SCRITTI LETTERARI
DI
LEONARDO DA VINCI

cavati dagli Autografi e pubblicati

da

J. P. RICHTER

IN DUE PARTI. — PARTE II.

LONDRA:
SAMPSON LOW, MARSTON, SEARLE & RIVINGTON
188, FLEET STREET
1883
THE LITERARY WORKS
OF
LEONARDO DA VINCI
compiled and edited from the Original Manuscripts
by
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KNIGHT OF THE BAVARIAN ORDER OF ST. MICHAEL, &c.

IN TWO VOLUMES.—VOL. II.

LONDON:
SAMPSON LOW, MARSTON, SEARLE & RIVINGTON
188, FLEET STREET
1883
DEDICATED

BY PERMISSION

to

HER MOST GRACIOUS MAJESTY

THE QUEEN
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ERRATA.

Italian text: page 19 l. 13 for rope read rompe.—p. 30 l. 3 from the end for sciuma read schiuma.—p. 132 l. 16 for scarce read scorre.—p. 164 l. 33 for trova read trova.—p. 170 l. 28 for pà vicini read più vicini.—p. 260 l. 9 for varano read varano.—p. 295 l. 12 for oro read loro.—p. 319 l. 9 for arimeticici read arimeticici; l. 11 for sie stende read si estende.—p. 328 l. 12 for modi read modo.—p. 339 l. 33 for regoli read regole.—p. 358 l. 5 from the end for bellonti read bollenti.—p. 365 l. 3 from the end for abbraccierani read abbraccieran—.

English text: page 46 l. 13 for No. 14 read No. 4.—p. 49 l. 19 for PI. CXXXIV read Pl. LXXXIV.—p. 53 first Note, for PI. IX read Pl. XIJII.—p. 60 l. 8 for Pl. CXIX read Pl. XCIX.—p. 103 l. 4 from the end for XCVI read XCIV.—p. 105 l. 8 for Pl. XL read Pl. XC; l. 9 for Pl. XL read Pl. XCI.—p. 135 l. 11 for weight read weighty.—p. 190 l. 25 for it there read there.—p. 344 l. 4 from the end for to much read so much.—p. 368 l. 14 for Flamme read Flame; l. 29 for to blows read blows.
The notes on Sculpture.

Compared with the mass of manuscript treating of Painting, a very small number of passages bearing on the practice and methods of Sculpture are to be found scattered through the note books; these are here given at the beginning of this section (Nos. 706—709). There is less cause for surprise at finding that the equestrian statue of Francesco Sforza is only incidentally spoken of; for, although Leonardo must have worked at it for a long succession of years, it is not in the nature of the case that it could have given rise to much writing. We may therefore regard it as particularly fortunate that no fewer than thirteen notes in the master's handwriting can be brought together, which seem to throw light on the mysterious history of this famous work. Until now writers on Leonardo were acquainted only with the passages numbered 712, 719, 720, 722 and 723.

In arranging these notes on sculpture I have given the precedence to those which treat of the casting of the monument, not merely because they are the fullest, but more especially with a view to reconstructing the monument, an achievement which really almost lies within our reach by combining and comparing the whole of the materials now brought to light, alike in notes and in sketches.

A good deal of the first two passages, Nos. 710 and 711, which refer to this subject seems obscure and incomprehensible; still, they supplement each other and one contributes in no small degree to the comprehension of the other. A very interesting and instructive commentary on these passages may be found in the fourth chapter of Vasari's vol. ii.
Introduzione della Scultura under the title "Come si fanno i modelli per fare di bronzo le figure grandi e piccole, e come le forme per buttarle; come si armino di ferri, e come si gettino di metallo," &c. Among the drawings of models of the moulds for casting we find only one which seems to represent the horse in the act of galloping—No. 713. All the other designs show the horse as pacing quietly; and as these studies of the horse are accompanied by copious notes as to the method of casting, the question as to the position of the horse in the model finally selected, seems to be decided by preponderating evidence. "Il cavallo dello Sforza"—C. Boito remarks very appositely in the Saggio on page 26, "doveva sembrare fratello al cavallo del Colleoni. E si direbbe che questo fosse figlio del cavallo del Gattamelata, il quale pare figlio di uno dei quattro cavalli che stavano forse sull'Arco di Nerone in Roma" (now at Venice). The publication of the Saggio also contains the reproduction of a drawing in red chalk, representing a horse walking to the left and supported by a scaffolding, given here on Pl. LXXVI, No. 1. It must remain uncertain whether this represents the model as it stood during the preparations for casting it, or whether—as seems to me highly improbable—this sketch shows the model as it was exhibited in 1493 on the Piazza del Castello in Milan under a triumphal arch, on the occasion of the marriage of the Emperor Maximilian to Bianca Maria Sforza. The only important point here is to prove that strong evidence seems to show that, of the numerous studies for the equestrian statue, only those which represent the horse pacing agree with the schemes of the final plans.

The second group of preparatory sketches, representing the horse as galloping, must therefore be considered separately, a distinction which, in recapitulating the history of the origin of the monument seems justified by the note given under No. 720.

Galeazzo Maria Sforza was assassinated in 1476 before his scheme for erecting a monument to his father Francesco Sforza could be carried into effect. In the following year Lodovico il Moro the young aspirant to the throne was exiled to Pisa, and only returned to Milan in 1479 when he was Lord (Governatore) of the State of Milan, in 1480 after the minister Cecco Simonetta had been murdered. It may have been soon after this that Lodovico il Moro announced a competition for an equestrian statue, and it is tolerably certain that Antonio del Pollajuolo took part in it, from this passage in Vasari's Life of this artist: "E si trovò, dopo la morte sua, il disegno e modello che a Lodovico Sforza egli aveva fatto per la statua a cavallo di Francesco Sforza, duca di Milano; il quale disegno è nel nostro Libro, in due modi: in uno egli ha sotto Verona; nell'altro, egli tutto armato, e sopra un basamento pieno di battaglie, fa saltare il cavallo addosso a un armato; ma la cagione perchè non mettesse questi disegni in opera, non ho già potuto sapere." One of Pollajuolo's drawings, as here described, has lately been discovered by Senatore Giovanni Morelli in the Munich Pinacothe. Here the profile of the horseman is a portrait of Francesco Duke of Milan, and under the horse, who is galloping to the left, we see a warrior thrown and lying on the ground; precisely the same idea as we find
in some of Leonardo’s designs for the monument, as on Pl. LXVI, LXVII, LXVIII, LXIX and LXXII No. 1; and, as it is impossible to explain this remarkable coincidence by supposing that either artist borrowed it from the other, we can only conclude that in the terms of the competition the subject proposed was the Duke on a horse in full gallop, with a fallen foe under its hoofs.

Leonardo may have been in the competition there and then, but the means for executing the monument do not seem to have been at once forthcoming. It was not perhaps until some years later that Leonardo in a letter to the Duke (No. 719) reminded him of the project for the monument. Then, after he had obeyed a summons to Milan, the plan seems to have been so far modified, perhaps in consequence of a remonstrance on the part of the artist, that a pacing horse was substituted for one galloping, and it may have been at the same time that the colossal dimensions of the statue were first decided on. The designs given on Pl. LXX, LXXI, LXXII, 2 and 3, LXXIII and LIV and on pp. 4 and 24, as well as three sketches on Pl. LXIX may be studied with reference to the project in its new form, though it is hardly possible to believe that in either of these we see the design as it was actually carried out. It is probable that in Milan Leonardo worked less on drawings, than in making small models of wax and clay as preparatory to his larger model. Among the drawings enumerated above, one in black chalk, Pl. LXXIII—the upper sketch on the right hand side, reminds us strongly of the antique statue of Marcus Aurelius. If, as it would seem, Leonardo had not until then visited Rome, he might easily have known this statue from drawings by his former master and friend Verrocchio, for Verrocchio had been in Rome for a long time between 1470 and 1480. In 1473 Pope Sixtus IV had this antique equestrian statue restored and placed on a new pedestal in front of the church of San Giovanni in Laterano. Leonardo, although he was painting independently as early as in 1472 is still spoken of as working in Verrocchio’s studio in 1477. Two years later the Venetian senate decided on erecting an equestrian statue to Colleoni; and as Verrocchio, to whom the work was entrusted, did not at once move from Florence to Venice—where he died in 1488 before the casting was completed—but on the contrary remained in Florence for some years, perhaps even till 1485, Leonardo probably had the opportunity of seeing all his designs for the equestrian statue at Venice and the red chalk drawing on Pl. LXXIV may be a reminiscence of it.

The pen and ink drawing on Pl. LXXII, No. 3, reminds us of Donatello’s statue of Gattamelata at Padua. However it does not appear that Leonardo was ever at Padua before 1499, but we may conclude that he took a special interest in this early bronze statue and the reports he could procure of it, form an incidental remark which is to be found in C. A. 145a; 432a, and which will be given in Vol. II under Ricordi or Memoranda.
Among the studies—in the widest sense of the word—made in preparation for this statue we may include the Anatomy of the Horse which Lomazzo and Vasari both mention; the most important parts of this work still exist in the Queen's Library at Windsor. It was beyond a doubt compiled by Leonardo when at Milan; only a few interesting records to be found among these designs are reproduced in Nos. 716 and 717; but it must be pointed out that out of 40 sheets of studies of the movements of the horse belonging to that treatise, a horse in full gallop occurs but once.
If we may trust the account given by Paulus Fovius—about 1527—Leonardo's horse was represented as "vehementer incitatus et anhelatus". Fovius had probably seen the model exhibited at Milan; but, need we, in fact, infer from this description that the horse was galloping? Compare Vasari's description of the Gattamelata monument at Padua: "Egli [Donatello] vi andò ben volentieri, e fece il cavallo di bronzo, che è in sulla piazza di Sant Antonio, nel quale si dimostra lo sbuffamento ed il fremito del cavallo, ed il grande animo e la fierezza vivacissimamente espressa dall'arte nella figura che lo cavalca".

These descriptions, it seems to me, would only serve to mark the difference between the work of the middle-ages and that of the renaissance.

We learn from a statement of Sabbà da Castiglione that, when Milan was taken by the French in 1499, the model sustained some injury; and this informant, who, however is not invariably trustworthy, adds that Leonardo had devoted fully sixteen years to this work (la forma del cavallo, intorno a cui Leonardo avea sedici anni continui consumati). This often-quoted passage has given ground for an assumption, which has no other evidence to support it, that Leonardo had lived in Milan ever since 1483. But I believe it is nearer the truth to suppose that this author's statement alludes to the fact that about sixteen years must have past since the competition in which Leonardo had taken part.

I must in these remarks confine myself strictly to the task in hand and give no more of the history of the Sforza monument than is needed to explain the texts and drawings I have been able to reproduce. In the first place, with regard to the drawings, I may observe that they are all, with the following two exceptions, in the Queen's Library at Windsor Castle; the red chalk drawing on Pl. LXXVI No. 1 is in the MS. C. A. (see No. 712) and the fragmentary pen and ink drawing on page 4 is in the Ambrosian Library. The drawings from Windsor on Pl. LXVI have undergone a trifling reduction from the size of the originals.

There can no longer be the slightest doubt that the well-known engraving of several horsemen (Passavant, Le Peintre-Graveur, Vol. V, p. 181, No. 3) is only a copy after original drawings by Leonardo, executed by some unknown engraver; we have only to compare the engraving with the facsimiles of drawings on Pl. LXV, No. 2, Pl. LXVII, LXVIII and LXIX which, it is quite evident, have served as models for the engraver.

On Pl. LXV No. 1, in the larger sketch to the right hand, only the base is distinctly visible, the figure of the horseman is effaced. Leonardo evidently found it unsatisfactory and therefore rubbed it out.

The base of the monument—the pedestal for the equestrian statue—is repeatedly sketched on a magnificent plan. In the sketch just mentioned it has the character of a shrine or aedicula to contain a sarcophagus. Captives in chains are here represented on the entablature with their backs turned to that portion of the monument which more
strictly constitutes the pedestal of the horse. The lower portion of the aedicula is surrounded by columns. In the pen and ink drawing Pl. LXVI—the lower drawing on the right hand side—the sarcophagus is shown between the columns, and above the entablature is a plinth on which the horse stands. But this arrangement perhaps seemed to Leonardo to lack solidity, and in the little sketch on the left hand, below, the sarcophagus is shown as lying under an arched canopy. In this the trophies and the captive warriors are detached from the angles. In the first of these two sketches the place for the trophies is merely indicated by a few strokes; in the third sketch on the left the base is altogether broader, buttresses and pinnacles having been added so as to form three niches. The black chalk drawing on Pl. LXVIII shows a base in which the angles are formed by niches with pilasters. In the little sketch to the extreme left on Pl. LXV, No. 1, the equestrian statue serves to crown a circular temple somewhat resembling Bramante’s tempietto of San Pietro in Montorio at Rome, while the sketch above to the right displays an arrangement faintly reminding us of the tomb of the Scaligers in Verona. The base is thus constructed of two platforms or slabs, the upper one considerably smaller than the lower one which is supported on flying buttresses with pinnacles.

On looking over the numerous studies in which the horse is not galloping but merely walking forward, we find only one drawing for the pedestal, and this, to accord with the altered character of the statue, is quieter and simpler in style (Pl. LXXIV). It rises almost vertically from the ground and is exactly as long as the pacing horse. The whole base is here arranged either as an independent baldacchino or else as a projecting canopy over a recess in which the figure of the deceased Duke is seen lying on his sarcophagus; in the latter case it was probably intended as a tomb inside a church. Here, too, it was intended to fill the angles with trophies or captive warriors. Probably only No. 724 in the text refers to the work for the base of the monument.

If we compare the last mentioned sketch with the description of a plan for an equestrian monument to Gian Giacomo Trivulzio (No. 725) it seems by no means impossible that this drawing is a preparatory study for the very monument concerning which the manuscript gives us detailed information. We have no historical record regarding this sketch nor do the archives in the Trivulzio Palace give us any information. The simple monument to the great general in San Nazaro Maggiore in Milan consists merely of a sarcophagus placed in recess high on the wall of an octagonal chapel. The figure of the warrior is lying on the sarcophagus, on which his name is inscribed; a piece of sculpture which is certainly not Leonardo’s work. Gian Giacomo Trivulzio died at Chartres in 1518, only five months before Leonardo, and it seems to me highly improbable that this should have been the date of this sketch; under these circumstances it would have been done under the auspices of Francis I, but the Italian general was certainly not in favour with the French monarch at the time. Gian Giacomo Trivulzio was a sworn foe to Ludovico il Moro, whom he strove for years to overthrow. On the 6th September 1499 he marched victorious into Milan at the head
of a French army. In a short time, however, he was forced to quit Milan again when Ludovico il Moro bore down upon the city with a force of Swiss troops. On the 15th of April following, after defeating Lodovico at Novara, Trivulzio once more entered Milan as a Conqueror, but his hopes of becoming Governatore of the place were soon wrecked by intrigue. This victory and triumph, historians tell us, were signalled by acts of vengeance against the dethroned Sforza, and it might have been particularly flattering to him that the casting and construction of the Sforza monument were suspended for the time.

It must have been at this moment—as it seems to me—that he commissioned the artist to prepare designs for his own monument, which he probably intended should find a place in the Cathedral or in some other church. He, the husband of Margherita di Nicolino Colleoni, would have thought that he had a claim to the same distinction and public homage as his less illustrious connection had received at the hands of the Venetian republic. It was at this very time that Trivulzio had a medal struck with a bust portrait of himself and the following remarkable inscription on the reverse:

**DEO FAVENTE • 1499 • DICTVS • IO • IA • EXPVLIT • LVDOVICI • SF • (Sforiam) DVC • (ducem) MLI (Mediolani) • NOIE (nomine) • REGIS • FRANCORVM • EODEM • ANN • (anno) RED’T (redit) • LVS (Ludovicus) • SUPERATVS ET CAPTVS • EST • AB • EO.**

In the Library of the Palazzo Trivulzio there is a MS. of Callimachus Siculus written at the end of the XVth or beginning of the XVIth century. At the beginning of this MS. there is an exquisite illuminated miniature of an equestrian statue with the name of the general on the base; it is however very doubtful whether this has any connection with Leonardo’s design.

Nos. 731—740, which treat of casting bronze, have probably a very indirect bearing on the arrangements made for casting the equestrian statue of Francesco Sforza. Some portions evidently relate to the casting of cannon. Still, in our researches about Leonardo’s work on the monument, we may refer to them as giving us some clue to the process of bronze casting at that period.
De' statua.

Se vuoi fare una figura di marmo, se prima vna di terra, la quale, finita che l'ai, secca e mettila in vna cassa che sia ancora capace, dopo la figura tratta d'esso loco, a ricicere il marmo che vuoi scoprirvi, a dentro la figura alla similitudine di quella di terra; e poi messa la figura di terra in detta cassa abbi bacchette ch'etrino appiutto per i suoi busi, e spingile dentro tuto per ciascuno buso che ciascuna bacchetta bifca tocca la figura in diversi lochi, e la parte d'essa bacchette, che resta fori della cassa, tigni di nero, e fa il còtrassegnò alla bacchetta e al suo buso in modo ch'a tua posta si scotti; e trai d'essa cassa la figura di terra e mettivi il tuo pezzo di marmo, e tuto leua del marmo, che tutte le sue bacchette si nascondino sino al loro segnio in detti busi, e per potere questo meglio fare fa che tutta la cassa si po' essa leuare in alto, e l'fondo d'essa cassa resti sèpre sotto il marmo ed a questo modo ne potrai leuare col ferro con grà facilità.

If you wish to make a figure in marble, first make one of clay, and when you have finished it, let it dry and place it in a case which should be large enough, after the figure is taken out of it, to receive also the marble, from which you intend to reveal the figure in imitation of the one in clay. After you have put the clay figure into this said case, have little rods which will exactly slip in to the holes in it, and thrust them so far in at each hole that each white rod may touch the figure in different parts of it. And colour the portion of the rod that remains outside black, and mark each rod and each hole with a countersign so that each may fit into its place. Then take the clay figure out of this case and put in your piece of marble, taking off so much of the marble that all your rods may be hidden in the holes as far as their marks; and to be the better able to do this, make the case so that it can be lifted up; but the bottom of it will always remain under the marble and in this way it can be lifted with tools with great ease.
Acquista hó errato a insegnare alli sculptori *circundare con fili i membri delle loro figure, quasi credendo che essi membri sieno d'equale *rotondità, in qualunque parte da essi fili *circundati sieno.

708.

Measurement and Division of a Statue.

Divide the head into 12 degrees, and each degree divide into 12 points, and each point into 12 minutes, and the minutes into mins and the mins into semi mins.

Degree—point—minute—minim.

709.

Sculptured figures which appear in motion, will, in their standing position, actually look as if they were falling forward.

710.

Three braces which bind the mould.

[If you want to make simple casts quickly, make them in a box of river sand wetted with vinegar.]
II.

6[Quando • tu avrai • fatto • la • forma • sopra il cavalo e tu • sarai la grossezza del metallo 9 di terra.]

10 Nota • nello allegare • quante • ore • vâ • per cetinajo 11 [nel guttare ognuno tenga stoppato il fornello col 11 suo • infocato];

13 [nel dentro di tutta la forma • sia inbueato rallo 14 di lin seme o di treméntina; e poi sia dato vna mano 15 di polvere di borace e di pece greca con acqua vite, 16 e la forma di fori inpecciata, acciocché stàdo sotto 17 terra l'umido non la ...

24 [Per maneggiare la forma grade, fa ne modello della pi 25 scola forma; fa una piccola stàtta a proportione;]

26 [fa le bocche alla forma, mettré ch'è in sul cavallo;]

27 [Tieni le corna • in molle, e fondile con colà di pesce 28 pesa le parti 29 della forma, da che qua tità 30 di metallo ella • a essere occupata, 31 e tato ne da al fornello, che 32 a quella parte a a porgere il 33 suo metallo, e questo cogni 34 scerai a pesare la terra di quella 35 parte della forma, dove il fornello 36 colla sua qua tità a a rispode 37 e, e questo si fa acioche l 38 fornello delle gábe le epia, e che 39 dalle gábe non abbia a soccorrere 40 alla testa che sarebbe impossibile 41 [gitta nel medesimo 42 gie tto del cavallo 43 lo sportello della]

W. XI.

FORMA DEL CAVALLO.

2.Fa il cavallo sopra gambe di ferro fer me e stabili in bo no fondaménto, poi lo insceva e fa gli la cappa di sopra, 4 lasciando ben seccare a suolo a suolo, e questa ingrasseraí tre dita, di poi arma e ferra secondo il bisogno; oltre a di questo cava

facto. 7. chauollo ettu. 8. grosseza. 10. bone va • ciétinario. 11. hognivno • stopato • chol. 12. infichato midiriano ea ù tempo di stoppi. 13. hollo. 14. poi dato. 15. grecha chon acq"a". 16. ella • chessa ollo. 17. lomido nolla [ ] chose. 18. fatte subito chella [ ] [ ] 19. il sabione di for [ ] azzoo ció di. 20 quello d'ferme [ ] chon acieto. 21. e ben [ ] 22. misia nella forma [ ] uno quadrello. 23. psto • e cierne cí clara dono e a ceto. 24. manegiare. 25. cholla • falle una piccholo. 26. falle boche. 27. chonna imele effondile cholla di pezzi. 28. pensa [la forma] 2. 30. ella essere ochuapatà. 31. etatò. 32. acquella parte a a porgiere. 33. ecquesto chogño. 34. seceri • tera. 35. forn. 36. cholla • rispode. 37. ecquesto. 38. gábe ñapisteche doubful. 30. ale • ahiascharrer. 40. chessa reb e impossib. 42. chauollo. 43. sportello della. Here the text breaks of.

711. 2. ghanbe • esatible. 3. sondonéto • effagii la chappa. 4. scechare assuolo assuolo • ecquesta. 5. efera sechondo. 6. chava

710. The importance of the notes included under this number is not diminished by the fact that they have been lightly crossed out with red chalk. Possibly they were the first scheme for some fuller observations which no longer exist; or perhaps they were crossed out when Leonardo found himself obliged to give up the idea of casting the equestrian statue. In the original the first two sketches are above l. 1, and the third below l. 9.

THE SPORZA MONUMENT.

II.

THE MOULD FOR THE HORSE.

Make the horse on legs of iron, strong and well set on a good foundation; then grease it and cover it with a coating, leaving each coat to dry thoroughly layer by layer; and this will thicken it by the breadth of three fingers. Now fix and bind it with
la forma, e poi fa la ?grossezza, e poi riępi
la forma a mezza a mezza, e quella in-
tegra, poi con sua ferri cierchiala e ^cigni
e la ricuoci di dëtro dove à a toccare il
brö179zo.

DEI FAR LA FORMA DI PEZZI.

17 Segnia sopra il cavallo finito tutti li
pezz della for99ma, di che tu vo vestire
tal cavallo, e nello intaremare 41 li taglia in
ogni intestartura, acciò che quandó si è finit19ta
la forma che tu la possi cavare e poi ri-
cometternre 41 al primo loco colli sua scorti
delló cotrasegni.

18 a b quadretto - starà infra la cappa
e il maschio, cioè 18 nel uaco dove à a
stare il brózo liquefatto e questi 19 tali qua-
dretti di brózo manterranno li spati della for-
20 ma, alla cappa con equal distàßia, e per
questo tali 21 quadretti 50 di gràde impor-
tante.
22 "La terra sia niista 23 ço rea;
24 tollicerà, a rëdec9re, e pagare la cò-
26 sumata."
27 Secca la 28 a suoli. 29 Fa la forma
di fori 30 di giesso per fugire 31 il tópo
del seccare, 31 e la spesa di legnie, e cô 31
tal giesso ferma 34 li ferri de fori e di
35 dentro cò due dita di 36 grossezza, fa
terra 37 cottà.
38 E questa tal forma 39 farai in un dl;
ven mezz39a navata di giesso 41 ti serene.
13 Bono.
44 Ritasa cò 44 colla e terra 45 over- chiara
46 d'ovo 46 e mattone e ro17sume.

C. A. 2134 : 684

Tutti i capi dell'èle chiavarde.

712. All the heads of the large nails.

711. See P1. IX.XV. The figure "40," close
to the sketch in the middle of the page between
lines 16 and 17 has been added by a collector's
hand.

In the original, below line 21, a square piece
of the page has been cut out about 9 centiméres
by 7 and a blank piece has been gammed into
the place.

Lines 22—24 are written on the margin. 1. 27 and
28 are close to the second marginal sketch. 1. 42 is a
note written above the third marginal sketch and on
the back of this sheet is the text given as No. 642.

Compare also No. 802.

712. See P1. LXXVI, No. 1. This drawing has
already been published in the "Saggio delle Opere di
L. da Vinci." Milano 1872, P1. XXIV, No. 1. But,
for various reasons I cannot regard the editor's
suggestions as satisfactory. He says: "Veggansi le
armature di legname colle quali forse vennè sostenuto il
modello, quando per le nozze di Bianca Maria Sforza con
Massimiliano imperatore, esso fu collocato sotto un arco
trionfale davanti al Castello."
PL. LXXI

Heliog. Dujardin.
Queste legature vano di dentro.

These bindings go inside.

Sale fatto di sterco vmano bruciato e calcinato e fatto ne liscia e quella distesa al letto foco, e tutti li sterchi in simile modo fanno sale, e quelli sali destillati sono molto penetrati.

Salt may be made from human excrements, burnt and calcined, made into lees and dried slowly at a fire, and all the excrements produce salt in a similar way and these salts when distilled, are very strong.

714. 1. stercho. 2. chalcinato effatto nelisicia coque. 3. disecha allëto focho etutti liaster. 4. quali. 5. dessilati.

714: Vasari repeatedly states, in the fourth chapter of his Introdizione della Scultura, that in preparing to cast bronze statues horse-dung was frequently used by sculptors. If, notwithstanding this, it remains doubtful whether I am justified in having introduced here this text of but little interest, no such doubt can be attached to the sketch which accompanies it.
NOTES ON SCULPTURE.

W. XII.

**METHOD OF FOUNDING AGAIN.**

This may be done when the furnace is made [4] strong and bruised.

W. H. 64.]

Ginneto · grosso · di messer Galeazzo.

W. H. IV.]

Siciliano di messer Galeazzo.

C. A. 386 b; 870 a]

Misura del siciliano, la ganba dirieto, in faccia, alzata e distesa.

C. A. 382 a; 11820]

Ancora si potra dare opera al cavallo di bronzo che sarà gloria immortale e eterno onore della felice memoria del signore vostro padre e della idyta casa Sforzesca.

C. 158 (11]

A di 23 d'aprile 1490 comiciam questo libro e ricomiciam il cavallo.

On the 23rd of April 1490 I began this book, and recommenced the horse.

**NOTES.**

W. H. 65.]

Questo si potrebbe fare fatto il for- nello · ferma e pillata.

W. H. 64.]

Ginneto · grosso · di messer Galeazzo.

W. H. IV.]

Siciliano di messer Galeazzo.

C. A. 386 b; 870 a]

Misura del siciliano, la ganba dirieto, in faccia, alzata e distesa.

C. A. 382 a; 11820]

Ancora si potra dare opera al cavallo di bronzo che sarà gloria immortale e eterno onore della felice memoria del signore vostro padre e della idyta casa Sforzesca.

C. 158 (11]

A di 23 d'aprile 1490 comiciam questo libro e ricomiciam il cavallo.

715. 1. richocere. 2. potre. 4. pilata. 716. 1. gianecto · galeaz. 717. 1. ciciliano · meser galeazo. 718. 1. ciciliano. 2. alza. 719. 1-2 written from left to right. 1. Anchora si potera · honore dela. 2. S"gré" vost · dela. 720. Chomcialia · richomiciai.

715. This note in 1. 4 is written below the sketches. 716. 717. These notes are by the side of a drawing of a horse with figured measurements. 718. There is no sketch belonging to this passage. Galeazzo here probably means Galeazzo di San Severino, the famous captain who married Bianca the daughter of Ludovico il Moro. 719. The letter from which this passage is here extracted will be found complete in section XXI. (see the explanation of it, on page 2).
721. There is to be seen, in the mountains of Parma and Piacenza, a multitude of shells and corals full of holes, still sticking to the rocks, and when I was at work on the great horse for Milan, a large sackful of them, which were found thereabout, was brought to me into my workshop, by certain peasants.

722. Believe me, Leonardo the Florentine, who has to do the equestrian bronze statue of the Duke Francesco that he does not need to care about it, because he has work for all his life time, and, being so great a work, I doubt whether he can ever finish it.

723. Of the horse I will say nothing because I know the times.

724. During ten years the works on the marbles have been going on I will not wait for my payment beyond the time, when my works are finished.

725. The project of the Triulzo monument.

There are other deviations of less importance from the original.
A coureur, as large as life, with the rider requires for the cost of the metal, duc. 500.
And for cost of the iron work which is inside the model, and charcoal, and wood, and the tool to cast it in, and for binding the mould, and including the furnace where it is to be cast, duc. 200.
To make the model in clay and then in wax, duc. 432.
To the labourers for polishing it when it is cast, duc. 450.

[12] Cost of the marble of the monument [14].

Cost of the marble according to the drawing. The piece of marble under the horse which is 4 braccia long, 2 braccia and 2 inches wide and 9 inches thick 38 hundredweight, at 4 Lire and 10 Soldi per hundredweight, duc. 58.
And for 13 braccia and 6 inches of cornice, 7 in. wide and 4 in. thick, 24 hundredweight, duc. 24.
And for the frieze and architrave, which is 4 br. and 6 in. long, 2 br. wide and 6 in. thick, 29 hundredweight, duc. 20.
And for the capitals made of metal, which are 8, 5 inches in. square and 2 in. thick, at the price of 15 ducats each, will come to, duc. 122.
And for 8 columns of 2 br. 7 in., 4 1/2 in. thick, 20 hundredweight, duc. 20.
And for 8 bases which are 5 1/2 in. square and 2 in. high 5 hundredils, duc. 5.
And for the slab of the tombstone 4 br. 10 in. long, 2 br. 4 1/2 in. wide, 36 hundredweight, duc. 36.
And for 8 pedestal feet each 8 br. long and 6 1/2 in. wide and 6 1/2 in. thick, 20 hundredweight come to, duc. 20.
And for the cornice below which is 4 br. and 10 in. long, and 2 br. and 5 in. wide, and 4 in. thick, 32 hundredils, duc. 32.
And for the stone of which the figure of the deceased is to be made which is 3 br. and 8 in. long, and 1 br. and 6 in. wide, and 9 in. thick, 30 hundredils, duc. 30.

And for the stone on which the figure lies which is 3 br. and 4 in. long and 1 br. and 2 in., wide and 4 1/2 in. thick duc. 16.
And for the squares of marble placed between the pedestals which are 8 and are 9 br. long and 9 in. wide, and 3 in. thick, 8 hundredweight, duc. 8.
in all, duc. 389.
Zecca di Roma.

It can also be made without a spring. The mint of Rome.

But the screw above must always be joined to the part of the movable sheath:
Tutte le monete che non aino il cierchio intero, non siano accennate, per buone, e a fare la perfezione del lor cierchio è necessario che in prima le mone te sié tutte di perfetto circolo, e a fare questo sié si debbe in prima fare vna moneta perfetta in peso e in larghezza e grossezza, e si debbe di questa tal lar 9ghezza e grossezza sié fat te molte lamine, tirate per una medesima tra' filia, le quali re steranno a modo di righe, e di queste tali righe si stampi e sono le monete 26 tőde, a modo che si facino i crueili da cesta 28 gnic, e queste mone te poi si stampino nel 3° modo sopra detto ecc.

Il vacuo della stampa 32 sia più largo da alto 31 che da basso vni fornemente, 35 e insesibile.

Questo taglia le monete, di perfetta ro 37 tonità e grossezza e peso e ris 39 parma l'omo che taglia e pesa, e rispiarmia l'omo che fa le monete 40 tőde; adunque sol passa per li mani del traslatore e dello stampato 42 re e fa monete bellissime.

Polvere da medaglie.

Stoppini • incombustibili • di fungo ridotto in polvere, 3 stagno bruciato e tutti i metalli, 4 allume scaglialuolo, 5 fumo di cucina da ottone, 6 e ciascuna cosa inumidisse con acqua o me lago 7 o acieto • forte di grà, uino bianco, o di quella prima acqua di trementina destillata, o olio, pure che poco sia invidi di, e gitta in teleroli.

Dello inprotàre medaglie.

Polta di smeriglio mista con acquavite 2 o scaglia di ferro con aceto, o cenere di foglie di noce, o cenere 3 di paglia sottomette trita.

Powder for medals.

The incombustible growth of soot on wicks reduced to powder, burnt tin and all the metals, alum, isinglass, smoke from a brass forge, each ingredient to be moistened, with aqua vitae or malmsey or strong malt vinegar, white wine or distilled extract of turpentine, or oil; but there should be little moisture, and cast in moulds.

Of taking casts of medals.

A paste of emery mixed with aqua vitae, or iron filings with vinegar, or ashes of walnut leaves, or ashes of straw very finely powdered.

726. 1. reccha di rona. 2. Puosi anchera. 3. massi. 4. chom giunato, 5. ether, 6. eai. 7. perfecione. 8. prima ne mone. 9. perfecto. 10. cholo e afare. 11. e si in patra. 12. perfecta. 13. questa. 14. sie fac. 15. queste. 16. ris. 26. chesi. 27. equestre. 28. isitan pino. 29. declo ele. 30. vacuo. 31. larcho. 32. chessa. 33. Questo. 34. grosseza. 35. essima. 36. spira. 37. chettaglia essima. 38. spira. 39. rispiarma. 40. alla. 41. istamplio. 42. effa

727. 1. stopini incombustibili. 2. brusno ettuitti. 3. allume scaglialuolo. 4. essiasichiuma. 5. inimiiissi con acq"a". 6. bianco o di ella prima acq"a". 7. destillati o hollio

728. 1. polta di smeriglio. 2. acq"a". 3. ho cenere. 4. inolo [inp] in. 5. batutto. 6. radopio [cre] esistien. 7. accobbial

See Pl. LXXVI No. 2. The text of lines 31—35 stands parallel in the text. 24—27.

Farther evidence of Leonardo's occupations and engagements at Rome under Pope Leo X. may be gathered from some rough copies of letters which will be found in this volume. Hitherto nothing has been known of his work in Rome beyond some doubtful, and perhaps mythical, statements in Vasari. 727. The meaning of scaglialuolo in this passage is doubtful.
The diameter is given in the lead enclosed; it is beaten with a hammer and several times extended; the lead is folded and kept wrapped up in parchment so that the powder may not be split; then melt the lead, and the powder will be on the top of the melted lead, which must then be rubbed between two plates of steel till it is thoroughly pulverised; then wash it with aqua fortis, and the blackness of the iron will be dissolved leaving the powder clean.

Emery in large grains may be broken by putting it on a cloth many times doubled, and hit it sideways with the hammer, when it will break up; then mix it little by little and it can be founded with ease; but if you hold it on the anvil you will never break it, when it is large.

Any one who grinds small should do it on plates of tempered steel with a cone shaped grinder; then put it in aqua fortis, which melts away the steel that may have been worked up and mixed with the small, and which makes it black; it then remains purified and clean; and if you grind it on porphyry the porphyry will work up and mix with the small and spoil it, and aqua fortis will never remove it because it cannot dissolve the porphyry.

If you want a fine blue colour dissolve the small made with tartar, and then remove the salt.

Vitrified brass makes a fine red.

STUCCO.

Place stucco over the prominence of the . . . . which may be composed of Venus and Mercury, and lay it well over that prominence of the thickness of the side of a knife, made with the ruler and cover this with the bell of a still, and you will have again the moisture with which you applied the paste. The rest you may dry

In this passage a few words have been written in a sort of cipher—that is to say backwards; as in L. 3 erew for Venus, l. 4 orercom for Mercúrio, l. 12 il or ree is set arob for il coerro (? ) cò bozice. The meaning of the word before "di gieno" in l. 1 is unknown; and the sense, in which sagomà is used here and in other passages is obscure—Venus and Mercúrio may mean 'marble' and 'limes', of which stucco is composed.

12. The meaning of orree is unknown.
ON CASTING BRONZE.  

[730—734.]

Brunisci co buon brunitoio e fa grosso inverso la costa.

STUCCO.

12 Poluerizza il ... cò borace e acqua, in pasta e fa stucco, e poi scalda in modo si secchi, e poi vernica con foco in modo che lustri.

S. K. M. III. 50#]

STUCCO DA FORMARE.

2 Togli · butiro parti 6, ciera parti · 2 · e tatta farina volatile · che, messa sopra le cose strutte · le facci · sode a modo · di cera · o di terra · da formare.

COLLA.

7 Togli mastice tremêtina stillata 8 e biacca.

S. K. M. III. 35#]

DA GITTARE.

3 Il tartaro bruciato e polvereizzato col gesso e gittato fa che esso · gesso si tiene insieme · poi, ch'è ricotto, e poi nell' acqua si disfa.

S. K. M. III. 53#]

PER GITTARE BRÔZO · IN GIESSO.

2 Togli per ogni 2 scodelle · di gesso una di corno di bo bruciato e mischia insieme · e gitta.

S. K. M. II. 1 55#]

Quâdo voi gittare di ciera, abbrucia la sciuma · con una candela, e'l gietto verrà senza busi.

S. K. M. III. 55#]

2 øcie di gesso da libbra · di metallo; noce che fa simile alla curva.

2 ounces of plaster to a pound of metal — walnut, which makes it like the curve.

... brunisti ci biò brunitoio e. in. chousta. 11. stucco. 12. il oreve cò ecacod e acq"a" in. 13. passa effa stucco eppoi scalt' o. 14. eppoi vernica con vocho · lunetri. 730. 1. stucco. 2. toli bituro parte · parte. 4. chose. 5. terra. 7. tomastice temêtina. 8. biacca. 731. 2. tartaro. 3. verizato chol. 4. brasso. 5. tiene sieme · rico. 6. acq"a". 732. 1. gesso · di. 3. brucia e misscia. 733. 1. abruca. 2. chandela. 734. 1. libra.

734. The second part of this is quite obscure.
S. K. M. Ill. 560]

[Terra asciuta 16 3 libbre, 100 libbre di metallo 3 la bagnata terra 20, 4 di bagnato 100, di metà, 5 che cresce 4 libbre d’acqua, 6 una di cera, una libbra di metallo, al-7 quatto misco, 8 inatura có terra, 9 misura per misura.]

H. 528]

Tal fia il gietto 8 qual fia la stàpa.

Tr. 58]

COME SI DEBMONO PULIRE I GIETTI.

Farai uno mazzo di fila di ferro, grosso come spaghetto, 1e coll’ acqua fregherai, tenendo sotto uno tinello, acciò nò facci fago sotto.

COME SI DE’ LEUARE I RICCI DEL BRÓZO.

Farai uno palo di ferro che sia a uso d’uno largo scarpollo, 7 e có quello fregherai su per quelle creste del brózo, che rimarrano 8 sopra i gietti delle bóbarde, che diriuan dalle schiappature della forma, ma fà che il palo pesi bene, e’ colpi sieno lúghi e grádi.

FACILITÀ DI FONDERE.

Allega prima una parte del metallo alla manica, di poi lo metti i fornace, e questo farà prícipio col suo bagnio al fondere del rame.

PER PROVVEDERE AL RAME CHE SI FREDDASSE NELLA FORNACE.

Quando il rame si fredsasse nella fornace fa che subito, quando tu te n’avedi, di tagliarlo có frugatojo - mètre ch’elì è i panica’, overo se fusse 15 iteramètè - raffredato, tagliaio, come si fa il piobo, có larghi e grossi scar17 pelli.

[735--737.] ON CASTING BRONZE.

[Dried earth 16 pounds, 100 pounds of metal wet clay 20,— of wet 100,—half,—which increases 4 lbs. of water,—1 of wax, 1 lb. of metal, a little less,—the scrapings of linen with earth, measure for measure.]

735. The translation is given literally, but the meaning is quite obscure.
Se avessi a fare vno grà gietto.

Se avessi a fare uno gietto di cento mila · libbre, falo có · 2 · fornelli con 2000 libbre 28 per ciascuno · o isino · in 3000 libbre il piv.

Tr. 531

1Comme fare bene a ròperre vna grà massa di brózo.

Se volli ròperre · una · grà · massa · di brózo · sospèdilo · prima, 3 poi · li fa da 4 · lati · uno muro · a vso di truogo · di mattoni, e fa li grà fico , e quado è bê rosso, dali · uno colpo con vno 5grà peso levato · in alto cò grà forza.

Tr. 541

DEl fare vnire il piòbo con altro · metallo.

Se volessi per masserittia · mettere · il piòbo · nel metallo · e per soprire · alla soma dello stagno · che si · richiede · nel metallo ·, allega · prima · il piòbo · collo · stagno · e poi metti sopra · il rame fòdoto.

1Come si debe · fondere in uno fornello.

Il fornello · de' essere · ifra 4. pilastri bê fòdati.

DElla grossezza della cappa.

La cappa nò debe · prevalicare · la grossezza · di 2 · dita ·, e debesi inter· rare · in quatro volte · sopra · la terra · sottile · e poi bene armare, 10 e sia · sola·mête · ricotta · di dêtro · e dato · poi · sottimête · di cenere · e bouina.

DElla grossezza della bôbarda.

La bôbarda · de' essere da 600 libbre di ballotta · ì su, có questa regola; 13 farai la misura del diametro · della · ballotta · e quel-

If you have to make a large cast.

If you have to make a cast of a hundred thousand pounds do it with two furnaces and with 2000 pounds in each, or as much as 3000 pounds at most.

738.

739.

How to proceed to break a large mass of bronze.

If you want to break up a large mass of bronze, first suspend it, and then make round it a wall on the four sides, like a trough of bricks, and make a great fire therein. When it is quite red hot give it a blow with a heavy weight raised above it, and with great force.

To combine lead with other metal.

If you wish for economy in combining lead with the metal in order to lessen the amount of tin which is necessary in the metal, first alloy the lead with the tin and then add the molten copper.

How to melt [metal] in a furnace.

The furnace should be between four well founded pillars.

Of the thickness of the coating.

The coating should not be more than two fingers thick, it should be laid on in four thicknesses over fine clay and then well fixed, and it should be fired only on the inside and then carefully covered with ashes and cow's dung.

Of the thickness of the gun.

The gun being made to carry 600 lbs. of ball and more, by this rule you will take the measure of the diameter of the ball and

738. 1. be a · 1 grà. 2. 1 grà. 3. 1 muro · eitta · fcho. 4. ecuando · dali 1 colpi chon.
739. 1. chol. 2. e per soprire. 3. chosí · chol. 4. eppoi · arame. 5. fondere il fornello. 7. grosseza · chappa. 8. chappa ... prevalichare la grosseza debessi. 9. gueto · socitile. 10. essa · richotta. 11. grosseza. 12. libr. 13. ba"lo"ta · dia-
la - dividit - i 6 - parti, e una d'esse parti-fia la grossezza - dinazi e la metà sepre-piv rieto, e se la ballotta fia di libbre 700, 7/12 del diametro della ballotta fia la sua 16-grossezza - dinazi, e se la ballotta fia 800, l'ottavo del suo diametro 17-dinazi, e se 900, 1/6 e 1/2 e se 1000 1/9.

DELLA LUCEZZA DELLA TRÒBA DELLA BÔBARDA.

Della grossezza del passa-volanti.

La grossezza dinazi de' passavolanti - nò deve passare dalla metà 26-isino al terzo del diametro della ballotta, E la lucezza da 30 isino i 36 17-ballotté.

Of the length of the body of the gun.

If you want it to throw a ball of stone, make the length of the gun to be 6, or as much as 7 diameters of the ball; and if the ball is to be of iron make it as much as 12 balls, and if the ball is to be of lead, make it as much as 18 balls. I mean when the gun is to have the mouth fitted to receive 600 lbs. of stone ball, and more.

Of the thickness of small guns.

The thickness at the muzzle of small guns should be from a half to one third of the diameter of the ball, and the length from 30 to 36 balls.

Of luting the furnace within.

The furnace must be luted before you put the metal in it, with earth from Valenza, and over that with ashes.

Of restoring the metal when it is becoming cool.

When you see that the bronze is congealing take some willow-wood cut in small chips and make up the fire with it.

The cause of its curdling.

I say that the cause of this congealing often proceeds from too much fire, or from ill-dried wood.

4740. I. 2. Terra di Valenza.—Valenza is north of Alessandria on the Po.
pūte d'esee flam turbe e finire có molto
fumo, nó te ne fidare, e massime 13 quå-
do avrai il bagnio quasi in acqua.

1 Dello allegare il metallo.

15 Il metallo si vole fare universalmente nelle bòbarde có 6 · o uisino 8 16 per cieto, cioè 6 di staignio · sopra · cieto · di rame, e quåto meno ve ne metti, 17 piv sicura sia · la bòbarda.

14 Quådo si debe accópagniare · lo stagno col rame.

19 Lo staignio · col rame si debbe · met-
tere · quådo · ài il rame còdotto in acqua.

15 Come si debe aVmétare il fondere.

21 Il fondere fia da te avmétato · quådo sarà còdotto il rame in 1/3 22 in acqua, al-
ora · con v legnio di castagnio ispesso rimaneggerai il rima 23 nelle del rame an-
cora iterò · ifra la · parte · fonduta.

and if you see the tips of the flames dull and ending in much smoke do not trust it, and particularly when the flux metal is almost fluid.

Of alloying the metal.

Metal for guns must invariably be made with 6 or even 8 per cent, that is 6 of tin to one hundred of copper, for the less you put in, the stronger will the gun be.

When the tin should be added to the copper.

The tin should be put in with the copper when the copper is reduced to a fluid.

How to hasten the melting.

You can hasten the melting when 1/3 ds of the copper is fluid; you can then, with a stick of chestnut-wood, repeatedly stir what of copper remains entire amidst what is melted.

Introductory Observations on the Architectural Designs (XII), and Writings on Architecture (XIII).

Until now very little has been known regarding Leonardo's labours in the domain of Architecture. No building is known to have been planned and executed by him, though by some contemporary writers incidental allusion is made to his occupying himself with architecture, and his famous letter to Lodovico il Moro,—which has long been a well-known document,—in which he offers his service as an architect to that prince, tends to confirm the belief that he was something more than an amateur of the art. This hypothesis has lately been confirmed by the publication of certain documents, preserved at Milan, showing that Leonardo was not only employed in preparing plans but that he took an active part, with much credit, as member of a commission on public buildings; his name remains linked with the history of the building of the Cathedral at Pavia and that of the Cathedral at Milan.

Leonardo's writings on Architecture are dispersed among a large number of MSS., and it would be scarcely possible to master their contents without the opportunity of arranging, sorting and comparing the whole mass of materials, so as to have some comprehensive idea of the whole. The sketches, when isolated and considered by themselves, might appear to be of but little value; it is not till we understand their general purport, from comparing them with each other, that we can form any just estimate of their true worth.

Leonardo seems to have had a project for writing a complete and separate treatise on Architecture, such as his predecessors and contemporaries had composed—Leon Battista Alberti, Filarete, Francesco di Giorgio and perhaps also Bramante. But, on the other hand, it cannot be denied that possibly no such scheme was connected with the isolated notes and researches, treating on special questions, which are given in this work; that he was merely working at problems in which, for some reason or other he took a special interest.

A great number of important buildings were constructed in Lombardy during the period between 1472 and 1499, and among them there are several by unknown architects,
of so high an artistic merit, that it is certainly not improbable that either Bramante or Leonardo da Vinci may have been, directly or indirectly, concerned in their erection.

Having been engaged, for now nearly twenty years, in a thorough study of Bramante's life and labours, I have taken a particular interest in detecting the distinguishing marks of his style as compared with Leonardo's. In 1869 I made researches about the architectural drawings of the latter in the Codex Atlanticus at Milan, for the purpose of finding out, if possible the original plans and sketches of the churches of Santa Maria delle Grazie at Milan, and of the Cathedral at Pavia, which buildings have been supposed to be the work both of Bramante and of Leonardo. Since 1876 I have repeatedly examined Leonardo's architectural studies in the collection of his manuscripts in the Institut de France, and some of these I have already given to the public in my work on "Les Projets Primitifs pour la Basilique de St. Pierre de Rome", Pl. 43. In 1879 I had the opportunity of examining the manuscript in the Palazzo Trivulzio at Milan, and in 1880 Dr. Richter showed me in London the manuscripts in the possession of Lord Ashburnham, and those in the British Museum. I have thus had opportunities of seeing most of Leonardo's architectural drawings in the original, but of the manuscripts themselves I have deciphered only the notes which accompany the sketches. It is to Dr. Richter's exertions that we owe the collected texts on Architecture which are now published, and while he has undertaken to be responsible for the correct reading of the original texts, he has also made it his task to extract the whole of the materials from the various MSS. It has been my task to arrange and elucidate the texts under the heads which have been adopted in this work. MS. B. at Paris and the Codex Atlanticus at Milan are the chief sources of our knowledge of Leonardo as an architect, and I have recently subjected these to a thorough re-investigation expressly with a view to this work.

A complete reproduction of all Leonardo's architectural sketches has not, indeed, been possible, but as far as the necessarily restricted limits of the work have allowed, the utmost completeness has been aimed at, and no efforts have been spared to include every thing that can contribute to a knowledge of Leonardo's style. It would have been very interesting, if it had been possible, to give some general account at least of Leonardo's work and studies in engineering, fortification, canal-making and the like, and it is only on mature reflection that we have reluctantly abandoned this idea. Leonardo's occupations in these departments have by no means so close a relation to literary work, in the strict sense of the word as we are fairly justified in attributing to his numerous notes on Architecture.

Leonardo's architectural studies fall naturally under two heads:

I. Those drawings and sketches, often accompanied by short remarks and explanations, which may be regarded as designs for buildings or monuments intended to be built. With these there are occasionally explanatory texts.

II. Theoretical investigations and treatises. A special interest attaches to these because they discuss a variety of questions which are of practical importance to this day. Leonardo's theory as to the origin and progress of cracks in buildings is perhaps to be considered as unique in its way in the literature of Architecture.

Henry de Geymüller.
XII.

Architectural Designs.

I. Plans for towns.

A. Sketches for laying out a new town with a double system of high-level and low-level road-ways.

Pl. LXXVII, No. 1 (MS. B, 15b). A general view of a town, with the roads outside it sloping up to the high-level ways within.

Pl. LXXVII, No. 3 (MS. B, 16b, see No. 741; and MS. B. 15b, see No. 742) gives a partial view of the town, with its streets and houses, with explanatory references.

Pl. LXXVII, No. 2 (MS. B, 15b; see No. 743). View of a double staircase with two opposite flights of steps.

Pl. LXXVIII, Nos. 2 and 3 (MS. B, 37a). Sketches illustrating the connection of the two levels of roads by means of steps. The lower galleries are lighted by openings in the upper road-way.

B. Notes on removing houses (MS. Br. M., 270b, see No. 744).

Le strade \( m \) sono pivi alte che le strade \( p \), s, braccia 6, e ciascuna \( s \) strada de' essere larga braccia 20, e avere \( \frac{1}{2} \) braccio di calo dalle stremità \( 3 \) al mezzo, e in esso mezzo sia a ogni braccio uno braccio di fessura, largo uno dito, dove l'acqua che

The roads \( m \) are 6 braccia higher than the roads \( p \) and the road must be 20 braccia wide and have \( \frac{1}{2} \) braccio slope from the sides towards the middle; and in the middle let there be at every braccio an opening, one braccio long and one finger wide, where the rain water may run off into

741. 1. strade \( [m] \) chelle. 2. largbr. 3. chalo. 3. mezo [eda esse stremita cinesso mezo \( \cdot \) br unobr. 4. deba. 6. largeza
PIEDE DEBBA SCOLARE NELLE CA'VE FATTE AL
MEDESIMO PIANO DI \( p \cdot s \), E DA OGNI STRE-
MITÀ DELLA \( \delta \) LARGHEZZA DI DETTA STRADA. SIA
UNO PORTICO DI LARGHEZZA DI BRACCIA \( G \) SUL.
LE COLONNE, E SAPPI CHE, CHI VOLESSE ANDARE
PER TUTTA LA TERRA PER LE \( \delta \) Strade alte,
POTRÀ A SUO ACCONCIO USARLE, E CHI VOLESSE
ANDARE \( \delta \) PER LE BASSE, ANCORA IL SIMILE; PER
LE STRADE ALTE NON DEVONO ANDARE
9 CARRI, NÉ ALTRE SIMILI COSÌ, ANZI SIANO
SOLAME'TE PER LI GIETELI O' S' MINI; PER LE BASSE
DEVONO ANDARE I CARRI E ALTRE SOME AL USO
\( \epsilon \) E COMMODITÀ DEL POPOLO.; L'UNA CASA DE'
VOLGIERE LE SCHIENE \( \delta \) ALL'ALTRA, LASCIA'I LA
STRADA BASSA IN MEZZO, ED AGLI USCI. \( \eta \) SI
METTANO LE VETTOVAGLIE, COME LEGNIE, VINO
E SIMILI COSÌ; PER LE \( \delta \) VIE SOTTERRANE E SI DE'
VOTARE DE' STALLE E SIMILI COSÌ FETIDE
6 DALL'UNO ARCO ALL'ALTRO

742. De' essere braccia 300, cioè ciascuna via che riceve il lume dalle fessure delle
strade di sopra, e a ogni arco de' essere
una scala a luna'ca tóda, perché ne' catoni
delle quadre si piscia, e larga, e nella prima
volta sia vn uscio ch'entri i destri e pisci-
atoi comuni, e per scala si discièda dalla
strada alta alla bassa, e le strade \( \delta \) alte si
comincino fori delle porte, e givnte a esse
porte abbia'no composto l'altezza di braccia
\( G \); Fia fatta detta terra o presso \( a \) mare
o altro fiume grosso, acciocché le brutture
della \( \eta \) città, menate dall'acqua sia vno po-
tate via.

743. Il modo di scale le scale \( \cdot c \cdot d \cdot \) discendo-
n o \( j \cdot f \cdot g \), e \( \delta \) similmente \( f \cdot g \) disciède
\( j \cdot h \cdot k \).

744. I portici di larghese di br. \( \eta \) Isu. 7. le colonne essapiches .. vollesi .. tere. 8. assu anchoncio .. vollesi. 9. no de an-
tare. 10. cari. .. simile .. sia. 11. cari. 12. chomodita .. chasa. .. 13. lassciado .. imero edal ussi. 14. met-
sino le veto vagio .. essamil. 15. soceterane .. essimile. 16. archo allalto \( \delta \).

4. discièdano .. essimilèmete.

5. On moving houses.

I. chase. 2. chase. 3. c'esqusto cò facilita (i). 5. eppoi. 6. còmetano. 11. chase .. novela.
chète tali case son prima fatte di pezzi sopra le piazze, e poi si comettono insieme colli loro legnami nel sito dove si debbono stabilire.

because such houses are at first made in pieces on the open places, and can then be fitted together with their timbers in the site where they are to be permanent.

Li omimi del paese abitino le nuove case in parte, quando nò v'è la court.

Let the men of the country [or the village] partly inhabit the new houses when the court is absent.

744. On the same page we find notes referring to Romolontino and Villafranca with a sketch-map of the course of the "Sodro" and the "Loera" (both are given in the text farther on). There can hardly be a doubt that the last sentence of the passage given above, refers to the court of Francis I. King of France.—L.9—13 are written inside the larger sketch, which, in the original, is on the right hand side of the page by the side of lines 1—8. The three smaller sketches are below.

J. P. R.
II. Plans for canals and streets in a town.

Pl. LXXIX, 1. and 2, (MS. B, 37b, see No. 745, and MS. B. 36a, see No. 746). A Plan for streets and canals inside a town, by which the cellars of the houses are made accessible in boats.

The third text given under No. 747 refers to works executed by Leonardo in France.

The front a m will give light to the rooms; a e will be 6 braccia—a b 8 braccia—b e 30 braccia, in order that the rooms under the porticoes may be lighted; c d f is the place where the boats come to the houses to be unloaded. In order to render this arrangement practicable, and in order that the inundation of the rivers may not penetrate into the cellars, it is necessary to chose an appropriate situation, such as a spot near a river which can be diverted into canals in which the level of the water will not vary either by inundations or drought. The construction is shown below; and make choice of a fine river, which the rains do not render muddy, such as the Ticino, the Adda and many others. [12] The construction

On the page 388, which comes next in the original MS, is the sketch of an oval plan of a town over which is written "modo di canali per la città" and through the longer axis of it "canale maggiore" is written with "Tesino" on the prolongation of the canal.

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stieno a un altezza sarà una coca, come qui disotto, la quale sia all' entrare della terra, e meglio alquato detro acioché nimici nò la disfacciessino.

Let the width of the streets be equal to the average height of the houses.

The main underground channel does not receive turbid water, but that water runs in the ditches outside the town with four mills at the entrance and four at the outlet; and this may be done by damming the water above Romorantin.

[11] There should be fountains made in each piazza[13].

746. 3. alteza. . . . chase.

747. In the original this text comes immediately after the passage given as No. 744. The remainder of the writing on the same page refers to the construction of canals and is given later, in the "Topographical Notes".

10. Romolontino is Romorantin, South of Orleans in France.

Lines 1—11 are written to the right of the plan underneath it. J. P. R.
III. Castles and Villas.

A. Castles.

Pl. LXXX, No. 1 (P. V. fol. 39; No. d'ordre 2282). The fortified place here represented is said by Vallardi to be the "castello" at Milan, but without any satisfactory reason. The high tower behind the "rivellino" ravelin—seems to be intended as a watch-tower.

Pl. LXXX, No. 2 (MS. B, 23). A similarly constructed tower probably intended for the same use.

Pl. LXXX, No. 3 (MS. B). Sketches for corner towers with steps for a citadel.

Pl. LXXX, No. 4 (W. XVI). A cupola crowning a corner tower; an interesting example of decorative fortification. In this reproduction of the original pen and ink drawing it appears reversed.

B. Projects for Palaces.

Pl. LXXXI, No. 2 (MS. C. A, 75; 221, see No. 748). Project for a royal residence at Amboise in France.

Pl. LXXXII, No. 1 (C. A 308; 939). A plan for a somewhat extensive residence, and various details; but there is no text to elucidate it; in courts are written the three names:

Sâm (St. Mark)  cosi (Cosmo)  giovâ (John),
arch  mo  nino

C. Plans for small castles or Villas.

The three following sketches greatly resemble each other.

Pl. LXXXII, No. 2 (MS. K 36; see No. 749).
The text on this sheet refers to Cyprus (see Topographical Notes No. 1103), but seems to have no direct connection with the sketches inserted between.

Pl. LXXXVIII, Nos. 6 and 7 (MS. B, 12a; see No. 751). A section of a circular pavilion with the plan of a similar building by the side of it. These two drawings have a special historical interest because the text written below mentions the Duke and Duchess of Milan.

The sketch of a villa on a terrace at the end of a garden occurs in C. A. 150; and in C. A. 77b; 225b is another sketch of a villa somewhat resembling the Belvedere of Pope Innocent VIII, at Rome. In C. A. 62b; 193b there is a Loggia.

Pl. LXXXII, No. 4 (C. A. 387a; 1198a) is a tower-shaped Loggia above a fountain. The machinery is very ingeniously screened from view.

The Palace of the prince must have a piazza in front of it.

Houses intended for dancing or any kind of jumping or any other movements with a multitude of people, must be on the ground-floor; for I have already witnessed the destruction of some, causing death to many persons, and above all let every wall, be it ever so thin, rest on the ground or on arches with a good foundation.

Let the mezzanines of the dwellings be divided by walls made of very thin bricks, and without wood on account of fire.

Let all the privies have ventilation [by shafts] in the thickness of the walls, so as to exhale by the roofs.

The mezzanines should be vaulted, and the vaults will be stronger in proportion as they are of small size.

The tyles of oak must be enclosed in the walls in order to be protected from fire.

The remarks accompanying the plan reproduced on Pl. LXXXI, No. 2 are as follows: Above, to the left: "in a angello sita la guardia de la stalla" (in the angle a may be the keeper of the stable). Below are the words "strada d'Amboise" (road to Amboise), parallel with this "fossa br 4o" (the moat 40 braccia) fixing the width of the moat. In the large court surrounded by a portico "in terre No. — Larghe br. 80 e lunghe br 120." To the right of the castle is a large basin for aquatic sports with the words "giuostre colie nave cia in legiria li stiano sopra le na" (jousting in boats that is the men are to be in boats). J. P. R.

249. On each side of the castle, Pl. LXXXII. No. 2 there are drawings of details, to the left "Camino" a chimney, to the right the central lantern, sketched in red "8 lati" i.e. an octagon.

751. This passage was first published by AMORETTI in Memorie Storiche Cap. X: Una sua opera da riporlarsi a quest anno fu il bagno fatto per la duchessa Beatrice nel parco o giardino del Castello. Leonardo non solo ne disegnò il piccolo edificio a foggia di padiglione, nel cod. seguito Q. 3, ma anche contemporaneamente la pianta; ma sotto vi scrisse: Padiglione del giardino della duchessa; e sotto la pianta: Fondamento del padiglione ch'è nel mezzo del labirinto del duca di Milano; nemmeno data è presso il padiglione, disegnato nella pagina 12, ma poco sopra fra molti circoli intercisi vedesi = 10 Luglio 1492 = e nella pagina 2 presso ad alcuni disegni di legumi qualcheduno ha letto Settembre 1482 in vece di 1492, come dovria scriversi, e probabilmente scritto Leonardo.

The original text however hardly bears the interpretation put upon it by AMORETTI. He is mis-taken as to the mark on the MS. as well as in his statements as to the date, for the MS. in question has no date; the date he gives occurs, on the contrary, in another note-book. Finally, it appears to me quite an open question whether Leonardo was the architect who carried out the construction of the dome-like Pavilion here shown in section, or of the ground plan of the Pavilion drawn by the side of it. Must we, in fact, suppose that "il duca di Milano" here mentioned was, as has been generally assumed, Ludovico il Moro? He did not hold this title from the Emperor before 1494; till that date he was only called Governatore and Leonardo in speaking of him, mentions him generally as "il Moro" even after 1494. On January 18, 1491, he married Beatrice d'Este the daughter of Ercole I, Duke of Ferrara. She died on the 2nd January 1497, and for the reasons I have given it seems improbable that it should be this princess who is here spoken of as the "Duchessa di Milano". From the style of the handwriting it appears to me to be beyond
Il terreno che si cava dalle canove si deve elevare da càto tâto in alto che faccia un orto, che sia alto quâto la sala, ma fa che tra'l terreno dell' orto e'l muro della casa sia uno intervallo, acciò che l'umido no guasti i muri maestri.

The earth that is dug out from the cellars must be raised on one side so high as to make a terrace garden as high as the level of the hall; but between the earth of the terrace and the wall of the house, leave an interval in order that the damp may not spoil the principal walls.

all doubt that the MS. B, from which this passage is taken, is older than the dated MSS. of 1492 and 1493. In that case the Duke of Milan here mentioned would be Gian Galeazzo (1469—1494) and the Duchess would be his wife Isabella of Aragon, to whom he was married on the second February 1489.

J. P. R.
IV. Ecclesiastical Architecture.

A. General Observations.

Senpre vno edifitio vole· essere spiccato dintorno a volere dimostra•re la sua vera forma.

A building should always be detached on all sides so that its form may be seen.

Qui nô si può nè si debe fare cäpanile, anzi debe stare separato come à il domo e Sâ Giovanni di Fireze, se così il domo di Pisa che mostra il cäpanile per se dispiccato circa e così il domo, e ogn'vno per se può mostrare la sua perfet-tione, e chi lo volesse pure fare colla chiesa, faccia la lâ'terna scusare cäpanile come è la chiesa di Chiaravalle.

Here there cannot and ought not to be any campanile; on the contrary it must stand apart like that of the Cathedral and of San Giovanni at Florence, and of the Cathedral at Pisa, where the campanile is quite detached as well as the dome. Thus each can display its own perfection. If however you wish to join it to the church, make the lantern serve for the campanile as in the church at Chiaravalle.

753. The original text is reproduced on Pl. XCI, No. 1 to the left hand at the bottom.
754. This text is written by the side of the plan given on Pl. XCI. No. 2.
12. The Abbey of Chiaravalle, a few miles from Milan, has a central tower on the intersection of the cross in the style of that of the Certosa of Pavia, but the style is mediaeval (A. D. 1330). Leonardo seems here to mean, that in a building, in which the circular form is strongly conspicuous, the campanile must either be separated, or rise from the centre of the building and therefore take the form of a lantern.
A nessuna chiesa sta bene vedere tetti, è zi sia rappianato e per cat' nali l' acqua discendova ai condotti fatti nel frieze.

It never looks well to see the roofs of a church; they should rather be flat and the water should run off by gutters made in the frieze.

755. This text is to the left of the domed church reproduced on Pl. LXXXVII, No. 2.
B. The theory of Dome Architecture.

This subject has been more extensively treated by Leonardo in drawings than in writing. Still we may fairly assume that it was his purpose, ultimately to embody the results of his investigation in a "Trattato delle Cupole." The amount of materials is remarkably extensive. MS. B is particularly rich in plans and elevations of churches with one or more domes—from the simplest form to the most complicated that can be imagined. Considering the evident connexion between a great number of these sketches, as well as the impossibility of seeing in them designs or preparatory sketches for any building intended to be erected, the conclusion is obvious that they were not designed for any particular monument, but were theoretical and ideal researches, made in order to obtain a clear understanding of the laws which must govern the construction of a great central dome, with smaller ones grouped round it; and with or without the addition of spires, so that each of these parts by itself and in its juxtaposition to the other parts should produce the grandest possible effect.

In these sketches Leonardo seems to have exhausted every imaginable combination. The results of some of these problems are perhaps not quite satisfactory; still they cannot be considered to give evidence of a want of taste or of any other defect in Leonardo's architectural capacity. They were no doubt intended exclusively for his own instruction, and, before all, as it seems, to illustrate the features or consequences resulting from a given principle.

In MS. B, 32 (see Fl. C III, No. 2) we find eight geometrical patterns, each drawn in a square; and in MS. C.A., fol. 87 to 98 form a whole series of patterns done with the same intention.
I have already, in another place, pointed out the law of construction for buildings crowned by a large dome: namely, that such a dome, to produce the greatest effect possible, should rise either from the centre of a Greek cross, or from the centre of a structure of which the plan has some symmetrical affinity to a circle, this circle being at the same time the centre of the whole plan of the building.

Leonardo's sketches show that he was fully aware, as was to be expected, of this truth. Few of them exhibit the form of a Latin cross, and when this is met with, it generally gives evidence of the determination to assign as prominent a part as possible to the dome in the general effect of the building.

While it is evident, on the one hand, that the greater number of these domes had no particular purpose, not being designed for execution, on the other hand several reasons may be found for Leonardo's perseverance in his studies of the subject.

Besides the theoretical interest of the question for Leonardo and his Trattato and besides the taste for domes prevailing at that time, it seems likely that the intended erection of some building of the first importance like the Duomos of Pavia and Como, the church of Sta. Maria delle Grazie at Milan, and the construction of a Dome or central Tower (Tiburio) on the cathedral of Milan, may have stimulated Leonardo to undertake a general and thorough investigation of the subject; whilst Leonardo's intercourse with Bramante for ten years or more, can hardly have remained without influence in this matter. In fact now that some of this great Architect's studies for S. Peter's at Rome have at last become known, he must be considered henceforth as the greatest master of Dome-Architecture that ever existed. His influence, direct or indirect even on a genius like Leonardo seems the more likely, since Leonardo's sketches reveal a style most similar to that of Bramante, whose name indeed, occurs twice in Leonardo's manuscript notes. It must not be forgotten that Leonardo was a Florentine; the characteristic form of the two principal domes of Florence, Sta. Maria del Fiore and the Battisterio, constantly appear as leading features in his sketches.

The church of San Lorenzo at Milan, was at that time still intact. The dome is to this day one of the most wonderful cupolas ever constructed, and with its two smaller domes might well attract the attention and study

of a never resting genius such as Leonardo. A whole class of these sketches betray in fact the direct influence of the church of S. Lorenzo, and this also seems to have suggested the plan of Bramante's dome of St. Peter's at Rome.

In the following pages the various sketches for the construction of domes have been classified and discussed from a general point of view. On two sheets: Pl. LXXXIV (C. A. 354b; 118a) and Pl. LXXXV, Nos. 1—11 (Ash. II, 6b) we see various dissimilar types, grouped together; thus these two sheets may be regarded as a sort of nomenclature of the different types, on which we shall now have to treat.
1. Churches formed on the plan of a Greek cross.

Group I.

Domes rising from a circular base.

The simplest type of central building is a circular edifice.

Pl. LXXXIV, No. 9. Plan of a circular building surrounded by a colonnade.

Pl. LXXXIV, No. 8. Elevation of the former, with a conical roof.

Pl. XC. No. 5. A dodecagon, as most nearly approaching the circle.

Pl. LXXXVI, No. 1, 2, 3. Four round chapels are added at the extremities of the two principal axes;—compare this plan with fig. 1 on p. 44 and fig. 3 on p. 47 (W. P. 5\textsuperscript{b}) where the outer wall is octagonal.

Group II.

Domes rising from a square base.

The plan is a square surrounded by a colonnade, and the dome seems to be octagonal.

Pl. LXXXIV. The square plan below the circular building No. 8, and its elevation to the left, above the plan: here the ground-plan is square, the upper storey octagonal. A further development of this type is shown in two sketches C.A. 3\textsuperscript{a} (not reproduced here), and in

Pl. LXXXVI, No. 5 (which possibly belongs to No. 7 on Pl. LXXXIV.

Pl. LXXXV, No. 4, and p. 45, Fig. 3, a Greek cross, repeated p. 45, Fig. 3, is another development of the square central plan.

The remainder of these studies show two different systems; in the first the dome rises from a square plan,—in the second from an octagonal base.
Group III.

Domes rising from a square base and four pillars.\(^1\)

a) First type. A Dome resting on four pillars in the centre of a square edifice, with an apse in the middle, of each of the four sides. We have eleven variations of this type.

\(\text{aa})\) Pl. LXXXVIII, No. 3.

\(\text{bb})\) Pl. LXXX, No. 5.

\(\text{cc})\) Pl. LXXXV, Nos. 2, 3, 5.

\(\text{dd})\) Pl. LXXXIV, No. 1 and 4 beneath.

\(\text{ee})\) Pl. LXXXV, Nos. 1, 7, 10, 11:

b) Second type. This consists in adding aisles to the whole plan of the first type; columns are placed between the apses and the aisles; the plan thus obtained is very nearly identical with that of S. Lorenzo at Milan.

Fig. 1 on p. 56. (MS. B, 75\(^a\)) shows the result of this treatment adapted to a peculiar purpose about which we shall have to say a few words later on.

Pl. XCV, No. 1, shows the same plan but with the addition of a short nave. This plan seems to have been suggested by the general arrangement of S. Sepolcro at Milan.

MS. B. 57\(^b\) (see the sketch reproduced on p. 51). By adding towers in the four outer angles to the last named plan, we obtain a plan which bears the general features of Bramante’s plans for S. Peter’s at Rome.\(^2\) (See p. 51 Fig. 1.)

Group IV.

Domes rising from an octagonal base.

This system, developed according to two different schemes, has given rise to two classes with many varieties.

In a) On each side of the octagon chapels of equal form are added.

In b) The chapels are dissimilar; those which terminate the principal axes being different in form from those which are added on the diagonal sides of the octagon.

a. First Class.

The Chapel “degli Angeli,” at Florence, built only to a height of about 20 feet by Brunellesco, may be considered as the prototype of this group; and, indeed it probably suggested it. The fact that we see in MS. B. 11\(^b\)

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\(^1\) The ancient chapel San Satiro, via del Falcone, Milan, is a specimen of this type.

\(^2\) See Les projets primitifs etc., Pl. 9—12.
(Pl. XCV, No. 3) by the side of Brunellesco’s plan for the Basilica of Sto. Spirito at Florence, a plan almost identical with that of the Capella degli Angeli, confirms this supposition. Only two small differences, or we may say improvements, have been introduced by Leonardo. Firstly the back of the chapels contains a third niche, and each angle of the Octagon a folded pilaster like those in Bramante’s Sagrestia di S. M. presso San Satiro at Milan, instead of an interval between the two pilasters as seen in the Battistero at Florence and in the Sacristy of Sto. Spirito in the same town and also in the above named chapel by Brunellesco.

The first set of sketches which come under consideration have at first sight the appearance of mere geometrical studies. They seem to have been suggested by the plan given on page 44 Fig. 2 (MS. B. 55a) in the centre of which is written “Santa Maria in perticha da Pavia”, at the place marked A on the reproduction.

a) (MS. B. 34b, page 44 Fig. 3). In the middle of each side a column is added, and in the axes of the intercolumnar spaces a second row of columns forms an aisle round the octagon. These are placed at the intersection of a system of semicircles, of which the sixteen columns on the sides of the octagon are the centres.

b) The preceding diagram is completed and becomes more monumental in style in the sketch next to it (MS. B. 35a, see p. 45 Fig. 1). An outer aisle is added by circles, having for radius the distance between the columns in the middle sides of the octagon.

c) (MS. B. 96b, see p. 45 Fig. 2). Octagon with an aisle round it; the angles of both are formed by columns. The outer sides are formed by 8 niches forming chapels. The exterior is likewise octagonal, with the angles corresponding to the centre of each of the interior chapels.

Pl. XCII, No. 2 (MS. B. 96b). Detail and modification of the preceding plan—half columns against piers—an arrangement by which the chapels of the aisle have the same width of opening as the inner arches between the half columns. Underneath this sketch the following note occurs: questo vole avere 12 facce có 12 tabernacoli, come a b. (This will have twelve sides with twelve tabernacles as a b.) In the remaining sketches of this class the octagon is not formed by columns at the angles.

The simplest type shows a niche in the middle of each side and is repeated on several sheets, viz: MS. B 3; MS. C.A. 354b (see Pl. LXXXIV, No. 11), and MS. Ash II 6b; (see Pl. LXXXV, No. 9 and the elevations No. 8; Pl. XCII, No. 3; MS. B. 4b [not reproduced here] and Pl. LXXXIV, No. 2).
Pl. XCII, 3 (MS. B, 56) corresponds to a plan like the one in MS. B 35, in which the niches would be visible outside or, as in the following sketch, with the addition of a niche in the middle of each chapel.

Pl. XC, No. 6. The niches themselves are surrounded by smaller niches (see also No. 1 on the same plate).

Octagon expanded on each side.

A. by a square chapel:
MS. B. 34 (not reproduced here).

B. by a square with 3 niches:
MS. B. 11 (see Pl. XCIV, No. 3).

C. by octagonal chapels:
   a) MS. B, 21; Pl. LXXXVIII, No. 14.
   b) No. 2 on the same plate. Underneath there is the remark: "quest'è come le 8 cappele ano a essere facte" (this is how the eight chapels are to be executed).
   c) Pl. LXXXVIII, No. 5. Elevation to the plans on the same sheet, it is accompanied by the note: "ciasscuno de' 9 tiburi no' uole passare l'alteza di 2 quadri" (neither of the 9 domes must exceed the height of two squares).
   d) Pl. LXXXVIII, No. 1, Inside of the same octagon.
      MS. B, 30a, and 34b; these are three repetitions of parts of the same plan with very slight variations.

D. by a circular chapel:
MS. B, 18 (see Fig. 1 on page 47) gives the plan of this arrangement in which the exterior is square on the ground floor with only four of the chapels projecting, as is explained in the next sketch.

Pl. LXXXIX, MS. B, 17b. Elevation to the preceding plan sketched on the opposite side of the sheet, and also marked A. It is accompanied by the following remark, indicating the theoretical character of these studies: questo edificio anchora starebbe bene affararlo dalla linea a b c d insù. ("This edifice would also produce a good effect if only the part above the lines a b c d were executed").

Pl. LXXXIV, No. 11. The exterior has the form of an octagon, but the chapels project partly beyond it. On the left side of the sketch they appear larger than on the right side.

Pl. XC, No. 1, (MS. B, 25b); Repetition of Pl. LXXXIV, No. 11.
Pl. XC, No. 2. Elevation to the plan No. 1, and also to No. 6 of the same sheet.
Fig. 1

Fig. 2

Fig. 3
E. By chapels formed by four niches:
Pl. LXXXIV, No. 7 (the circular plan on the left below) shows this arrangement in which the central dome has become circular inside and might therefore be classed after this group. The sketch on the right hand side gives most likely the elevation for the last named plan.

F. By chapels of still richer combinations, which necessitate an octagon of larger dimensions:
Pl. XCI, No. 2 (MS. Ash. II. 8b); on this plan the chapels themselves appear to be central buildings formed like the first type of the third group. Pl. LXXXVII, No. 3.
Pl. XCI, No. 2 above; the exterior of the preceding figure, particularly interesting on account of the alternation of apses and niches, the latter containing statues of a gigantic size, in proportion to the dimension of the niches.

b. Second Class.

Composite plans of this class are generally obtained by combining two types of the first class—the one worked out on the principal axes, the other on the diagonal ones.

MS. B. 22 shows an elementary combination, without any additions on the diagonal axes, but with the dimensions of the squares on the two principal axes exceeding those of the sides of the octagon.

In the drawing W. P. 5b (see page 44 Fig. 1) the exterior only of the edifice is octagonal, the interior being formed by a circular colonnade; round chapels are placed against the four sides of the principal axes.

The elevation, drawn on the same sheet (see page 47 Fig. 3), shows the whole arrangement which is closely related with the one on Pl. LXXXVI No. 1, 2.

MS. B. 21a shows:

a) four sides with rectangular chapels crowned by pediments
Pl. LXXXVII No. 3 (plan and elevation);

b) four sides with square chapels crowned by octagonal domes.
Pl. LXXXVII No. 4; the plan underneath.

MS. B. 18a shows a variation obtained by replacing the round chapels in the principal axes of the sketch MS. B. 18a by square ones, with an

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1 This plan and some others of this class remind us of the plan of the Mausoleum of Augustus as it is represented for instance by Durand. See Cab. des Estampes, Bibliothèque Nationale, Paris, Topographie de Rome, V, 6, 82.

2 The note accompanying this plan is given under No. 754.
apse. Leonardo repeated both ideas for better comparison side by side, see page 47. Fig. 2.

Pl. LXXXIX (MS. B. 17¹). Elevation for the preceding figure. The comparison of the drawing marked M. with the plan on page 47 Fig. 2, bearing the same mark, and of the elevation on Pl. LXXXIX below (marked A) with the corresponding plan on page 47 is highly instructive, as illustrating the spirit in which Leonardo pursued these studies.

Pl. LXXXIV No. 12 shows the design Pl. LXXXVII No. 3 combined with apses, with the addition of round chapels on the diagonal sides.

Pl. LXXXIV No. 13 is a variation of the preceding sketch.

Pl. XC No. 3. MS. B. 25⁶. The round chapels of the preceding sketch are replaced by octagonal chapels, above which rise campaniles.

Pl. XC No. 4 is the elevation for the preceding plan.

Pl. XCI No. 1. (MS. B. 39⁶); the plan below. On the principal as well as on the diagonal axes are diagonal chapels, but the latter are separated from the dome by semicircular recesses. The communication between these eight chapels forms a square aisle round the central dome.

Above this figure is the elevation, showing four campaniles on the angles.¹

Pl. CXXXIV No. 3. On the principal axes are square chapels with three niches; on the diagonals octagonal chapels with niches. Cod. Atl. 340⁶ gives a somewhat similar arrangement.

MS. B. 30. The principal development is thrown on the diagonal axes by square chapels with three niches; on the principal axes are inner recesses communicating with outer ones.

The plan Pl. XCIJI No. 2 (MS. B. 22) differs from this only in so far as the outer semicircles have become circular chapels, projecting from the external square as apses; one of them serves as the entrance by a semicircular portico.

The elevation is drawn on the left side of the plan.

MS. B. 19. A further development of MS. B. 18, by employing for the four principal chapels the type Pl. LXXXVIII No. 3, as we have already seen in Pl. XCI No. 2; the exterior presents two varieties.

a) The outer contour follows the inner.²

b) It is semicircular.

Pl. LXXXVII No. 2 (MS. B. 18⁶) Elevation to the first variation MS. B. 19. If we were not certain that this sketch was by Leonardo, we might feel tempted to take it as a study by Bramante for St. Peter's at Rome.³

¹ The note accompanying this drawing is reproduced under No. 753.
² These chapels are here sketched in two different sizes; it is the smaller type which is thus formed.
³ See Les projets primitifs Pl. 43.
MS. P. V. 39. In the principal axes the chapels of MS. B. 19, and semicircular niches on the diagonals. The exterior of the whole edifice is also an octagon, concealing the form of the interior chapels, but with its angles on their axes.

Group V.

Suggested by San Lorenzo at Milan.

In MS. C. A. 266 I, 812 there is a plan almost identical with that of San Lorenzo.—The diagonal sides of the irregular octagon are not indicated. If it could be proved that the arches which, in the actual church, exist on these sides in the first story, were added in 1574 by Martimo Bassi, then this plan and the following section would be still nearer the original state of San Lorenzo than at present. A reproduction of this slightly sketched plan has not been possible. It may however be understood from Pl. LXXXVIII No. 3, by suppressing the four pillars corresponding to the apses.

Pl. LXXXVII No. 1 shows the section in elevation corresponding with the above-named plan. The recessed chapels are decorated with large shells in the halfdomes like the arrangement in San Lorenzo, but with proportions like those of Bramante's Sacristy of Santa Maria presso S. Satiro.

MS. C. A. 266; a sheet containing three views of exteriors of Domes. On the same sheet there is a plan similar to the one above-named but with uninterrupted aisles and with the addition of round chapels in the axes (compare Pl. XCVII No. 3 and page 44 Fig. 1), perhaps a reminiscence of the two chapels annexed to San Lorenzo.—Leonardo has here sketched the way of transforming this plan into a Latin cross by means of a nave with side aisles.

Pl. XCI No. 1. Plan showing a type deprived of aisles and comprised in a square building which is surrounded by a portico. It is accompanied by the following text:

Ash. II. 74]

Questo edificio è abitato di sotto c di sopra come è san Sepulcro, ed è sopra come sotto, salvo che il di sopra al tiburio e d e' l di sotto al tiburio a b e quado

756. This edifice is inhabited [accessible] below and above, like San Sepulcro, and it is the same above as below, except that the upper story has the dome c d; and the

756. The church of San Sepolcro at Milan, founded in 1030 and repeatedly rebuilt after the middle of the XVIth century, still stands over the crypt of the original structure.
entri nella chiesa di sotto, tu cali 10 scalini, e quando moti in quello di sopra tu sali 20 scalini, che a 1/3 l'uno fano 10 braccia, e questo è lo spazio ch'è infra i piani dell'una e l'altra chiesa.

10. br. e. ii. ellatara.

Above the plan on the same sheet is a view of the exterior. By the aid of these two figures and the description, sections of the edifice may easily be reconstructed. But the section drawn on the left side of the building seems not to be in keeping with the same plan, notwithstanding the explanatory note written underneath it: "dentro il difitto di sopra" (interior of the edifice above)¹.

Before leaving this group, it is well to remark that the germ of it seems already indicated by the diagonal lines in the plans Pl. LXXXV No. 11 and No. 7. We shall find another application of the same type to the Latin cross in Pl. XCVII No. 3.

¹ The small inner dome corresponds to a b on the plan—it rises from the lower church into the upper—above, and larger, rises the dome c d. The aisles above and below thus correspond (è di sopra come di sotto, salvoche etc.). The only difference is, that in the section Leonardo has not taken the trouble to make the form octagonal, but has merely sketched circular lines in perspective.

J. P. R.
2. Churches formed on the plan of a Latin cross.

We find among Leonardo's studies several sketches for churches on the plan of the Latin cross; we shall begin by describing them, and shall add a few observations.

A. Studies after existing Monuments.

Pl. XCIV No. 2. (MS. B. 11².) Plan of Santo Spirito at Florence, a basilica built after the designs of Brunellesco.—Leonardo has added the indication of a portico in front, either his own invention or the reproduction of a now lost design.

Pl. XCV No. 2. Plan accompanied by the words: "A è santo sepolcro di milano di sopra" (A is the upper church of S. Sepolcro at Milan); although since Leonardo's time considerably spoilt, it is still the same in plan.

The second plan with its note: "B è la sua parte scocto tera" (B is its subterranean part [the crypt]) still corresponds with the present state of this part of the church as I have ascertained by visiting the crypt with this plan. Excepting the addition of a few insignificant walls, the state of this interesting part of the church still conforms to Leonardo's sketch; but in the Vestibolo the two columns near the entrance of the winding stairs are absent.

B. Designs or Studies.

Pl. XCV No. 1. Plan of a church evidently suggested by that of San Sepolcro at Milan. The central part has been added to on the principle of the second type of Group III. Leonardo has placed the "coro" (choir) in the centre.
Pl. XCVI No. 2. In the plan the dome, as regards its interior, belongs to the First Class of Group IV, and may be grouped with the one in MS. B. 35a. The nave seems to be a development of the type represented in Pl. XCV No. 2, B. by adding towers and two lateral porticos.

On the left is a view of the exterior of the preceding plan. It is accompanied by the following note:

B. 34 a] 757.

Questo edificio è abitato di sopra e di sotto; di sopra si va per li campanili; ed uassi su per lo piano dove sono fondati i 4 tiburi, e detto piano à uno parapetto dinanzi, e di detti tiburi nessuno ne riesce in chiesa, anzi sono separati i tutto.

This building is inhabited below and above; the way up is by the campaniles, and in going up one has to use the platform, where the drums of the four domes are, and this platform has a parapet in front, and none of these domes communicate with the church, but they are quite separate.

757. 4. a l parapetto. 5. neressiè .. tuc. o.

Pl. XCVI No. 1 (MS. C. A. 16b; 65a). Perspective view of a church seen from behind; this recalls the Duomo at Florence, but with two campaniles. 

Pl. XCVII No. 3 (MS. B. 52a). The central part is a development of S. Lorenzo at Milan, such as was executed at the Duomo of Pavia. There is sufficient analogy between the building actually executed and this sketch to suggest a direct connection between them. Leonardo accompanied Francesco di Giorgio when the latter was consulted on June 21st, 1490 as to this church; the fact that the only word accompanying the plan is: "sagrestia", seems to confirm our supposition, for the sacristies were added only in 1492, i.e. four years after the beginning of the Cathedral, which at that time was most likely still sufficiently unfinished to be capable of receiving the form of the present sketch.

Pl. XCVII No. 2 shows the exterior of this design. Below is the note: edificio figurate di sotto (edifice proper for the ground plan figured below).

Here we may also mention the plan of a Latin cross drawn in MS. C. A. fol. 266 (see p. 50).

Pl. XCIV No. 1 (MS. L. 15b). External side view of Brunellesco's Florentine basilica San Lorenzo, seen from the North.

Pl. XCIV No. 4 (V. A. V, 1). Principal front of a nave, most likely of a church on the plan of a Latin cross. We notice here not only the

1 Already published in Les projets primitifs Pl. IX.
2 Already published in the Saggio Pl. IX.
3 See Malaspina, il Duomo di Pavia. Documents.
principal features which were employed afterwards in Alberti's front of S. Maria Novella, but even details of a more advanced style, such as we are accustomed to meet with only after the year 1520.

In the background of Leonardo's unfinished picture of St. Jerome (Vatican Gallery) a somewhat similar church front is indicated (see the accompanying sketch).

The view of the front of a temple, apparently a dome in the centre of four corinthian porticos bearing pediments (published by Amoretti Tav. II. B as being by Leonardo), is taken from a drawing, now at the Ambrosian Gallery. We cannot consider this to be by the hand of the master.
C. Studies for a form of a Church most proper for preaching.

The problem as to what form of church might answer the requirements of acoustics seems to have engaged Leonardo's very particular attention. The designation of "teatro" given to some of these sketches, clearly shows which plan seemed to him most favourable for hearing the preacher's voice.

Pl. XCVII, No. 1 (MS. B, 52). Rectangular edifice divided into three naves with an apse on either side, terminated by a semicircular theatre with rising seats, as in antique buildings. The pulpit is in the centre. Leonardo has written on the left side of the sketch: "teatro da predicare" (Theatre for preaching).

MS. B, 55° (see page 56, Fig. 1). A domed church after the type of Pl. XCV, No. 1, shows four theatres occupying the apses and facing the square "coro" (choir), which is in the centre between the four pillars of the dome. The rising arrangement of the seats is shown in the sketch above. At the place marked B Leonardo wrote teatri per uldire messa (rows of seats to hear mass), at T teatri, and at C coro (choir).

In MS. C.A. 260, are slight sketches of two plans for rectangular choirs and two elevations of the altar and pulpit which seem to be in connection with these plans.

In MS. Ash II, 8° (see p. 56 and 57. Fig. 2 and 3). "Locho dove si predica" (Place for preaching). A most singular plan for a building. The interior is a portion of a sphere, the centre of which is the summit of a column destined to serve as the preacher's pulpit. The inside is somewhat

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1 The note teatro de predicar, on the right side is, I believe, in the handwriting of Pompeo Leoni. J. P. R.
ARCHITECTURAL DESIGNS.

Fig. 2.
like a modern theatre, whilst the exterior and the galleries and stairs recall the ancient amphitheatres.

Page 57, Fig. 4. A plan accompanying the two preceding drawings. If this gives the complete form Leonardo intended for the edifice, it would have comprised only about two thirds of the circle. Leonardo wrote in the centre "fondamento", a word he often employed for plans, and on the left side of the view of the exterior: locho dove si predicha (a place for preaching in).
D. Design for a Mausoleum.

Pl. XCVIII (P. V., 182. No. d'ordre 2386). In the midst of a hilly landscape rises an artificial mountain in the form of a gigantic cone, crowned by an imposing temple. At two thirds of the height a terrace is cut out with six doorways forming entrances to galleries, each leading to three sepulchral halls, so constructed as to contain about five hundred funeral urns, disposed in the customary antique style. From two opposite sides steps ascend to the terrace in a single flight and beyond it to the temple above. A large circular opening, like that in the Pantheon, is in the dome above what may be the altar, or perhaps the central monument on the level of the terrace below.

The section of a gallery given in the sketch to the right below shows the roof to be constructed on the principle of superimposed horizontal layers, projecting one beyond the other, and each furnished with a sort of heel, which appears to be undercut, so as to give the appearance of a beam from within. Granite alone would be adequate to the dimensions here given to the key stone, as the thickness of the layers can hardly be considered to be less than a foot. In taking this as the basis of our calculation for the dimensions of the whole construction, the width of the chamber would be about 25 feet but, judging from the number of urns it contains—and there is no reason to suppose that these urns were larger than usual—it would seem to be no more than about 8 or 10 feet.

The construction of the vaults resembles those in the galleries of some etruscan tumuli, for instance the Regulini Galeassi tomb at Cervetri (lately discovered) and also that of the chamber and passages of the pyramid of Cheops and of the treasury of Atreus at Mycenae.

The upper cone displays not only analogies with the monuments mentioned in the note, but also with Etruscan tumuli, such as the Cocumella
tomb at Vulci, and the Regulini Galeassi tomb\(^1\). The whole scheme is one of the most magnificent in the history of Architecture.

It would be difficult to decide as to whether any monument he had seen suggested this idea to Leonardo, but it is worth while to enquire, if any monument, or group of monuments of an earlier date may be supposed to have done so.\(^2\)

\(^1\) See Fersgson, Handbook of Architecture, I, 291.

\(^2\) There are, in Algiers, two Monuments, commonly called “Le Madracen” and “Le tombeau de la Chrétienne,” which somewhat resemble Leonardo’s design. They are known to have served as the Mausolea of the Kings of Mauritania. Pomponius Mela, the geographer of the time of the Emperor Claudius, describes them as having been “Monumentum commune regiae gentis.” See Le Madracen, Rapport fait par M. le Grand Rabbin A. Cahen, Constantine 1873—Mémoire sur les fouilles exécutées au Madras’en ... par le Colonel Brunon, Constantine 1873.—Deux Mausolées Africains, le Madracen et le tombeau de la Chrétienne par M. J. de Laurière, Tours 1874.—Le tombeau de la Chrétienne, Mausolée des rois Mauritaniens par M. Berbrugger, Alger 1867.—I am indebted to M. LE BLANC of the Institut, and M. LUD. LALANNE, Bibliothécaire of the Institut for having first pointed out to me the resemblance between these monuments; while M. ANT. HÉRON DE VILLEFOSSE of the Louvre was kind enough to place the abovementioned rare works at my disposal. Leonardo’s observations on the coast of Africa are given later in this work. The Herodium near Bethlehem in Palestine (Jebel el Fureidis, the Frank Mountain) was, according to the latest researches, constructed on a very similar plan. See Der Frankenberg, von Baurath C. Schick in Jerusalem, Zeitschrift des Deutschen Palästina-Vereins, Leipzig 1880, Vol. III, pages 88—99 and Plates IV and V.

J. P. R.
E. Studies for the Central Tower, or Tiburio of Milan Cathedral.

Towards the end of the fifteenth century the Fabbricceria del Duomo had to settle on the choice of a model for the crowning and central part of this vast building. We learn from a notice published by G. L. Calvi¹ that among the artists who presented models in the year 1488 were: Bramante, Pietro da Gorgonzola, Luca Paperio (Fancelli), and Leonardo da Vinci.—

Several sketches by Leonardo refer to this important project:

Pl. CXIX, No. 2 (MS. S. K. III, No. 36*) a small plan of the whole edifice.—The projecting chapels in the middle of the transept are wanting here. The nave appears to be shortened and seems to be approached by an inner "vestibolo".—

Pl. C, No. 2 (Tr. 21). Plan of the octagon tower, giving the disposition of the buttresses; starting from the eight pillars adjoining the four principal piers and intended to support the eight angles of the Tiburio. These buttresses correspond exactly with those described by Bramante as existing in the model presented by Omodeo.²

Pl. C, 3 (MS. Tr. 16). Two plans showing different arrangements of the buttresses, which seem to be formed partly by the intersection of a system of pointed arches such as that seen in

Pl. C, No. 5 (MS. B, 27*) destined to give a broader base to the drum. The text underneath is given under No. 788.

MS. B, 3—three slight sketches of plans in connexion with the preceding ones.

¹ G. L. Calvi, Notizie sulla vita e sulle opere dei principali architetti scultori e pittori che fiore- rono in Milano, Part III, 20. See also: H. De Gymüller, Les projets primitifs etc. I, 37 and 116—119.—The Fabbricceria of the Duomo has lately begun the publication of the archives, which may possibly tell us more about the part taken by Leonardo, than has hitherto been known.
² Bramante's opinion was first published by G. Mongeri, Arch. stor. Lomb. V, fasc. 3 and afterwards by me in the publication mentioned in the preceding note.
Pl. XCI X, No. 1 (MS. Tr. 15) contains several small sketches of sections and exterior views of the Dome; some of them show buttress-walls shaped as inverted arches. Respecting these Leonardo notes:

Tr. 15

L'arco rivescio è migliore per fare spalla che l'ordinario, perché il rovescio trova sotto se muro resistete alla sua debolezza, e l'ordinario nò trova nel suo debole se non aria.

The inverted arch is better for giving a shoulder than the ordinary one, because the former finds below it a wall resisting its weakness, whilst the latter finds in its weak part nothing but air.

Three slight sketches of sections on the same leaf—above those reproduced here—are more closely connected with the large drawing in the centre of Pl. C, No. 4 (MS. Tr. 41) which shows a section of a very elevated dome, with double vaults, connected by ribs and buttresses ingeniously disposed, so as to bring the weight of the lantern to bear on the base of the dome.

A sketch underneath it shows a round pillar on which is indicated which part of its summit is to bear the weight: "il pilastro sarà charicho in a b." (The column will bear the weight at a b.) Another note is above on the right side: Larcho regiera tanto sotto asse chome di sopra se (The arch supports as much below it [i.e. a hanging weight] as above it).

Pl. C, No. 1 (C.A. 303a). Larger sketch of half section of the Dome, with a very complicated system of arches, and a double vault. Each stone is shaped so as to be knit or dovetailed to its neighbours. Thus the inside of the Dome cannot be seen from below.

MS. C.A. 303b. A repetition of the preceding sketch with very slight modifications.

MS. Tr. 9 (see Fig. 1 and 2). Section of the Dome with reverted buttresses between the windows, above which iron anchors or chains seem to be intended. Below is the sketch of the outside.
Pl. XCIX, No. 3 (C.A., 262°) four sketches of the exterior of the Dome.

C.A. 12. Section, showing the points of rupture of a gothic vault, in evident connection with the sketches described above.

It deserves to be noticed how easily and apparently without effort, Leonardo manages to combine gothic details and structure with the more modern shape of the Dome.

The following notes are on the same leaf, oni cosa pôderosa, and oni cosa pôderosa desidera de(scendere); farther below, several multiplications most likely intended to calculate the weight of some parts of the Dome, thus $16 \times 47 = 720; 720 \times 800 = 176000$, next to which is written: peso del pilastro di 9 teste (weight of the pillar 9 diameters high).

Below: $176000 \times 8 = 1408000$; and below:

Sémjliô e se cê 80 (?!) il peso del tiburio
(six millions six hundred (?) 80 the weight of the Dome),

Bossi hazarded the theory that Leonardo might have been the architect who built the church of Sta. Maria delle Grazie, but there is no evidence to support this, either in documents or in the materials supplied by Leonardo's manuscripts and drawings. The sketch given at the side shows the arrangement of the second and third socle on the apses of the choir of that church; and it is remarkable that those sketches, in MS. S. K. M. II², 2° and 1°, occur with the passage given in Volume I as No. 665 and 666 referring to the composition of the Last Supper in the Refectory of that church.
F. The Project for lifting up the Battistero of Florence and setting it on a basement.

Among the very few details Vasari gives as to the architectural studies of Leonardo, we read: "And among these models and designs there was one by way of which he showed several times to many ingenious citizens who then governed Florence, his readiness to lift up without ruining it, the church of San Giovanni in Florence (the Battistero, opposite the Duomo) in order to place under it the missing basement with steps; he supported his assertions with reasons so persuasive, that while he spoke the undertaking seemed feasible, although every one of his hearers, when he had departed, could see by himself the impossibility of so vast an undertaking."1

In the MS. C. A. fol. 293, there are two sketches which possibly might have a bearing on this bold enterprise. We find there a plan of a circular or polygonal edifice surrounded by semicircular arches in an oblique position. These may be taken for the foundation of the steps and of the new platform. In the perspective elevation the same edifice, forming a polygon, is shown as lifted up and resting on a circle of inverted arches which rest on an other circle of arches in the ordinary position, but so placed that the inverted arches above rest on the spandrels of the lower range.

What seems to confirm the supposition that the lifting up of a building is here in question, is the indication of engines for winding up, such as jacks, and a rack and wheel. As the lifting apparatus represented on this sheet does not seem particularly applicable to an undertaking of such magnitude, we may consider it to be a first sketch or scheme for the engines to be used.

1 This latter statement of Vasari's must be considered to be exaggerated. I may refer here to some data given by Libri, Histoire des sciences mathematiques en Italie (II, 216, 217): "On a cru dans ces derniers temps faire un miracle en mécanique en effectuant ce transport, et cependant dès l'année 1455, Gaspard Nadi et Aristote de Fioraventio avaient transporté, à une distance considerable, la tour de la Magione de Bologne, avec ses fondements, qui avait presque quatre-vingts pieds de haut. Le continueur de la chronique de Pugiola dit que le trajet fut de 35 pieds et que durant le transport auquel le chroniqueur affirme avoir assisté, il arriva un accident grave qui fit pencher de trois pieds la tour pendant qu'elle était suspendue, mais que cet accident fut promptement réparé (Muratori, Scriptores rer. ital. Tom. XVIII, col. 717, 718). Alidosi a rapporté une note où Nadi rend compte de ce transport avec une rare simplicité. D'après cette note, on voit que les opérations de ce genre n'étaient pas nouvelles. Celle-ci ne coûta que 150 livres (monnaie d'alors) y compris le cadeau que le Légit fit aux deux mécaniciens. Dans la même année, Aristote redressa le clocher de Cento, qui penchait de plus de cinq pieds (Alidosi, instruttione p. 188 — Muratori, Scriptores rer. ital., tom. XXIII, col. 888. — Bossi, chronica Medioli., 1492, in-fol. ad ann. 1455). On ne conçoit pas comment les historiens des beaux-arts ont pu négliger de tels hommes." J. P. R.
G. Description of an unknown Temple.

Per dodici gradi di scale al magno tempio si saliva, il quale otto cento braccia circundaua, e con ottàgulare figura era fabbricato, e sopra li otto angoli otto gran base si possauano a un braccio e mezzo, e grosse 3. e lunghe 6 nel suo sodo, col l'angolo in mezzo, sopra delle quali si fondauano 8 grà pilastri sopra del sodo della basa si levavava per ispatio di 24 braccia, e nel suo termine erano stabiliti 8 capitelli di 3 braccia l'uno, e largo 6, sopra di questi s'inguiva architraue fregio e cornice con altezza di 4 braccia e 1/2, il quale per retta linea 6 dall'un pilastro all'altro s'astenda, e così con circuito d'otto cento braccia il tempio circundava infra l'ù 7 pilastro e l'altro; per sostentacolo di tal mebro erano stabiliti dieci gran colone dell' altezza de' pilastri e cô 8 grossezza di 3 braccia sopra le base, le quali erà alte vn braccio e 1/2.

759. Either this description is incomplete, or, as seems to me highly probable, it refers to some ruin. The enormous dimensions forbid our supposing this to be any temple in Italy or Greece. Syria was the native land of colossal octagonal buildings, in the early centuries A. D. The Temple of Baalbek, and others are even larger than that here described.

J. P. R.
colonne colla medesima altezza de' pilastri, i quali si levaua sopra del paumeto 28 braccia e 1/2; sopra di questa medesima altezza si posaua architraue fregio e cornice con lunghezza d'otto cêto braccia, e cignea il tempio a vna medesima altezza circuiua dentro a tal circuito sopra il medesimo piano; in giro in centro del tempio per spatio di 24 braccia nascono le corrispondentie delli 8 pilastri dell'i angoli, e delle colonne poste a esse prime faccie, e si leuauano alla medesima altezza sopra detta, e sopra tal pilastri li architraui perpetui ritorNAVANO sopra li primi detti pilastri e colonne.

same height as the pillars, rising at once from the pavement to a height of twenty eight braccia and a half; and at this height the architrave, frieze and cornice were placed which surrounded the temple having a length of eight hundred braccia. At the same height, and within the temple at the same level, and all round the centre of the temple at a distance of 24 braccia farther in, are pillars corresponding to the eight pillars in the angles, and columns corresponding to those placed in the outer spaces. These rise to the same height as the former ones, and over these the continuous architrave returns towards the outer row of pillars and columns.

V. Palace architecture.

But a small number of Leonardo's drawings refer to the architecture of palaces, and our knowledge is small as to what style Leonardo might have adopted for such buildings.

Pl. CII No. 1 (W.: XVIII). A small portion of a façade of a palace in two stories, somewhat resembling Alberti's Palazzo Rucellai.—Compare with this Bramante's painted front of the Casa Silvestri, and a painting by Montorfano in San Pietro in Gessate at Milan, third chapel on the left hand side and also with Bramante's palaces at Rome. The pilasters with arabesques, the rustica between them, and the figures over the window may be painted or in sgraffito. The original is drawn in red chalk.

Pl. LXXXI No. 1 (MS. Tr. 42). Sketch of a palace with battlements and decorations, most likely graffiti; the details remind us of those in the Castello at Vigevano.¹

MS. Ms. o", contains a design for a palace or house with a loggia in the middle of the first story, over which rises an attic with a Pediment reproduced on page 67. The details drawn close by on the left seem to indicate an arrangement of coupled columns against the wall of a first story.

Pl. LXXXV No. 14 (MS. S. K. M. III 79º) contains a very slight

¹ Count GIULIO PORRO, in his valuable contribution to the Archivio Storico Lombardo, Anno VIII, Fasc. IV (31 Dec. 1881): Leonardo da Vinci, Libro di Annotazioni e Memorie, refers to this in the following note: "Alla pag. 41 vi è uno schizzo di volta ed accanto scrisse: 'il pilastro sarà charico in su 6' e potrebbe darsi che si riferisse alla cupola della chiesa delle Grazie tanto più che a pag. 42 vi è un disegno che rassomiglia assai al basamento che oggi si vede nella parte esterna del coro, di quella chiesa." This may however be doubted. The drawing, here referred to, on page 41 of the same manuscript, is reproduced on Pl. C No. 4 and described on page 61 as being a study for the cupola of the Duomo of Milan. J. P. R.
sketch in red chalk, which most probably is intended to represent the façade of a palace. Inside is the short note he 7 (7 and 7).

MS. J² 8a (see pages 68 Fig. 1 and 2) contains a view of an unknown palace. Its plan is indicated at the side.

In MS. Br. M. 126a (see Fig. 3 on page 68) there is a sketch of a house, on which Leonardo notes: casa con tre terrazi (house with three terraces).
Pl. CX, No. 4 (MS. L. 36*) represents the front of a fortified building drawn at Cesena in 1502 (see No. 1049).

Here we may also mention the singular building in the allegorical composition represented on Pl. LVIII in Vol. I. In front of it appears the head of a sphinx or of a dragon which seems to be carrying the palace away.

The following texts refer to the construction of palaces and other buildings destined for private use:

W. XII

La corte de' auere le parieti per l'altezza la metà della sua larghezza, cioè se la corte sarà braccia 40, la casa deve essere alta 20 nelle parieti di tal corte, e tal corte vol essere larga per la metà di tutta la facciata.

760. In the courtyard the walls must be half the height of its width, that is if the court be 40 braccia, the house must be 20 high as regards the walls of the said courtyard; and this courtyard must be half as wide as the whole front.

760. See Pl. Cl, no. 1, and compare the dimensions here given, with No. 748 lines 26—29; and the drawing belonging to it Pl. LXXI, no. 2.
The manner in which one must arrange a stable. You must first divide its width in 3 parts, its depth matters not; and let these 3 divisions be equal and 6 braccia broad for each part and 10 high, and the middle part shall be for the use of the stablemasters; the 2 side ones for the horses, each of which must be 6 braccia in width and 6 in length, and be half a braccio higher at the head than behind. Let the manger be at 2 braccia from the ground, to the bottom of the rack, 3 braccia, and the top of it 4 braccia. Now, in order to attain to what I promise, that is to make this place, contrary to the general custom, clean and neat: as to the upper part of the stable, i.e. where the hay is, that part must have at its outer end a window 6 braccia high and 6 broad, through which by simple means the hay is brought up to the loft, as is shown by the machine $E$; and let this be erected in a place 6 braccia wide, and as long as the stable, as seen at $k\ p$. The other two parts, which are on either side of this, are again divided; those nearest to the hay-loft are 4 braccia, $p\ s$, and only for the use and circulation of the servants belonging to the stable; the other two which reach to the outer walls are 2 braccia, as seen at $s\ k$, and these are made for the purpose of giving hay to the mangers, by means of funnels, narrow at the top and wide over the manger, in order that the hay should not choke them. They must be well plastered and clean and are represented at $4\ fs$. As to the giving the horses water, the troughs must be of stone and above them [cisterns of] water. The mangers may be opened as boxes are uncovered by raising the lids.

Per fare vna polita stalla.
2. Modo · come · si de' · componere · vna · stalla: Dividerai in prima la sua larghezza · in parti · 3 · e la sua lunghezza é libera, e le · 3 · dette divisioni · sieno equali e di larghezza di braccio 6 per ciascuna, e alte 10, e la parte di mezzo sia in uso · de' maestri di stalla · le 2 da cato per i cavagli · de' quali ciascuno ne de' 6 pigliare per larghezza braccio 6 · lunghezza braccio 6 · e alte pivi dinanti · che dietro · 12 · braccio · la mangiatoia sia alta da terra braccia 2 · il principio della rastrelliera 8 · braccia · 3 · e l'ultimo · braccia 4 · Ora · a volere atenere · quello ch'io prometto · cioè de' fare detto sito corto allo universale vso · pulito e netto · inquanto al · di sopra · della stalla · cioè dove sta il fieno · deve detto loco avere nella sua testa di fori vna 11 · finestra · alta 5 · e larga 6 · donde con vn facil modo si codica il fieno su detto 12 · solaro · come appare nello strumento $E$ · e sia collocata i · un sito di larghezz'2 di braccio 6 · e lungo quinto la stalla · come appare in · $k\ p$ · e l'altre · 2 parte 14 · che mettano in mezzo · questa · ciascuna sia diuisa in 2 parti · le dua diverso · il fieno sia 15 · no braccia 4 · $p\ s$ · solo · allo · ofitio · e andamento · de' · ministri · d'essa · stalla · l'altre 16 · che confinano · colle · parieti · muri · sieno · di · braccia 2 · come · appare in · $s\ k$ · e queste · sieno · allo · ofitio · di · dare · il · feno · alle · magiatoie · per · condotti · stretti · nel · principio · e larghi · sulle · magiatoie · acciò · che · l' · feno · non · si · fermi · infra · via · sieno · 19 · bene · itonici · e · politi · figurati · dov'è · segnato · $f$ · $s$ · in · quanto · al · dare · 20 · bere · siano · le · magiatoie · di · pietra · sopra · le · quali · sia · l'acqua · si · chè · si · possoni · 21 · scoprire · le · magiatoie · come · si · scoprioni · le · casse · alzando · i · coperchi · loro.

$761$. See Pl. LXXVIII, No. 1.
MODO COME SI FANNO "L'ARMATURE PER FARE 3 ORNAMETO 4 DI EDIFITI.

5. Modo come si debbono 6 mettere le per-tiche 7 per legare i mazzuoli 8 de' ginepri sopra esse 9 pertiche, le quali sono 10 confitte sopra l'ar"11matura della vol"12ta e lega essi ma"13zzuoli con salci e 14 sù per fare cimerosa 15 colle forbici e la16vora le cò salci;

17. Sia da l'u18no all' altro 19 cerchio uno 20 1/2 braccio e 'l gi21nepro si de' 22 regiere col'13le cime in giv 24 cómiciado 25 di sotto;

26. A questa colonna si lega 27 d'intorno 4 pertiche, dintor28 no alle quali s'inchioda 29 vinchi grossi uno dito e poi 30 si fa da piè e vassi in alto legà31 do mazzuoli di cime di 32 ginepro colle cime j ba33esso cioè sotto sopra.

Sia lasciata cadere l'acqua 3 in tutto il cerchio di a·b.

THE WAY TO CONSTRUCT A FRAME-WORK FOR DECORATING BUILDINGS.

The way in which the poles ought to be placed for tying bunches of juniper on to them. These poles must lie close to the framework of the vaulting and tie the bunches on with osier withes, so as to clip them even afterwards with shears.

Let the distance from one circle to another be half a braccia; and the juniper [sprigs] must lie top downwards, beginning from below.

Round this column tie four poles to which willows about as thick as a finger must be nailed and then begin from the bottom and work upwards with bunches of juniper sprigs, the tops downwards, that is upside down.

The water should be allowed to fall from the whole circle a·b.
VI. Studies of architectural details.

Several of Leonardo's drawings of architectural details prove that, like other great masters of that period, he had devoted his attention to the study of the proportion of such details. As every organic being in nature has its law of construction and growth, these masters endeavoured, each in his way, to discover and prove a law of proportion in architecture. The following notes in Leonardo's manuscripts refer to this subject.

**Fig. 1.**

**MS. S. K. M. III, 47b** (see Fig. 1). A diagram, indicating the rules as given by Vitruvius and by Leon Battista Alberti for the proportions of the Attic base of a column.

**MS. S. K. M. III 55a** (see Fig. 2). Diagram showing the same rules.
ARCHITECTURAL DESIGNS. [764—766.]

764. toro superiore astragali quadre troclea
    B toro superiore
    2 B nestroli astragali quadre
toro inferiore
    3 B orbiculo troclea
    4 B nestroli
    5 B toro inferiore plintho
    6 B latostru

765. Steps of Urbino.

The plinth must be as broad as the thickness of the wall against which the plinth is built.

766. The ancient architects... beginning with the Egyptians (?) who, as Diodorus Siculus writes, were the first to build and construct large cities and castles, public and private buildings of fine form, large and well proportioned....

The column, which has its thickness at the third part.... The one which would be thinnest in the middle, would break;... the one which is of equal thickness and of equal strength, is better for the edifice. The second best as to usefulness will be the one whose greatest thickness is where it joins with the base.

C. A. 318a; 961a]  

I nostri antichi architettori... cominciano in prima dagli Egizi, i quali secondo che descrive Diodoro Siculo... furò i primi edificatori e componitori di città grandissime e di castelli ed edifici pubblici e privati di forma, grandezza e qualità per le quali i loro antecedenti riguardevoli con stupefazione e maraviglia... e elevate e grandissime macchine parèdo loro....

5 La colonna ch'è a la sua grossezza nel terzo... quella che fosse sottile nel mezzo monterassi nelle...? quella ch'è di pari grossezza e di pari forza è migliore per l'edificio,... seconda di bontà sarà quella ch'è a la maggior grossezza dov' ella si cogiugnie colla basa.
Il capitello a essere j questo formato, dividì la sua grossezza da capo j 8 d'ù pié .... e fa che sia alto 3/7, e ver- rà a essere quadro, dipoi dividì l'altezza j 8, come facessi la colonna, di poi pon 1/9 l'ovovo e un altro ottavo la grossezza della tavola che sta di sopra al capitello; 11i corni della tavola del capitello anò a sportare fuori dalla maggior larghezza della c'apana 3/7, cioè sette del di sopra della c'apana che tocca a ciascù corno di sporto 1/7, 15e la mozzatura de' corni vuole essere largha quát' è alta, cioè 1/6; j l resto degli orn- naméti lasciò 16jn libertà degli scultori; 17ma per tornare alle colonne, e provare la ragione secondo la forma di lor forterza 18o debolezza, dico così, che quão le line si partiranno dalla sommità della 19colonna e termineranno nel suo nasciméto e la lor uia e l'uguézza sia di pari 20distanza o latitudine, dico che questa colonna ....

Arch. III. 156)

Il cilindro d'vn corpo di figura coló nale, e le suo opposite fronti so due cierchi d'interposizione parallela 4e infra li lor ciétri s'estéde una línea 5retta, che passa per il mezzo della grossezza 6del cilindro e termina nelli cierchi 7d'essì cierchi, la quale línea dalli antichi è detta axis.

767.

768.

\[ a \cdot b \cdot 1/3 \cdot di \cdot n \cdot m ; \quad 2m \cdot o \cdot 1/6 \cdot di \cdot r \cdot o; \]
\[ 3l'ovovo \quad sporta \quad 1/6 \cdot di \cdot r \cdot o; \quad 4s \cdot 7 \cdot 1/6 \cdot di \cdot r \cdot o \]
\[ 5a \cdot b \quad si \quad divida \quad in \quad 9 \quad e \quad 1/2 \quad il \quad abaco \quad è \quad 1/6; \]
\[ 7ovo \quad 1/6; \quad 8 fusaiolo \quad e \quad listelo \quad 1/6 \quad e \quad 1/4. \]

\[ a \cdot b \quad è \quad 1/3 \cdot di \quad n \cdot m; \quad m \cdot o \quad è \quad 1/6 \cdot di \quad r \cdot o. \]

The cylinder of a body columnar in shape and its two opposite ends are two circles enclosed between parallel lines, and through the centre of the cylinder is a straight line, ending at the centre of these circles, and called by the ancients the axis.

767. Leonardo wrote these lines on the margin of a page of the Trattato di Francesco di Giorgio, where there are several drawings of columns, as well as a head drawn in profile inside an outline sketch of a capital.

768. See li. LXXV, No. 16. In the original the drawing and writing are both in red chalk.

Vol. II.
Pl. LXXXV No. 6 (MS. Ash. II 6) contains a small sketch of a capital with the following note, written in three lines: I chorni del capiteio, deono essere la quarta parte d’uno quadro (The horns of a capital must measure the fourth part of a square).

MS. S. K. M. III 72 contains two sketches of ornamentations of windows. In MS. C. A. 308; 938 (see Pl. LXXXII No. 1) there are several sketches of columns. One of the two columns on the right is similar to those employed by Bramante at the Canonica di S. Ambrogio. The same columns appear in the sketch underneath the plan of a castle. There they appear coupled, and in two stories one above the other. The archivolts which seem to spring out of the columns, are shaped like twisted cords, meant perhaps to be twisted branches. The walls between the columns seem to be formed out of blocks of wood, the pedestals are ornamented with a reticulated pattern. From all this we may suppose that Leonardo here had in mind either some festive decoration, or perhaps a pavilion for some hunting place or park. The sketch of columns marked "35" gives an example of columns shaped like candelabra, a form often employed at that time, particularly in Milan, and the surrounding districts for instance in the Cortile di Casa Castiglione now Silvestre, in the cathedral of Como, at Porta della Rana &c.

769.

Concerning architraves of one or several pieces.

An architrave of several pieces is stronger than that of one single piece, if those pieces are placed with their length in the direction of the centre of the world. This is proved because stones have their grain or fibre generated in the contrary direction i.e. in the direction of the opposite horizons of the hemisphere, and this is contrary to fibres of the plants which have...

The Proportions of the stories of a building are indicated by a sketch in MS. S. K. M. II 11 (see Pl. LXXXV No. 15). The measures are written on the left side, as follows: br 1'-6' | -4' -2 br 9 e | -1' | - br 5-|6|7|8|9|-|0|3 [br = braccia; | = oscie].

Pl. LXXXV No. 13 (MS. B. 62) and Pl. XCIII No. 1 (MS. B. 15) give a few examples of arches supported on piers.

G. 324

Delli architravi di uno e di più pezzi.

1 L’architrave di più pezzi è più potente che quel d’un sol pezzo, essendo essi pezzi colle lor lunghezze situati perverso il cetro del medo; pruovasi perchè le pietre anno il nervo vero tiglio generato per il tra’verso, cioè per il uerso dell’oriizonti opposti d’un medesimo emisferio, e questo è contrario al tiglio delle piante le quali anno...
Leonardo's original writings on the theory of Architecture have come down to us only in a fragmentary state; still, there seems to be no doubt that he himself did not complete them. It would seem that Leonardo entertained the idea of writing a large and connected book on Architecture; and it is quite evident that the materials we possess, which can be proved to have been written at different periods, were noted down with a more or less definite aim and purpose. They might all be collected under the one title: "Studies on the Strength of Materials". Among them the investigations on the subject of fissures in walls are particularly thorough, and very fully reported; these passages are also especially interesting, because Leonardo was certainly the first writer on architecture who ever treated the subject at all. Here, as in all other cases Leonardo carefully avoids all abstract argument. His data are not derived from the principles of algebra, but from the laws of mechanics, and his method throughout is strictly experimental.

Though the conclusions drawn from his investigations may not have that precision which we are accustomed to find in Leonardo's scientific labours, their interest is not lessened. They prove at any rate his deep sagacity and wonderfully clear mind. No one perhaps, who has studied these questions since Leonardo, has combined with a scientific mind anything like the artistic delicacy of perception which gives interest and lucidity to his observations.

I do not assert that the arrangement here adopted for the passages in question is that originally intended by Leonardo; but their distribution into five groups was suggested by the titles, or headings, which Leonardo himself prefixed to most of these notes. Some of the longer sections perhaps should not, to be in strict agreement with this divi-
sion, have been reproduced in their entirety in the place where they occur. But the comparatively small amount of the materials we possess will render them, even so, sufficiently intelligible to the reader; it did not therefore seem necessary or desirable to subdivide the passages merely for the sake of strict classification.

The small number of chapters given under the fifth class, treating on the centre of gravity in roof-beams, bears no proportion to the number of drawings and studies which refer to the same subject. Only a small selection of these are reproduced in this work since the majority have no explanatory text.
ON FISSURES IN WALLS.

770.

First write the treatise on the causes of the giving way of walls and then, separately, treat of the remedies. Parallel fissures constantly occur in buildings which are erected on a hill side, when the hill is composed of stratified rocks with an oblique stratification, because water and other moisture often penetrates these oblique seams carrying in greasy and slippery soil; and as the strata are not continuous down to the bottom of the valley, the rocks slide in the direction of the slope, and the motion does not cease till they have reached the bottom of the valley, carrying with them, as though in a boat, that portion of the building which is separated by them from the rest. The remedy for this is always to build thick piers under the wall which is slipping, with arches from one to another, and with a good scarp and let the piers have a firm foundation in the strata so that they may not break away from them.

In order to find the solid part of these strata, it is necessary to make a shaft at the foot of the wall of great depth through the strata; and in this shaft, on the side from which the hill slopes, smooth and flatten a

770. See Pl. CIV.
26. dalla sommità insino al fondo da quel lato, donde il mòte discède, 27 e in capo d'al-quàto tempo questa parte pulita, che si fecie nella pa28dite del pozzo, mostrerà manifesto segno qual parte del mòte si move.

Br. M. 1574

Mai le fissure de' muri saranno parallèle, fuor che se la 2 parte del muro, la qual 4 si separa dal suo rimanente, 5 non discida.

Quale regola è quella che fa 7.1 editti permanenti.

La permanètia dell'editti è la regola contraria alle 2 anteciedèti, cioè che le muraglie 10 sieno elevate in alto tutte equalmente con e quali 11 gradi, che abbraccino l'intera circuizione dello 12 edificio colle intere grossezze di qualunque sorte di 13 muri, e ancora che il muro sottile secchi più pre-14 sto che il grosso, e' nò si avrà a ròperre per il peso che lui 15 possa acquistare dal l'una all'altra giornata, perchè, 16 se il suo duplo seccassi in una giornata il doppi 17 seccherà in due o circa, si uerrà ragguagliado 18 co piccola differètia di peso in picola differètia di têpo.

19. Dice l'avversario 20 che a becca 21 tello discède.

22. E qui dice l'auersario 23 che r discède e non è.

Pronostici delle cause 25 delle fissure di qualùche 26 muro.

27. Quella parte del muro che nó discède riserà 28 in se l'obliquità del beccatello, copritore dell'obliquità del muro da lui discesa.

De' siti de' fondamètì e in qual 31 loco sò causa delle ruine.

32. Quando la fessura del muro è più larga di sopra 33 che di sotto e'li è manifesto segnìo che la mucraglia à la causa della ruina remotà dal perpe35 dicùlare d'essa fessura.

larchezza. 26. dacquei . . . discède. 27. chapo dalquàto lento questo . . . chessi. 28. mossterra . . . meals si mìllì.


771. Lines 1—5 refer to Pl. CV, No. 2. Line 9 alle due antecidète, see on the same page.

Lines 16—18. The translation of this is double-

space one palm wide from the top to the bottom; and after some time this smooth portion made on the side of the shaft, will show plainly which part of the hill is moving.

The cracks in walls will never be parallel unless the part of the wall that separates from the remainder does not slip down.

What is the law by which buildings have stability.

The stability of buildings is the result of the contrary law to the two former cases. That is to say that the walls must be all built up equally, and by degrees, to equal heights all round the building, and the whole thickness at once, whatever kind of walls they may be. And although a thin wall dries more quickly than a thick one it will not necessarily give way under the added weight day by day and thus, [16] although a thin wall dries more quickly than a thick one, it will not give way under the weight which the latter may acquire from day to day. Because if double the amount of it dries in one day, one of double the thickness will dry in two days or thereabouts; thus the small addition of weight will be balanced by the smaller difference of time [18].

The adversary says that a which projects, slips down.

And here the adversary says that r slips and not c.

How to prognosticate the causes of cracks in any sort of wall.

The part of the wall which does not slip is that in which the obliquity projects and overhangs the portion which has parted from it and slipped down.

On the situation of foundations and in what places they are a cause of ruin.

When the crevice in the wall is wider at the top than at the bottom, it is a manifest sign, that the cause of the fissure in the wall is remote from the perpendicular line through the crevice.

ful, and the meaning in any case very obscure.

Lines 19—23 are on the right hand margin close to the two sketches on Pl. CH, No. 3.
OF CRACKS IN WALLS, WHICH ARE WIDE AT THE BOTTOM AND NARROW AT THE TOP AND OF THEIR CAUSES.

That wall which does not dry uniformly in an equal time, always cracks.

A wall though of equal thickness will not dry with equal quickness if it is not everywhere in contact with the same medium. Thus, if one side of a wall were in contact with a damp slope and the other were in contact with the air, then this latter side would remain of the same size as before; that side which dries in the air will shrink or diminish and the side which is kept damp will not dry. And the dry portion will break away readily from the damp portion because the damp part not shrinking in the same proportion does not cohere and follow the movement of the part which dries continuously.

OF ARCHED CRACKS, WIDE AT THE TOP, AND NARROW BELOW.

Arched cracks, wide at the top and narrow below are found in walled-up doors, which shrink more in their height than in their breadth, and in proportion as their height is greater than their width, and as the joints of the mortar are more numerous in the height than in the width.

The crack diminishes less in _ro_ than in _m n_, in proportion as there is less material between _r_ and _o_ than between _n_ and _m_.

Any crack made in a concave wall is wide below and narrow at the top; and this originates, as is here shown at _b c d_, in the side figure.

1. That which gets wet increases in proportion to the moisture it imbibes.

2. And a wet object shrinks, while drying, in proportion to the amount of moisture which evaporates from it.
Della cavia del ronpere delli edifici pubblici e privati.

2 Romponsi li muri per fessure, che anno del diretto e alcune che anno dello obbluo; le rotture che anno del diretto, sono gnerate dali muri novi in comeuti di muri vecchi diretti, o cò morse giute alli muri vecchi, perchè tali morse, nond potendo resistere allo insopportabile peso del muro a loro còogiute, è neciesario a quelle ronpersi e dar loco al discieaso del predetto muro novo, il quale cala vn braccio per ogni 10 braccia, o più o meno, secondo la maggiore o minore soîna di calcina interposta infra le pietre murate e cò calcina più o me lique; è nota che sepre si de bene iprma fare li muri e poi vestirli delle pietre che li òto a vestire, per chè se così no si faciesse, il muro facciedo maggiore calo che la crosta di fori, e sarebbe neciesario che le morse fatte nella lati de' muri si ropesasso; perchè le pietre che vestono li muiri, essendo di maggiori grandezza che le pietre da quel'le vestite, è neciesario che ricevino minore quantità di calcina nelle loro comessure e per conseguenza faccino minore calo, il che accadere no può, essendo murate tali croste poi ch'el muro ro è secco.

22 a b muro nuovo. c è muro vecchio che già a fatto il calo, e lo a b fa il calo poi, beche a, essendo fonda sopra il c muro Vecchio, no si può in nesù modo rôpere per a evre stabile fondameto sopra del muro vecchio, ma sol si ronpere il rimanente del muiro novo ad esso ch'elli è murato di sopra dalla sommità del muro insino al fondo, facciendo il rmanente del muro nuovo becaltetto sopra il muro che disciède.

The walls give way in cracks, some of which are more or less vertical and others are oblique. The cracks which are in a vertical direction are caused by the joining of new walls, with old walls, whether straight or with indentations fitting on to those of the old wall; for, as these indentations cannot bear the too great weight of the wall added on to them, it is inevitable that they should break, and give way to the settling of the new wall, which will shrink one braccia in every ten, more or less, according to the greater or smaller quantity of mortar used between the stones of the masonry, and whether this mortar is more or less liquid. And observe, that the walls should always be built first and then faced with the stones intended to face them. For, if you do not proceed thus, since the wall settles more than the stone facing, the projections left on the sides of the wall must inevitably give way; because the stones used for facing the wall being larger than those over which they are laid, they will necessarily have less mortar laid between the joints, and consequently they settle less; and this cannot happen if the facing is added after the wall is dry.

a b the new wall, c the old wall, which has already settled; and the part a b settles afterwards, although a, being founded on c, the old wall, cannot possibly break, having a stable foundation on the old wall. But only the remainder b of the new wall will break away, because it is built from top to bottom of the building; and the remainder of the new wall will overhang the gap above the wall that has sunk.
774—776.

ON FISSURES IN WALLS.

81

Br. M. 1594]

Torre nova fundata **sopra la vecchia in parte.**

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Br. M. 1574]

**DELLE PIETRE CHE SI DISGIUGONO DALLA LOR CALCINA.**

Le pietre d'equal numero nella loro altezza, mu*rate con equal quietà di calcina, fano equal **calo** nella partita dell'umido che mollifi*ca* essa calcina.

Per lo passato si prova che la poca quietà **d**el muro nuovo interposta infra \( A-n \) farà po*co calo rispetto alla quietà del medesimo mu*ro che s'interpone infra \( c \) \& \( d \), e tal fia la pro**portione** che anno infra loro le raretè delle 12*dette calcine qual'è la proportio*ne** delle 13*nummeri over delle quietà delle calcine inter**po^ste** nelle cómesure delle pietre murate so*spra le varie altezze delle muri vecchi.

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A. 534]

**Questo muro si roperà sotto l'arco \( e-f \) perché i sette quadrelli **integri** nò sono soffitetti a sostener il piè dell'arco sopra postoli 3*e roperannosi questi 7* quadrelli nel mezzo aputo come appare in \( a-b \);**

la ragione si è che il quadrello \( a \) a sola*mete sopra se il peso \( a-k \) è l'ultimo quadrello sotto l'arco a sopra se il peso \( c-d \); \( x-a \); **6* d-pare que che facci fare for***

---

774. 2 sopra il vecchio.

775. 1. chesi. 2. giughano . chalcina. 3. puette. 4. chon . chalcina. 5. la passata . chella pocha.

9. pocho chalo rispecto. 10. chesiintepone . etal. 11. portione [d] che anno infralloro. 12. chalcine. 13. chal-

cine. 14. ste . chionesure.

776. 1. Quessto . iarcho [e] c . l. 2. assosterner . archo . postoli. 3. e roperanosi. quessto . mezo . chome apare.

6. iarcho. 7. cheesfacci . archo urteasappal. 8. archo. 9. chome . dopio.

775. See Pl. CV, No. 1. The top of the tower is wanting in this reproduction, and with it the letter \( n \) which, in the original, stands above the letter \( A \) over the top of the tower, while \( c \) stands perpendicularly over \( d \).

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za · all'arco · verso la spalla nel pùto · ma
il peso · p · o · li fa resistètia · o de tutte il
peso · ne va · nella radice dell'arco; ad-
que fa · la radice delli archi · come · 7 · 6, ch'è
più forte il doppio che · x · z.
c d seems to press on the arch towards
the abutment at the point p but the weight
p o opposes resistance to it, whence the whole
pressure is transmitted to the root of the
arch. Therefore the foot of the arch acts
like 7 6, which is more than double of x z.
II.

ON FISSURES IN NICHES.

Delle rotture della niches.

L'arco fatto del semicircolo, il quale fia carico nelli due opposti terzi della sua curvità, róperà in cinque lochi della sua curvita; provasi e sieno li pesi 

777.

L'arco di 

777. 1. rocture. 2. senil . charicho. 3. charvita. 4. charvita prosi esseno. 5. rompono . archo . per la. 6. passata chome 

caretremi sono equalméte aggraviati. 7. seguita "per la 5° chellarcho." 8. chello priemano . altrec. 9. archo . addi. 

to. véghano addisciedere e discieder nò possa. 12. sano della archo che inflonol. 13. achostare. 14. larcho . chome 

fu pr"t°" . ne risponde. 17. ch5 . possto.
ON THE SHRINKING OF DAMP BODIES OF DIFFERENT THICKNESS AND WIDTH.

3 La finestra a è causa della rottura del b e questa tal rottura è ammattata dal peso n m, il quale più si fica ovvero penetra intrà la teràra che riceve il suo fondameto, che nò fa la leuità del b', e ancora il fo- 6 dameto vechio che sta sotto b à fatto il calo, il che fatto non avea li piú lastri n m, e la parte b non disciède perpendiculare, anzi si gitta info'ri per obbligo e non si può per l'aversario gittare in dètro, perchè tal parte disunìta dal tutto è più larga di fori che di dentro e li labri del rimanente 10 e della medesima figura, e se tal parte disunìta avesse a étare in den- tro, 11 il maggiori entrerebbe nel mi- nore, il che sarebbe impossibile; adunque 12 è cócluso che per necessità la parte di tale emiciclo si disunisce dal tutto col 13 gittarsi cola parte inferiore infori e non indètro come vole 14 l'aversario ecc.

15 Quando le tribune intero o mezzo 16 sarà di sopra vinte da supercìpio peso, al- 17 lora le sue volte si apriranno 18 có apertura diminuitiva 19 dalla parte di sopra e larga di sot20to e stretta dalla parte di dentro e 21 larga di fuori, a similitudine della 22 Scorzà del pomo ovvero melaràcia 23 divisa in molte parti per la sua lúghez247za, chè quato ella sarà premuta dal32le opposi parti della sua lúhezza, 25 quella parte delle giùtere più si a27pira, che fia più distàte alla causa 28 che la prieme', e per questo mai si 29 cheb- bono caricare li archi delle volte 30 di qual- unche emiciclo dalli archi dello 31 suo edifitio massimo, perchè quel che 32 più pesa più prieme sopra ciò che li è di33sotto, e più disciende sopra li sua fon34damètì, il che intervenire nò può 35 alle cose più lievi come sono li emi36icieli predetti.

778. The figure on Pl. CV, No. 4 belongs to the first paragraph of this passage, lines 1–14; fig. 5 is sketched by the side of lines 15—and following. The sketch of a pomegranate refers to line 22. The drawing fig. 6 is, in the original, over line 37 and fig. 7 over line 54.
Which of these two cubes will shrink the more uniformly: the cube \( A \) resting on the pavement, or the cube \( b \) suspended in the air, when both cubes are equal in weight and bulk, and of clay mixed with equal quantities of water?

The cube placed on the pavement diminishes more in height than in breadth, which the cube above, hanging in the air, cannot do. Thus it is proved. The cube shown above is better shown here below.

The final result of the two cylinders of damp clay that is \( a \) and \( b \) will be the pyramidal figures below \( e \) and \( d \). This is proved thus: The cylinder \( a \) resting on block of stone being made of clay mixed with a great deal of water will sink by its weight, which presses on its base, and in proportion as it settles and spreads all the parts will be somewhat nearer to the base because that is charged with the whole weight, &c.; and the case will be the same with the weight of \( b \) which will stretch lengthwise in proportion as the weight at the bottom is increased and the greatest tension will be the neighbourhood of the weight which is suspended by it.
III. ON THE NATURE OF THE ARCH.

779. CHE COSA È ARCO.

The arch is nothing else than a force originated by two weaknesses, for the arch in buildings is composed of two segments of a circle, each of which being very weak in itself tends to fall; but as each opposes this tendency in the other, the two weaknesses combine to form one strength.

DELLA QUALITÀ DEL PESO DELL'ARCHI.

As the arch is a composite force it remains in equilibrium because the thrust is equal from both sides; and if one of the segments weighs more than the other the stability is lost, because the greater pressure will outweigh the lesser.

DEL CARICO DATO AGLI ARCHI.

Next to giving the segments of the circle equal weight it is necessary to load them equally, or you will fall into the same defect as before.

779. 1. chosa e archo. 2. archo . I forteza . deboleze. 3. larcho . chūposto . circhuli. 4. circhuli ciaschuno . debolissimo .
       . chadere eupon. 5. deboleze . chōuerano. 6. cha forteza. 7. dela . deli. 8. chūposto quello . equilibra. 9. chēstato .
Dove l'arco si rove.

16 L'arco si röperà j quella parte che passa il suo mezzo sotto il cieto.

Secondo röpimeto dell'arco.

18 Se 'l superchio peso fia posto ì mezzo l'arco nel puito a, quello desidera cadere in b, e ronpesi ne' 2/3 della sua altezza in e, e tanto fia più potête g e che e a quanto 21 m o entra in m n.

D'un altra cagione di ruina.

23 L'arco verrà ancora meno per essere sospito da traverso, inpero chè quando il carico nò si dirizza ai piè de l'arco, l'arco poco dura.

780.

Della fortezza dell'arco.

2 Il modo di fare l'arco permanete si è a riempire i suoi angoli di buono ripieno insino al suo raso overo culmine.

4 Del caricare sopra l'arco tòdo.

5 Del caricare l'arco acuto bene.

6 Dello incoveniente che seguita a caricare l'arco acuto sul suo mezzo.

WHERE AN ARCH BREAKS.

An arch breaks at the part which lies below half way from the centre.

SECOND RUPTURE OF THE ARCH.

If the excess of weight be placed in the middle of the arch at the point a, that weight tends to fall towards b, and the arch breaks at 2/3 of its height at e e; and g e is as many times stronger than e a, as m o goes into m n.

ON ANOTHER CAUSE OF RUIN.

The arch will likewise give way under a transversal thrust, for when the charge is not thrown directly on the foot of the arch, the arch lasts but a short time.

ON THE STRENGTH OF THE ARCH.

The way to give stability to the arch is to fill the spandrels with good masonry up to the level of its summit.

ON THE LOADING OF ROUND ARCHES.

ON THE PROPER MANNER OF LOADING THE POINTED ARCH.

ON THE EVIL EFFECTS OF LOADING THE POINTED ARCH DIRECTLY ABOVE ITS CROWN.

15. larch. 16. larch. mezo [da]. 17. sechudo. archo. 18. mezzo larcho quelo. 19. chadere. dela alteza. 20. c. in n che. ej g e. 21. chajione. 22. larcho vera anchora essere. 23. charicho diriza archo. 24. larcho pocho. 780. 1. dela forteza delarcho. 2. larcho. 3. chulmine. 4. charichare larcho. 5. charichare larcho achuto. 6. delo inchoveniente charichare. 7. larcho achuto mezo. 8. dano larcho achuto. 9. charichato sopra a sua flachi. 10. larcho
ON THE DAMAGE DONE TO THE POINTED ARCH BY THROWING THE PRESSURE ON THE FLANKS.

An arch of small curve is safe in itself, but if it be heavily charged, it is necessary to strengthen the flanks well. An arch of a very large curve is weak in itself, and stronger if it be charged, and will do little harm to its abutments, and its places of giving way are $o \cdot p$.

ON THE REMEDY FOR EARTHQUAKES.

The arch which throws its pressure perpendicularly on the abutments will fulfil its function whatever be its direction, upside down, sideways or upright.

The arch will not break if the chord of the outer arch does not touch the inner arch. This is manifest by experience, because whenever the chord $a \cdot o \cdot n$ of the outer arch $n \cdot r \cdot a$ approaches the inner arch $x \cdot b \cdot y$ the arch will be weak, and it will be weaker in proportion as the inner arch passes beyond that chord. When an arch is loaded only on one side the thrust will press on the top of the other side and be transmitted.

"Del danno che riceve l'arco acuto a essere caricato sopra i suoi fiachi.

"L'arco poco curvo fia sicuro per se, ma se fia carico, le spalle bisogna bene armare; l'arco d'assai curvita fia per se debole, e piv forte se fia carico e fara poca noia alle sue spalle, e lui roperà in $o \cdot p$.

L'arco, poco, curvo, fia sicuro per se, ma se fia carico, le spalle bisogna bene armare; l'arco d'assai curvita fia per se debole, e piv forte se fia carico e fara poca noia alle sue spalle, e lui roperà in $o \cdot p$.

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ON THE NATURE OF THE ARCH.

782. A continuous body which has been forcibly bent into an arch, thrusts in the direction of the straight line, which it tends to recover.

783. In an arch judiciously weighted the thrust is oblique, so that the triangle $c n b$ has no weight upon it.

784. The two lower sketches are taken from the MS. S. K. M. III, 108; they have there no explanatory text.

Vol. II.

Il. 36[8]

La qualità continua, che per forza in arco sia piegata, spiege per la linia, onde desidera tornare.

Il. 35[8]
del' altro mezzo, e passa' sarà il peso per isino al suo fondamento, e röpera' in quella parte che sia piov' lontana dai suoi stremi, e dalla sua corda.

to the spring of the arch on that side; and it will break at a point half way between its two extremities, where it is farthest from the chord.

I. here ask what weight will be needed to counterpoise and resist the tendency of each of these arches to give way?

Domando qui che pesi fieno quelli de' contrapesi a fare resistenza alla rovina di ciascun arco?

782.

L'arco di qualità discreta fa forza per linia obliqua, cioè il triangulo $c n b$ no sète peso.

783.

784.
Della potetia dell'arco nell'architettura.

La permanenza dell'arco fabbricato dallo architetto consiste nella corda e nelle spalle sue.

La situazione della corda nel sopra detto arco.

La situazione della corda è equale necessità nel principio dell'arco, e nel fine della rettitudine del pilastro qui dove si posa; provasi per la 2ª delle sosteaculi che dice: Quella parte del sostentaculo manco resiste che è più remota dal fermaometo del suo tutto; adunque essendo la somità del pilastro vittima remotione di 1 suo fermaometo, e l'istimile accadèdo nelle oppositi stremi dell'arco, che sono vtile distanza dal mezzo, suo vero fermaometo, noi abbia concluso, che tal corda s a b di neciessità richiede la situazione della sua oppositi stremi infra li 4 oppositi stremi predetti;

Dicie l'auersario che tale arco vole essere più che mezzo tondo, e allora non avrà bisogno di corda perché tali stremi nò spigneranno infuori, ma indenetro, come si dimostra nello eccesso a e c b d; Qui si risponde, tale inventione essere trista per 5 cause, e la prima è inquantà alla fortezza, perché è provato il paralello circolare, essendo còposto di due semicirculi, sol rôpersi dove tali semicirculi insieme si congiugono, come mostra la figura n m; oltre a di questo seguito, ch'egli è maggiore spatio infra li stremi del semicirculo che infra le paìfrieti del muri; terza è che il peso posto per còtro alla fortezza dell'arco diminuisce tanto di peso, quàto le poste dell'arco sono più larghe che detto spatio interposto infra li pilastri, quarta è che li pilastri indeboliscono per tato quàto la parte loro.

On the strength of the arch in architecture.

The stability of the arch built by an architect resides in the tie and in the flanks.

On the position of the tie in the above named arch.

The position of the tie is of the same importance at the beginning of the arch and at the top of the perpendicular pier on which it rests. This is proved by the 2nd "of supports" which says: that part of a support has least resistance which is farthest from its solid attachment; hence, as the top of the pier is farthest from the middle of its true foundation and the same being the case at the opposite extremities of the arch which are the points farthest from the middle, which is really its upper attachment, we have concluded that the tie a b requires to be in such a position as that its opposite ends are between the four above-mentioned extremes.

The adversary says that this arch must be more than half a circle, and that then it will not need a tie, because then the ends will not thrust outwards but inwards, as is seen in the excess at a c, b d. To this it must be answered that this would be a very poor device, for three reasons. The first refers to the strength of the arch, since it is proved that the circular parallel being composed of two semicircles will only break where those semicircles cross each other, as is seen in the figure n m; besides this it follows that there is a wider space between the extremities of the semicircle than between the plane of the walls; the third reason is that the weight placed to counterbalance the strength of the arch diminishes in proportion as the piers of the arch are wider than the space between the piers. Fourthly in proportion as the parts at c a b d turn outwards, the piers are weaker to support the arch above them. The 5th is that all the material and weight of the
c a b d e si piega indirieto nel ritienere sopra di se l'arco; la 58 è 39 che tutta la spesa e 1 peso dell'arco che eccede il mezzo tondo 31 è inutile e dannoso, ed è qui da notare, che il peso 32 sopra posto all'arco ròperà có più facilità l'arco in a b troui Năm do la curatura dell'eccesso che al mezzo circolo s'aggiunse 34 che essendo dirieto il pilastro insino al còtatto del semicirculo.

LARCHO IL QUALE É CARICO SOPRA IL SUO MEZZO RÒPERÀ 42 NEL SUO QUARTO DESTRO E SINISTRO.

37 Prouasi per la 7ª di questo che dice 38 le opposite stremità delli sostètaculi sono equalmente agra33vate dal peso che per lor si sospede; adunque il peso dato in f si 49 sète in b c cioè mezzo per ciascuno stremo, e per la terza che dice: 41 Quella parte del sostètacolo d'equal potètia più presto si rompe 42 che è più distante al suo ferma-mèto, òde seguita che . . . . 43 per essere d' equally distâte al ʃ e ferma . . . .

32 Se l'armadura dell'arco no cala in-sieme 37 col calo dell'arco, la cal38 cina nel seccarsi restri39gnie in se medesima e 40 si spicca dalli' de'matto41ni, alli quali ella per col42 llegarli é interpo43sta, e così li lascia dil44getati, per la qual co45sa la volta resta disus46nita e le pioggie in bre47ve la ruinano.

ON THE NATURE OF THE ARCH.

arch which are in excess of the semicircle are useless and indeed mischievous; and here it is to be noted that the weight placed above the arch will be more likely to break the arch at a b, where the curve of the excess begins that is added to the semicircle, than if the pier were straight up to its junction with the semicircle [spring of the arch].

AN ARCH LOADED OVER THE CROWN WILL GIVE WAY AT THE LEFT HAND AND RIGHT HAND QUARTERS.

This is proved by the 7th of this which says: The opposite ends of the support are equally pressed upon by the weight suspended to them; hence the weight shown at f is felt at b c, that is half at each extremity; and by the third which says: in a support of equal strength [throughout] that portion will give way soonest which is farthest from its attachment; whence it follows that d being equally distant from f, e . . .

If the centering of the arch does not settle as the arch settles, the mortar, as it dries, will shrink and detach itself from the bricks between which it was laid to keep them together; and as it thus leaves them disjoined the vault will remain loosely built, and the rains will soon destroy it.

ON THE STRENGTH AND NATURE OF ARCHES, AND WHERE THEY ARE STRONG OR WEAK; AND THE SAME AS TO COLUMNS.

That part of the arch which is nearer to the horizontal offers least resistance to the weight placed on it.
Quando il triangolo \( a z n \) calando caccia indiretto.

1/2 di ciascuno 1/2 arco cioè \( a.s \) e cosi \( z.m \), eia ?raggio si è che a pioba sopra b, e cosi \( z \) sopra f.

Ciascuno 1/2 arco, sendo vinto dal superchio pesò, si romanerà ne 1/2 della sua altezza, la quale parte risponde per perpendiculare linea sopra il mezzo della sua basa; come appare in a-b; E questo accade chè l peo desidera cadere e passare pel pîuto r; E sègli desiderasse còtra sua natura cade534e nel pítuo s, l’arco n.s si ròperrebbe nel suo mezzo appunto e se l’arco n.s. fosse solo legno, il peso posto in n. desidererebbe cadere in m. e ronperreesi in mezzo 1/2 all’arco e m., altremetti si ròperà nel terzo 1/3 di sopra nel pîuto 19/2, perché da a.n. 20 è l’arco piva533no, che non è da 22a. o e che no33nè da o.s; 24 è tanto quàto 25 p. t. è maggiore533e che t.n., 27 tanto fia piva for28te a.o che 29 non è a.n.; 30 e similitù 31 tanto fia piva 34 forte s.o che 30 o a. quàto 34 r p. fia maggiore534 e che p t.

Quel che fia che fia raddoppiato nella quadratura della sua grossezza 37 regerà quattro tanti pesò quanto regieva lò scèpio, tanto piva quanto il diamitò della sua grossezza entra e men numero di volte nella 33 sua lunghezza, Cioè la grossezza dell’arco scèpio entra 10 40 volte nella sua lunghezza, la grossezza del arco duplicato ètèrà 5 volte 41 nella sua lunghezza; Adùque entra trà la metà meno la grossezza de 41 l’arco duplicato nella sua lunghezza, chè no fa quella de l’arco scèpio nella sua, è ragionevol cosa che regga la metà piva pesò che no gli toccherebbe, se fosse alla propoiione dell’ar65co scèpio; Onde essendo quest’arco duplicato per 4 volte la quà6ità dell’arco scèpio, parrebbe che dovesse regiere24 tati piva pesò, 47 e la sopra detta regola dimostra che ne sostiene 8 cotàti apputo.

When the triangle \( a z n \), by settling, drives backwards the 1/2 of each \( 1/2 \) circle that is \( a s \) and in the same way \( z \), the reason is that \( a \) is perpendicularly over \( b \) and so likewise \( z \) is above \( f \).

Either half of an arch, if overweighted, will break at 1/3 of its height, the point which corresponds to the perpendicular line above the middle of its bases, as is seen at \( a b \); and this happens because the weight tends to fall past the point \( r \).—And if, against its nature it should tend to fall towards the point \( s \) the arch \( n s \) would break precisely in its middle. If the arch \( n s \) were of a single piece of timber, if the weight placed at \( n \) should tend to fall in the line \( n m \), the arch would break in the middle of the arc \( e m \), otherwise it will break at one third from the top at the point \( a \) because from \( a \) to \( n \) the arch is nearer to the horizontal than from \( a \) to \( o \) and from \( o \) to \( s \), in proportion as \( p t \) is greater than \( t n \), \( a o \) will be stronger than \( a n \) and likewise in proportion as \( s o \) is stronger than \( a r \), \( p \) will be greater than \( p t \).

The arc which is doubled to four times of its thickness will bear four times the weight of the single arch could carry, and more in proportion as the diameter of its thickness goes a smaller number of times into its length. That is to say that if the thickness of the single arch goes ten times into its length, the thickness of the doubled arch will go five times into its length. Hence as the thickness of the double arch goes only half as many times into its length as that of the single arch does, it is reasonable that it should carry half as much more weight as it would have to carry if it were in direct proportion to the single arch. Hence as this double arch has 4 times the thickness of the single arch, it would seem that it ought to bear 4 times the weight; but by the above rule it is shown that it will bear exactly 8 times as much.
ON THE NATURE OF THE ARCH.

That pier, which is charged most unequally, will soonest give way.

The column $c\ b$, being charged with an equal weight, [on each side] will be most durable, and the other two outward columns require on the part outside of their centres, such pressure as there is inside of their centre, that is, from the centre of the column, towards the middle of the arch.

Arches which depend on chains for their support will not be very durable.

That arch will be of longer duration which has a good abutment opposed to its thrust.

The arch itself tends to fall. If the arch be 30 braccia and the interval between the walls which carry it be 20, we know that 30 cannot pass through the 20 unless 20 becomes likewise 30. Hence the arch being crushed by the excess of weight, and the walls offering insufficient resistance, part, and afford room between them, for the fall of the arch.

But if you do not wish to strengthen the arch with an iron tie you must give it such abutments as can resist the thrust; and you can do this thus: fill up the spandrels $m\ n$ with stones, and direct the lines of the joints between them to the centre of the circle of the arch, and the reason why this makes the arch durable is this. We know very well that if the arch is loaded with an excess of weight above its quarter as $a\ b$, the wall $f\ g$ will be thrust outwards because the arch would yield in that direction, if the other quarter $b\ c$ were loaded, the wall $f\ g$ could be thrust inwards, if it were not for the line of stones $x\ y$ which resists this.

THE NATURE OF THE ARCH.

That pier, which is charged most unequally, will soonest give way.

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THE NATURE OF THE ARCH.

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of the angles outwards, as is shown by the line \( h c \) and by the line \( t d \) which thrust out the pier \( m \); that is they tend to force it away from the centre of such an octagon.

An Experiment to show that a weight placed on an arch does not discharge itself entirely on its columns; on the contrary the greater the weight placed on the arches, the less the arch transmits the weight to the columns.

The experiment is the following. Let a man be placed on a steel yard in the middle of the shaft of a well, then let him spread out his hands and feet between the walls of the well, and you will see him weigh much less on the steel yard; give him a weight on the shoulders, you will see by experiment, that the greater the weight you give him the greater effort he will make in spreading his arms and legs, and in pressing against the wall and the less weight will be thrown on the steel yard.
Helieg. Dujardin.

Imp. Eudes.
IV.

ON FOUNDATIONS, THE NATURE OF THE GROUND AND SUPPORTS.

789.

The first and most important thing is stability.

As to the foundations of the component parts of temples and other public buildings, the depths of the foundations must bear the same proportions to each other as the weight of material which is to be placed upon them.

Every part of the depth of earth in a given space is composed of layers, and each layer is composed of heavier or lighter materials, the lowest being the heaviest. And this can be proved, because these layers have been formed by the sediment from water carried down to the sea, by the current of rivers which flow into it. The heaviest part of this sediment was that which was first thrown down, and so on by degrees; and this is the action of water when it becomes stagnant, having first brought down the mud whence it first flowed. And such layers of soil are seen in the banks of rivers, where their constant flow has cut through them and divided one slope from the other to a great depth; where in gravelly strata the waters have run off, the ma-

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789. 1. ella loro permanetia. 2. chem le mebrificazioni chonponi. 3. pubblici. 4. debebe. dapprofondita approfondita. 5. dappeso. . dappeso. choscarichare si debebe. 8. alla. 9. spatieto. 10. faceta assuoli. 11. chitaposso. 12. parte. . grave [opil]. 13. eppi lievi luna echetia. 14. tra "nel- grava" ecuesto si prove. 15. questi. 16. turbulentie. 17. strachicho. 17. fec. 22. prim"a". 23. asischicho. 24. ecuesto fallac. 25. forme. 26. manifessta. 20. cholor chon. 31. chorii an seghasti. 32. essparitii. 34. dallaltre. 35. gioriosi. 37. se secha. 38. chowenita. 40. figho. 41. ecuesto. 43. tereste. 45. chosi de chiverso.
cata 38 e couertita in dura 39 pietra, e massime di 40 quel fango, che era più 41 sottile, e questo ci 42 fa cöcludere, che ogni par43te della terrestre superficie fu 44 già ciët tro della terra e 45 così de cöverso ecc.

A. 50 a]

Quella parte del fondaméto delli edifici che piv pesa 2 piv si fica e lec lascia in alto il piv leggiero disunito da se; 7 77 E quel terreno ch'è piv · premvto, sendo poroso, piv acconsente; 7 7 7 Senpre tu · devi · fare i fon-
daméti che sportino egualmente fori del 5 carico de'lor mvri e pilasstri come appare in m · a · b · , e se 6 farai · come · molti fanno, cioè di fare uno fondaméto d'equal 7 larghezza · in sino alla superficie · della terra, e di sopra li danno diseguale 8 carico come terials have, in consequence, dried and been converted into hard stone, and this happened most in what was the finest mud; whence we conclude that every portion of the surface of the earth was once at the centre of the earth, and vice versa &c.

790.

The heaviest part of the foundations of buildings settles most, and leaves the lighter part above it separated from it.

And the soil which is most pressed, if it be porous yields most.

You should always make the foundations project equally beyond the weight of the walls and piers, as shown at m a b. If you do as many do, that is to say if you make a foundation of equal width from the bottom up to the surface of the ground, and charge

791.

si dimostra in · b · e · e in e · o, la parte del fonda\:m\:é\:to · b · e, perché è piena dal pilas-
tro del câtome , piv pesa e piv spigie 10 in basso il suo fòdaméto che nó fa il muro · e · o che non occupa 11 interamète il suo fòdaméto, e però meno spegnie e mè si fica, 11 onde ficcadosi il pilastro b · e · e si diunisce e parte dal mv13ro · e · o · come si uede nel piv dell'edifici che sono spicati intorno · a detti pilasstri.

A. 53 a]

La finestra · a · sta bene sotto 2 la finestra c e la finestra · 3 · b · sta · male · sotto · lo spatio 4 · d · , perché detto · spatio · è sanza 5 sostegnio · e fondaméto, 6 si ch'è ricordati di nó röpere 7 mai sotto · li spati · delle finestre.

790. 1. Que\:la. 2. ficha . ella\:sce\:ia . el . legieri . dasse. 3. Eque\:l \:ter\:mo . schüs\:ete. 4. de\:bì . chesp\:orti\:no. 5. pilas\:stri chome \:ap\:are . esse. 6. chome . l fondam\:é\:to (equ\:il) de quale. 7. large\:za . a\:la . delatere . dano. 8. charico. 9. châ\:rion. 10. baso . nome \:occhupa. 11. ficha. 12. \:l\:d\:g\:h\:ád\:os . disunisse. 13. chome . ches\:s\:o\:n spichazi. 14. pilas\:stri.

791. 2. ella. 3. sotto [la finestra] lo spazio. 5. effondaméto. 6. richordsi.
DEL SOSTÉTACULO.

Il pilastro moltiplicato per grossezza crescerà tanto più che la sua debita potenza quattò e' màca della ragionevole altezza.

ESEMPIO.

Se uno pilastro deve essere alto 9 braccia, cioè che s'egli sarà grosso uno braccio, la regola lo pone di 9 braccia; se ne collegherai 100 insieme per grossezza fia grosso braccia 10 e alto 9, e se il primo pilastro regiava 10000 libbre, perchè questo secòdo non è alto se non è circa 8 a una grossezza, e màcàdoli 8 parti della lunghezza c'ègrierà pìv otto volte, cioè ogni pilastro collegato li toccherà a regire pìv 8 volte che dislegato, cioè 10 che se prima regiava dieci mila libbre, adesso ne sosterrà 90 mila.

OF THE SUPPORTS.

A pillar of which the thickness is increased will gain more than its due strength, in direct proportion to what its loses in relative height.

EXAMPLE.

If a pillar should be nine times as high as it is broad—that is to say, if it is one braccio thick, according to rule it should be nine braccia high; then, if you place 100 such pillars together in a mass this will be ten braccia broad and 9 high; and if the first pillar could carry 10000 pounds the second being only about as high as it is wide, and thus lacking 8 parts of its proper length, it, that is to say, each pillar thus united, will bear eight times more than when disconnected; that is to say, that if at first it would carry ten thousand pounds, it would now carry 90 thousand.

792. [sostétaculo. 2. pilastro moltiplicato per grossezza cresciuta, tanto "pìv che". 3. màca. 4. alteza. 5. Se l. grossesse. 6. 1 br. 7. [de] la. 8. 9 br. 9. cholegenni. 10. grosseza. 11. br. 12. esse. 13. lbr. 14. sechùdo. 15. circa. 16. a l grosseza e màchàdoli. 17. dela lungheza. 18. cholegato. 19. tochera. 20. chesse. 21. mila lbr. 22. sostera.

VOL. II.
ON THE RESISTANCE OF BEAMS.

That angle will offer the greatest resistance which is most acute, and the most obtuse will be the weakest.

If the beams and the weight are 100 pounds, how much weight will be wanted at a·b to resist such a weight, that it may not fall down?

That beam which is more than 20 times as long as its greatest thickness will be of brief duration and will break in half; and

The three smaller sketches accompany the text in the original, but the larger one is not directly connected with it. It is to be found on fol. 89a of the same Manuscript and there we read in a note, written underneath, coverchio della perdita del castello (roof of the flagstaff of the castle).—Compare also Pl. XCIII, No. 1.
la parte ch'è tra nel mvro, sia penetrata di pece calda e fasciata d'asse di quercia, òcor essa penetrata; 6 ogni trave vole passare i suoi muri e esser ferma di là da essi mvri cò sofittici catene, perchè spesso si vede per terremoti le travi usci're de'mvri e rovinare poi i mvrì e solari; dove, se sono icatenate, terranno i mvrì in sieme fermi, e i mvrì fermano i solari.

10 Ancora ti ricordo che tu noi faci mai i smali sopra legni, imperochè nel crescire e discrescire che fa il legname per l'umido e secco, spesse volte crepano detti solai e crepa te le loro divisioni a poco a poco si fano in poliere e fano brutta evidetìa.

15 Ancora ti ricordo nò facci solari sostenuti da archi e travi, imperochè col tepo il solaro, ch'è sostenuto dalle travi, cala all'quasto in nel suo mezzo, e quella parte del solaro, ch'è sostenuta dal arco, resta nel suo loco, onde i solari che sono sostenuti da 2 varie nature di sostèta cui paiono col tepo fatti a colli.

remember, that the part built into the wall should be steeped in hot pitch and filleted with oak boards likewise so steeped. Each beam must pass through its walls and be secured beyond the walls with sufficient chaining, because in consequence of earthquakes the beams are often seen to come out of the walls and bring down the walls and floors; whilst if they are chained they will hold the walls strongly together and the walls will hold the floors. Again I remind you never to put plaster over timber. Since by expansion and shrinking of the timber produced by damp and dryness such floors often crack, and once cracked their divisions gradually produce dust and an ugly effect. Again remember not to lay a floor on beams supported on arches; for, in time the floor which is made on beams settles somewhat in the middle while that part of the floor which rests on the arches remains in its place; hence, floors laid over two kinds of supports look, in time, as if they were made in hills.

795. 1. della lunghezza, 2. cheffia...pvi...chele [15] 10. 3. magli...pochi...pocho. 4. richordoti. 5. cholda...essa...travendo. 7. chò sofittiti chatene...tremoti...usci. 8. lcatenate. 9. terrano...e e mvri. 10. Anchora ti richordo chettu. 11. crescire et discrescire cheffia legname. 12. essecho...isspese...etti soli e crep. 13. ti le...apoch apocho...effano. 15. Anchora ti richordo no faci. 16. e trav...chol...dale. 17. chol...i...me...e...eli... [che elp] eque parte. 18. sostenta...arch...locho. 19. propositione J solari chessone. 20. chol...chill...piano chol...acholl. The word propositions written on the margin near line 19 has apparently nothing to do with this text, but M. Ravaisson, in his edition of MS. A has been misled by it to take 1 solari (line 18) for the beginning of a new paragraph.

795. 19. M. Ravaisson, in his edition of MS. A gives a very different rendering of this passage translating it thus: Les planchers qui sont soutenus par deux différentes natures de supports paraissent avoir le temps faits en voile a choll:
Remarks on the style of Leonardo's architecture.

A few remarks may here be added on the style of Leonardo’s architectural studies. However incomplete, however small in scale, they allow us to establish a certain number of facts and probabilities, well worthy of consideration.

When Leonardo began his studies the great name of Brunellesco was still the inspiration of all Florence, and we cannot doubt that Leonardo was open to it, since we find among his sketches the plan of the church of Santo Spirito* and a lateral view of San Lorenzo (Pl. XCIV No. 1), a plan almost identical with the chapel Degli Angeli, only begun by him (Pl. XCIV, No. 3) while among Leonardo's designs for domes several clearly betray the influence of Brunellesco’s Cupola and the lantern of Santa Maria del Fiore².

The beginning of the second period of modern Italian architecture falls during the first twenty years of Leonardo's life. However the new impetus given by Leon Battista Alberti either was not generally understood by his contemporaries, or those who appreciated it, had no opportunity of showing that they did so. It was only when taken up by Bramante and developed by him to the highest rank of modern architecture that this new influence was generally felt. Now the peculiar feature of Leonardo's sketches is that, like the works of Bramante, they appear to be the development and continuation of Alberti's.

¹ See Pl. XCIV, No. 2. Then only in course of erection after the designs of Brunellesco, though he was already dead; finished in 1481.
² A small sketch of the tower of the Palazzo della Signoria (MS. C.A. 309) proves that he also studied mediaeval monuments.
But a question here occurs which is difficult to answer. Did Leonardo, till he quitted Florence, follow the direction given by the dominant school of Brunellesco, which would then have given rise to his "First manner", or had he, even before he left Florence, felt Alberti's influence—either through his works (Palazzo Rucellai, and the front of Santa Maria Novella) or through personal intercourse? Or was it not till he went to Milan that Alberti's work began to impress him through Bramante, who probably had known Alberti at Mantua about 1470 and who not only carried out Alberti's views and ideas, but, by his designs for St. Peter's at Rome, proved himself the greatest of modern architects. When Leonardo went to Milan Bramante had already been living there for many years. One of his earliest works in Milan was the church of Santa Maria presso San Satiro, Via del Falcone.

Now we find among Leonardo's studies of Cupolas on Plates LXXXIV and LXXXV and in Pl. LXXX several sketches which seem to me to have been suggested by Bramante's dome of this church.

The MSS. B and Ash. II contain the plans of S. Sepolcro, the pavilion in the garden of the duke of Milan, and two churches, evidently inspired by the church of San Lorenzo at Milan.

MS. B. contains besides two notes relating to Pavia, one of them a design for the sacristy of the Cathedral at Pavia, which cannot be supposed to be dated later than 1492, and it has probably some relation to Leonardo's call to Pavia June 21, 1490. These and other considerations justify us in concluding, that Leonardo made his studies of cupolas at Milan, probably between the years 1487 and 1492 in anticipation of the erection of one of the grandest churches of Italy, the Cathedral of Pavia. This may explain the decidedly Lombardo-Bramantesque tendency in the style of these studies, among which only a few remind us of the forms of the cupolas of S. Maria del Fiore and of the Baptistery of Florence. Thus, although when compared with Bramante's work, several of these sketches plainly reveal that master's influence, we find, among the sketches of domes, some, which show already Bramante's classic style, of which the Tempietto of San Pietro in Montorio, his first building executed at Rome, is the foremost example.

On Plate LXXXIV is a sketch of the plan of a similar circular building; and the Mausoleum on Pl. XCVIII, no less than one of the pedestals for the statue of Francesco Sforza (Pl. LXV), is of the same type.

1 Evidence of this I intend to give later on in a Life of Bramante, which I have in preparation.
2 The sketch of the plan of Brunellesco's church of Santo Spirito at Florence, which occurs in the same Manuscript, may have been done from memory.
3 It may be mentioned here, that in 1494 Bramante made a similar design for the lantern of the Cupola of the Church of Santa Maria delle Grazie.
The drawings Pl. LXXXIV No. 2, Pl. LXXXVI No. 1 and 2 and the ground floor of the building in the drawing Pl. XCI No. 2, with the interesting decoration by gigantic statues in large niches, are also, I believe, more in the style Bramante adopted at Rome, than in the Lombard style. Are we to conclude from this that Leonardo on his part influenced Bramante in the sense of simplifying his style and rendering it more congenial to antique art? The answer to this important question seems at first difficult to give, for we are here in presence of Bramante, the greatest of modern architects, and with Leonardo, the man comparable with no other. We have no knowledge of any buildings erected by Leonardo, and unless we admit personal intercourse—which seems probable, but of which there is no proof—, it would be difficult to understand how Leonardo could have affected Bramante's style. The converse is more easily to be admitted, since Bramante, as we have proved elsewhere, drew and built simultaneously in different manners, and though in Lombardy there is no building by him in his classic style, the use of brick for building, in that part of Italy, may easily account for it.

Bramante's name is incidentally mentioned in Leonardo's manuscripts in two passages (Nos. 1414 and 1448). On each occasion it is only a slight passing allusion, and the nature of the context gives us no due information as to any close connection between the two artists.

It might be supposed, on the ground of Leonardo's relations with the East given in sections XVII and XXI of this volume, that some evidence of oriental influence might be detected in his architectural drawings. I do not however think that any such traces can be pointed out with certainty unless perhaps the drawing for a Mausoleum, Pl. XCVIII.

Among several studies for the construction of cupolas above a Greek cross there are some in which the forms are decidedly monotonous. These, it is clear, were not designed as models of taste; they must be regarded as the results of certain investigations into the laws of proportion, harmony and contrast.

The designs for churches, on the plan of a Latin cross are evidently intended to depart as little as possible from the form of a Greek cross; and they also show a preference for a nave surrounded with outer porticos.

The architectural forms preferred by Leonardo are pilasters coupled (Pl. LXXXII No. 1) or grouped (Pl. LXXX No. 5 and XCVI No. 4), often combined with niches. We often meet with orders superposed, one in each story, or two small orders on one story, in combination with one great order (Pl. XCVI No. 2).
The drum (tamburo) of these cupolas is generally octagonal, as in the
cathedral of Florence, and with similar round windows in its sides. In
Pl. LXXXVII No. 2 it is circular like the model actually carried out
by Michael Angelo at St. Peter's.

The cupola itself is either hidden under a pyramidal roof, as in the
Baptistery of Florence, San Lorenzo of Milan and most of the Lombard
churches (Pl. XCI No. 1 and Pl. XCII No. 1); but it more generally suggests
the curve of Sta Maria del Fiore (Pl. LXXXVIII No. 5; Pl. XL No. 2;
Pl. LXXXIX, M; Pl. XL No. 4, Pl. XCVI No. 2). In other cases
(Pl. LXXX No. 4; Pl. LXXXIX; Pl. XC No. 2) it shows the sides of the
octagon crowned by semicircular pediments, as in Brunellesco's lantern of
the Cathedral and in the model for the Cathedral of Pavia.

Finally, in some sketches the cupola is either semicircular, or as in
Pl. LXXXVII No. 2, shows the beautiful line, adopted sixty years later
by Michael Angelo for the existing dome of St. Peter's.

It is worth noticing that for all these domes Leonardo is not satisfied
to decorate the exterior merely with ascending ribs or mouldings, but employs
also a system of horizontal parallels to complete the architectural system. Not
the least interesting are the designs for the tiburio (cupola) of the Milan
Cathedral. They show some of the forms, just mentioned, adapted to the
peculiar gothic style of that monument.

The few examples of interiors of churches recall the style employed in
Lombardy by Bramante, for instance in S. Maria di Canepanuova at
Pavia, or by Dolcebuono in the Monastero Maggiore at Milan (see Pl. CI
No. 1 [C. A. 181*b; 546*b]; Pl. LXXXIV No. 10).

The few indications concerning palaces seem to prove that Leonardo
followed Alberti's example of decorating the walls with pilasters and a flat
rustica, either in stone or by graffitti (Pl. CII No. 1 and Pl. LXXXV
No. 14).

By pointing out the analogies between Leonardo's architecture and that
of other masters we in no way pretend to depreciate his individual and
original inventive power. These are at all events beyond dispute. The
project for the Mausoleum (Pl. XCVIII) would alone suffice to rank him
among the greatest architects who ever lived. The peculiar shape of the
tower (Pl. LXXX), of the churches for preaching (Pl. XCVII No. 1 and
pages 56 and 57, Fig. 1—4), his curious plan for a city with high and low
level streets (Pl. LXXVII and LXXVIII No. 2 and No. 3), his Loggia
with fountains (Pl. LXXXII No. 4) reveal an originality, a power and fa-
cility of invention for almost any given problem, which are quite wonderful.
In addition to all these qualities he probably stood alone in his day in one department of architectural study,—his investigations, namely, as to the resistance of vaults, foundations, walls and arches.

As an application of these studies the plan of a semicircular vault (Pl. CIII No. 2) may be mentioned here, disposed so as to produce no thrust on the columns on which it rests: volta i botte e non ispignie ifori le colone. Above the geometrical patterns on the same sheet, close to a circle inscribed in a square is the note: la ragiò d'una volta cioè il terzo del diamitro della sua... del tedesco in domo.

There are few data by which to judge of Leonardo's style in the treatment of detail. On Pl. LXXXV No. 10 and Pl. CIII No. 3, we find some details of pillars; on Pl. CI No. 3 slender pillars designed for a fountain and on Pl. CIII No. 1 M.S. B, is a pen and ink drawing of a vase which also seems intended for a fountain. Three handles seem to have been intended to connect the upper parts with the base. There can be no doubt that Leonardo, like Bramante, but unlike Michael Angelo, brought infinite delicacy of motive and execution to bear on the details of his work.
Leonardo’s eminent place in the history of medicine, as a pioneer in the sciences of Anatomy and Physiology, will never be appreciated till it is possible to publish the mass of manuscripts in which he largely treated of these two branches of learning. In the present work I must necessarily limit myself to giving the reader a general view of these labours, by publishing his introductory notes to the various books on anatomical subjects. I have added some extracts, and such observations as are scattered incidentally through these treatises, as serving to throw a light on Leonardo’s scientific attitude, besides having an interest for a wider circle than that of specialists only.

Vasari expressly mentions Leonardo’s anatomical studies, having had occasion to examine the manuscript books which refer to them. According to him Leonardo studied Anatomy in the companionship of Marc Antonio della Torre “aiutato e scambievolmente aiutando.”—This learned Anatomist taught the science in the universities first of Padua and then of Pavia, and at Pavia he and Leonardo may have worked and studied together. We have no clue to any exact dates, but in the year 1506 Marc Antonio della Torre seems to have not yet left Padua. He was scarcely thirty years old when he died in 1512, and his writings on anatomy have not only never been published, but no manuscript copy of them is known to exist.

This is not the place to enlarge on the connection between Leonardo and Marc Antonio della Torre. I may however observe that I have not been able to discover in Leonardo’s manuscripts on anatomy any mention of his younger contemporary. The few quotations which occur from writers on medicine—either of antiquity or of the middle ages are printed in Section XXII. Here and there in the manuscripts mention is made of an anonymous “adversary” (avversario) whose views are opposed and refuted by Leonardo, but there is no ground for supposing that Marc Antonio della Torre should have been this “adversary.”

Only a very small selection from the mass of anatomical drawings left by Leonardo have been published here in facsimile, but to form any adequate idea of their scientific

**XIV. Anatomy, Zoology and Physiology.**
merit they should be compared with the coarse and inadequate figures given in the published books of the early part of the XVI. century.

William Hunter, the great surgeon—a competent judge—who had an opportunity in the time of George III. of seeing the originals in the King's Library, has thus recorded his opinion: "I expected to see little more than such designs in Anatomy as might be useful to a painter in his own profession. But I saw, and indeed with astonishment, that Leonardo had been a general and deep student. When I consider what pains he has taken upon every part of the body, the superiority of his universal genius, his particular excellence in mechanics and hydraulics, and the attention with which such a man would examine and see objects which he has to draw, I am fully persuaded that Leonardo was the best Anatomist, at that time, in the world . . . Leonardo was certainly the first man, we know of, who introduced the practice of making anatomical drawings" (Two introductory letters. London 1784, pages 37 and 39).

The illustrious German Naturalist Johan Friedrich Blumenbach esteemed them no less highly; he was one of the privileged few who, after Hunter, had the chance of seeing these Manuscripts. He writes: Der Scharfblick dieses grossen Forschers und Darstellers der Natur hat schon auf Dinge geachtet, die noch Jahrhunderte nachher unbemerkt geblieben sind" (see Blumenbach's medicinische Bibliothek, Vol. 3. St. 4, 1795, page 728).

These opinions were founded on the drawings alone. Up to the present day hardly anything has been made known of the text, and, for the reasons I have given, it is my intention to reproduce here no more than a selection of extracts which I have made from the originals at Windsor Castle and elsewhere. In the Bibliography of the Manuscripts, at the end of this volume a short review is given of the valuable contents of these Anatomical note books which are at present almost all in the possession of her Majesty the Queen of England. It is, I believe, possible to assign the date with approximate accuracy to almost all the fragments, and I am thus led to conclude that the greater part of Leonardo's anatomical investigations were carried out after the death of della Torre.

Merely in reading the introductory notes to his various books on Anatomy which are here printed it is impossible to resist the impression that the Master's anatomical studies bear to a very great extent the stamp of originality and independent thought.
I.

ANATOMY.

W. An. IV. 167 a

Voglio far miracoli;—abbì mè che li altri omini più quieti, e quelli che vogliono arricchirsi in ù di; vivi nel lungo tepo in grà povertà, co'dicme interviene e interverrà in etter in alli alchimisti, e cercatori di creare oro e argèto, e all'igegnieri che volgiono che l'aqua morta dia vita motiva a se medesima con cótinuo morto, e al sòmo stolito negromante e icantatore.

E tu che dici, esser meèglio il vedere fare l'anatomia, che uede tali disegni, direbìsti bene, se fusse possibile vedere tu&ste queste cose che in tal disegni si dimostrano in una sola figura, nella quale con tutto il tuò ingegno nò vedrà, e non avrai la nozitìa, se nò d'alquàte poche vene, delgiiali quali io, per averne vera e piena notitìa, ò disfatti pàriv di dieci co&ri vmani, di-

I wish to work miracles;—it may be that I shall possess less than other men of more peaceful lives, or than those who want to grow rich in a day. I may live for a long time in great poverty, as always happens, and to all eternity will happen, to alchemists, the would-be creators of gold and silver, and to engineers who would have dead water stir itself into life and perpetual motion, and to those supreme fools, the necromancer and the enchanter.

[23] And you, who say that it would be better to watch an anatomist at work than to see these drawings, you would be right; if it were possible to observe all the things which are demonstrated in such drawings in a single figure, in which you, with all your cleverness, will not see nor obtain knowledge of more than some few veins, to obtain a true and perfect knowledge of which I have dissected more than ten human bodies, destroying

796. Lines 1–59 and 60–89 are written in two parallel columns. When we here find Leonardo putting himself in the same category as the Alchemists and Necromancers, whom he elsewhere mocks at so bitterly, it is evidently meant ironically. In the same way Leonardo, in the introduction to the Books on Perspective sets himself with transparent satire on a level with other writers on the subject. Line 23 and the following seem to be directed against students of painting and young artists rather than against medical men and anatomists.
struggling every other member, considering
with minute visions some particular 47.· every part of the whole body that
have no intimation to any width 49.· then she found, without causing them to
bleed, except the insensible bleeding of the capillary veins, and as one single body
would not last so long, since it was necessary
to proceed with several bodies by
degrees, until I came to an end and had a
complete knowledge; this I repeated twice, to
learn the differences (59).

And if you should have a love for such things you might be prevented by loathing, and
if that did not prevent you, you might be
deterred by the fear of living in the night hours in
the company of those corpses, quartered and
flayed and horrible to see. And if this did not
prevent you, perhaps you might not be able to
draw so well as it is necessary for such a demon-
stration; or, if you had the skill in drawing, it
might not be combined with knowledge of per-
spective; and if it were so, you might not un-
derstand the methods of geometrical demonstration
and the method of the calculation of forces
and of the strength of the muscles; patience
also may be wanting, so that you lack per-
serverance. As to whether all these things
were found in me or not (84), the hundred
and twenty books composed by me will give
verdict Yes or No. In these I have been hinder-
dered neither by aversion nor negligence, but
simply by want of time. Farewell (89).

The order of the book.

This work must begin with the concep-
tion of man, and describe the nature of the
womb and how the foetus lives in it, up to
what stage it resides there, and in what way
it quickens into life and feeds. Also its
growth and what interval there is between

84. Leonardo frequently, and perhaps habitually,
 wrote in notebook of a very small size and only
moderately thick; in most of those which have
been preserved undivided, each contains less than
fifty leaves. Thus a considerable number of such
volumes must have gone to make up a volume of
the bulk of the 'Codex Atlanticus' which now contains
nearly 1200 detached leaves. In the passage under
consideration, which was evidently written at a late
der to his life, Leonardo speaks of his Manu-
script note-books as numbering 120; but we should
hardly be justified in concluding from this passage
that the greater part of his Manuscripts were now

797. The meaning of the word nervo varies in
different passages, being sometimes used for
muscolo (muscle).
ANATOMY.

da uno grado d’accrescimento a uno altro, e che cosa lo spinga fori del corpo della madre, e per che cagione qualche volta lui uèga fori dal uètro di sua madre inati al debito temp.

7) Poi discriuerai quali membra sieno quale che crescono poi che’l putto è nato piv che l’altre, e da la misura d’ù putto d’un anno.

9) Poi discrivi l’omo cresciuto e la femina e sue misure e nature di compassione colore e fisonomie.

11) Di poi descrivi com’egli è còposto di vene, nerii, muscoli e ossa; Questo farai nell’ultimo del libro; di poi figura in 4 storie quattro universalis casi delle omini, cioè lettizia con vari atti di ridere, e figura la cagio del riso; piatto in vari modi colla sua cagione; còtètione có vari movi eti d’uccisione, fughe, pavre, ferocità, ardimeti, nicidi e tutte cose appartenenti a simili casi; di poi figura una fatica có tirare, spegniere portare, fermare, sostenere e simili cose.

17) Di poi discriui attitudine e movimentò di poi prospettiva per l’ofitio e effetti dell’ochio e dell’udito,—dirai di mvsicha— e descrivi dell’ali sèsi.

19) Di poi discrivi la natura de’ sensi.

20) Questa figura strumetale dell’omo dimostreremo in figure, delle quali le 3 prime saranno la ramificatione delle ossa, cioè vna dinazi che 2 dimostri l’attitudine de’ siti e figure de’ ossi, la seconda sarà veduta in 2 profil e mostrerà la profondità del tutto e delle parti e loro sito; La 3 e figura ha dimostratrice delle ossa dalla parte d’irieto; Di poi faremo 3 altre figure ne’ simili aspetti colle ossa segate, nelle quali si vedranno le lor grossezze e uacuità; 3 altre figure faremo dell’ossa intere e de’n eruiri che na segono dalla nuca, e in che membra ramificano; E 3 altre de’ossa e vene e do’ve ramificano, poi 3 con muscoli e 3 con pelle, e figure proporzioni, e 3 della femina per dimostrare matrice e vene mestruali, che vanno alle poppe.

one stage of growth and another. What it is that forces it out from the body of the mother, and for what reasons it sometimes comes out of the mother’s womb before the due time.

Then I will describe which are the members, which, after the boy is born, grow more than the others, and determine the proportions of a boy of one year.

Then describe the fully grown man and woman, with their proportions, and the nature of their complexes, colour, and physiognomy.

Then how they are composed of veins, tendons, muscles and bones. This I shall do at the end of the book. Then, in four drawings, represent four universal conditions of men. That is, Mirth, with various acts of laughter, and describe the cause of laughter. Weeping in various aspects with its causes. Contention, with various acts of killing; flight, fear, ferocity, boldness, murder and every thing pertaining to such cases. Then represent Labour, with pulling, thrusting, carrying, stopping, supporting and such like things.

Further I would describe attitudes and movements. Then perspective, concerning the functions and effects of the eye; and of hearing—here I will speak of music—, and treat of the other senses.

And then describe the nature of the senses.

This mechanism of man we will demonstrate in figures; of which the three first will show the ramification of the bones; that is: first one to show their height and position and shape; the second will be seen in profile and will show the depth of the whole and of the parts, and their position. The third figure will be a demonstration of the bones of the backparts. Then I will make three other figures from the same point of view, with the bones sawn across, in which will be shown their thickness and hollowness. Three other figures of the bones complete, and of the nerves which rise from the nape of the neck, and in what limbs they ramify. And three others of the bones and veins, and where they ramify. Then three figures with the muscles and three with the skin, and their proper proportions; and three of woman, to illustrate the womb and the menstrual veins which go to the breasts.
Ordine del libro.

Questa mia figurazione del corpo vmano ti sarà dimostra nó altre’menti, che se tu auessi l’omo naturale inäti, e la ragó si è, che se tu vuoi be’ne conoscere le parti dell’omo anatomizzato, tu lo vuoi — o l’o-chio tuo — per diversi aspetti, quello coside-rando di sotto, e di sopra, e dalli lati, vol-tando6lo e cercando l’origine di ciascu mebro, e i tal modo la notomia natürale à soddisfatta alla tua notitia; Ma tu à a intèdere, che tal noti8ția nó ti lascia sad-disfatto, cóciosiaché la gràdissima confusione che 9resulta della mistione di paniculi misti co uene, arterie, nerui, corde, 10muscì, ossi, sangue, il quale tignie di se ogni parte d’un medesimo colo11re, e le vene, che di tal sangue si votano non sono conosciute per la lor dimi12uzione, e la integrità dell’ pannicoli, nel cercare le parti che dentro a 13loro s’includono, si viene a rompere, e la lor trasparètia, tinta di sangue, 14nó ti lascia conoscere le parti coperte da loro per la similitu15dine del lor colore insanguinato, e nò può avere la notitia dell’u che tu 16nó cofonda e distrugga l’altro; adunque è necessario fare più notomie, 17delle quali 3 te ne bisogna per avere piena notitia delle vene et arterie, 18disstruggedo con sōma diligentia tutto il rimanëte, e altre 3 per auere la notitia 19delli pannicoli, e 3 per le corde et muscoli et legamëti, e 3 per li ossi e carëtilagini, e 3 per la notomia delle ossa, le quali s’anno a segare et dimo-20strare, quale è buso et quale no, quale è midolloso, quale è spungno18so, et quale è grosso dal fori al dentro, et quale è sottile, et alcuno à in al21cuna parte grà sottilegze, et in alcuna è grosso, e in alcuna busa, o

798. This depicting of mine of the human body will be as clear to you as if you had the natural man before you; and the reason is that if you wish thoroughly to know the parts of man, anatomically, you—or your eye—require to see it from different aspects, considering it from below and from above and from its sides, turning it about and seeking the origin of each member; and in this way the natural anatomy is sufficient for your comprehension. But you must understand that this amount of knowledge will not continue to satisfy you; seeing the very great confusion that must result from the combination of tissues, with veins, arteries, nerves, sinews, muscles, bones, and blood which, of itself, tinges every part the same colour. And the veins, which discharge this blood, are not discerned by reason of their smallness. Moreover integrity of the tissues, in the process of the investigating the parts within them, is inevitably destroyed, and their transparent substance being tinged with blood does not allow you to recognise the parts covered by them, from the similarity of their blood-stained hue; and you cannot know everything of the one without confusing and destroying the other. Hence, some further anatomy drawings become necessary. Of which you want three to give full knowledge of the veins and arteries, everything else being destroyed with the greatest care. And three others to display the tissues; and three for the sinews and muscles and ligaments; and three for the bones and cartilages; and three for the anatomy of the bones, which have to be sawn to show which are hollow and which are not, which have marrow and which are spongy, and which are thick from the outside inwards, and which are thin. And some are extremely thin in some parts and thick in others, and in some parts hollow or filled up with bone, or full of marrow, or spongy. And all these conditions are sometimes found

2 Questa. 3 chesettu...ella...chesettu. 4 conoscere le parte...natomizzate tu lo voli oltui oltiochi. 5 asspetto. 6 ececcerchando...ciascù. 7 naturale ta saddisfatzato...chettal. 8 lascia...coesosia chella...confusione. 9 della...pañi-chali. 10 muscoli...dumedesimo. 11 elle...cognosceute. 12 notizia elle...panniculi nel cerciare le parte...al. 13 sincludano...si neghino...ella...trasparëtia. 14 lascia cognossescere le parte [che son sotto a] coperte dalloro per almiñata. 15 poi...chettal. 16 desstruggedo...notomie. 17 desstruggedo...soma. 18 pannichili...musccoli elegamëti e 3 et 3...e [I] 3 per la notomia...assegare et dimos. 21 quale he spungno18 su. 22 equa le he...esottile...innal. 23 chuna...sottilegze...alchuna...alchuna. 24 ossaspugnosa et chosì...saran. 25 numedesimo. 26 essau. 28 as-
ANATOMY.

piena 44 d'osso, o midolloso, o spugnosa; e così tutte queste cose saranno alcuna volta trovatve in un medesimo osso, e alcuno osso che non a nessuna; e 3 te ne bisog-
ntra fare per la donna, nella quale è grà mis-
terio, mediante la matrice e suo feto; 47a-
dunque per il mio disegno ti fia noto ogni
parte e ogni tutto mediante la dimostrazione
30 di 3 diversi aspetti di ciascuna parte, perché
quando tu avrai veduto39to alcuni membro dalla
diretta parte dinanzi con qualche neruo, corda, o
vena che nasca dalla opposita parte, ti fia
dimostrato il medesimo membro volto per lato
31o diretto; non altreméti che se tu avessi
in mano il medesimo membro e andasti lo
evotato di parte in parte insino a tanto
che tu avessi piena notizia di quell30lo che
tu desideri sapere, e così similmente ti fia
posto inanti in tre 34 di dimostrazione di
ciascun membro per diversi aspetti in modo che
ri resterai con152era e piena notizia di quello
che tu vuoi sapere della figura dell'omo.

36 Adunque qui con 12 figure intere ti
sarà mostrata la cosmo grafia del minor
37 modo col medesimo ordine che inizi a
me fu fatto da Tolomeo nella sua cosmo-
38 grafia, e così diuidero poi quelle in
mèbra, come lui diuise il tutto in provincie;
39 e poi dirò l'usitio delle parti per
ciascun verso, mettedoti in dalle ochi la
notitia 40 di tutta la figura e valutudine del-
lo uomo inquàto a moto locale mediante le
sue parti, 41 E così piacessi al nostro autore
che io potessi dimostrare la natura dei
omini e lo42o costumi nel modo che io
descrivo la sua figura.

43 E ricordati che la notomia delle ner-
ui non ti darà la situazione della loro rami-
ficazione, nè in quali muscoli essi si rami-
ficano mediante li corpi disfatti in acqua
45 correttè, e in acqua di calcina, perché,
ancorchè ti rimàga la origine de'lor nas-
schimenti 46 senza tale acqua come coll' ac-
qua, le ramificazioni loro pel corso del-
lo acqua si 47 vengono a vire, non altreméti
che si fascia il lino o canapa pettinata per
filare, 48 tutto in vn fascio in modo che in-
possibile è a ritrovare in quali muscoli o
e quale 49 o quate ramificazioni li neru
s'infondino ne predetti muscoli.

in one and the same bone, and in some
bones none of them. And three you must
have for the woman, in which there is
much that is mysterious by reason of the
womb and the foetus. Therefore by my
drawings every part will be known to you,
and all by means of demonstrations from
eight different points of view of each part;
for when you have seen a limb from the
front, with any muscles, sinews, or veins
which take their rise from the opposite side,
the same limb will be shown to you in a
side view or from behind, exactly as if you
had that same limb in your hand and were
turning it from side to side until you
had acquired a full comprehension of all
you wished to know. In the same way there
will be put before you three or four demon-
strations of each limb, from various points
of view, so that you will be left with a true
and complete knowledge of all you wish to
learn of the human figure[35].

Thus, in twelve entire figures, you will
have set before you the cosmo'graphy of this
lesser world on the same plan as, before
me, was adopted by Ptolemy in his cosmo-
graphy; and so I will afterwards divide them
into limbs as he divided the whole world
into provinces; then I will speak of the
function of each part in every direction, putting
before your eyes a description of the whole
form and substance of man, as regards his
movements from place to place, by means
of his different parts. And thus, if it
please our great Author, I may demonstrate
the nature of men, and their customs in the
way I describe his figure.

And remember that the anatomy of the
nerves will not give the position of their
ramifications, nor show you which muscles
they branch into, by means of bodies dis-
sected in running water or in lime water;
though indeed their origin and starting point
may be seen without such water as well as
with it. But their ramifications, when under
running water, cling and unite—just like flat
or hemp carded for spinning—all into a skein,
in a way which makes it impossible to trace
in which muscles or by what ramification the
nerves are distributed among those muscles.

798. 35. Compare Pl. CVII. The original drawing at Windsor is 287/8 × 197/8 centimètres. The
upper figures are slightly washed with Indian ink. On the back of this drawing is the text No. 1140.
ORDINE DI NOTOMIA.

1 Fa prima l’ossa come dire le braccia, e poni il motore dalla spalla al 3° gomito per tutte le linie; Di poi dal gomito al braccio; Di poi dal 4° braccio alla mano e dalla mano alli diti.

5 E nel braccio porrai li motori de’ diti che s’aprono, e 6° questi nella loro di-
mostrazione porrai soli; nella 2° dimo-
strazione vestirai questi muscoli degli se-
condi motori de’ diti, 8° e così farai a
grado a grado per non confondere: ma
primo po’i sopra dell’ossa quelli mu-
scoli che con essi ossa si congiungono,
10 senza altra confusione d’altrì muscoli,
e con quelli porrai 11° li nerui e uene,
che li nutriscono, avendo prima fatto l’al-
bero delle u° e nerui sopra delle sen-
plici ossa.

W. An. IV, XXI]

Comincia la notomia alla testa e finis-
cila nella piàta del piede.

W. An. II. 596 (6)]

3° uomini finiti, 3° con ossa e nerui,
3° con ossa senplici; 4° Queste sono 12
dimostrazioni di figure 5°tere.

W. An. IV. 158 a]

Quando tu a’i finito di 2° crescere l’omo-
tu 3° farai la statua c’è tu tutte sue misure.
5 superficiali.

800. Begin the anatomy at the head and finish
at the sole of the foot.

801. 3 men complete, 3 with bones and ner-
ves, 3 with the bones only. Here we have
12 demonstrations of entire figures.

802. When you have finished building up the
man, you will make the statue with all its
superficial measurements.

802. Crescere l’omo. The meaning of this ex-
pression appears to be different here and in
the passage C.A. 1572, 468 a (see No. 526, Note 1. 2).
Here it can hardly mean anything else than
modelling, since the sculptor forms the figure by
degrees, by adding wet clay and the figure con-
sequently increases or grows. Tu farai la statua would
then mean, you must work out the figure in marble.
If this interpretation is the correct one, this pas-
sage would have no right to find a place in the
series on anatomical studies. I may say that it
was originally inserted in this connection under
the impression that di crescere should be read de-
scribere.
ANATOMY.

803.

Farai tutti li moti dell'ossa colle giunture loro dopo la dimostrazione delle prime tre figure dell'ossa, e questo si deve fare nel primo libro.

804.

You must show all the motions of the bones with their joints to follow the demonstration of the first three figures of the bones, and this should be done in the first book.

NOTE.

You will never get any thing but confusion in demonstrating the muscles and their positions, origin, and termination, unless you first make a demonstration of thin muscles after the manner of linen threads; and thus you can represent them, one over another as nature has placed them; and thus, too, you can name them according to the limb they serve; for instance the motor of the point of the great toe, of its middle bone, of its first bone, &c. And when you have the knowledge you will draw, by the side of this, the true form and size and position of each muscle. But remember to give the threads which explain the situation of the muscles in the position which corresponds to the central line of each muscle; and so these threads will demonstrate the form of the leg and their distance in a plain and clear manner.

I have removed the skin from a man who was so shrunk by illness that the muscles were worn down and remained in a state like thin membrane, in such a way that the sinews instead of merging in muscles ended in wide membrane; and where the bones were covered by the skin they had very little over their natural size.

803. 2. giunture. 3. dimostrazione. 4. ecc. 5. defare.


804. The photograph No. 41 of Grosvenor Gallery Publications: a drawing of the muscles of the foot, includes a complete facsimile of the text of this passage.
805. Which nerve causes the motion of the eye so that the motion of one eye moves the other?

Of frowning the brows, of raising the brows, of lowering the brows,—of closing the eyes, of opening the eyes,—of raising the nostrils, of opening the lips, with the teeth shut, of pouting with the lips, of smiling, of astonishment.—

Describe the beginning of man when it is caused in the womb and why an eight months child does not live. What sneezing is. What yawning is. Falling sickness, spasms, paralysis, shivering with cold, sweating, fatigue, hunger, sleepiness, thirst, lust.

Of the nerve which is the cause of movement from the shoulder to the elbow, of the movement from the elbow to the hand, from the joint of the hand to the springing of the fingers. From the springing of the fingers to the middle joints, and from the middle joints to the last.

Of the nerve which causes the movement of the thigh, and from the knee to the foot, and from the joint of the foot to the toes, and then to the middle of the toes and of the rotary motion of the leg.

806. Which nerves or sinews of the hand are those which close and part the fingers and toes latterly?

807. Remove by degrees all the parts of the front of a man in making your dissection, till you come to the bones. Description of the parts of the bust and of their motions.

808. Give the anatomy of the leg up to the hip, in all views and in every action and in

808. A straightened leg in profile is sketched by the side of this text.
ANATOMY.

W. A. II. 754]

Farai regola e misura di ciascun muscolo, e renderai ragione di tutti li loro viti, e in che modo s'adoperano e che li muove ecc.

Farai prima la spina del dosso, di poi va vestendo a gradi l'un sopra dell'altro di ciascù di questi muscoli, e ponì li nervi all'arterie e vene a ciascun muscolo per se; e oltre a di questo nota a quàsti spondìli si congiungìano; e che intestini sono loro a riscroto e che ossì e altri strumèti organìnic ecc.

Le parti più alte de' magri son più alte nelli mu'scioli, e similìmente ne' grassì; Ma la differètìa, che è dalla figura de'muscoli che 'anno li grossi a rispetto di delì muscoli, sarà qui di sotto descritta.

W. An IV. 7 (A. A)]

Descriui quali muscoli si perdono nello ingrassare, e nel dimaggrìre quali muscoli si scoperono.

È nota che quel loco dell'ala superfìtie del grasso che sarà più coacutata, quàdo si disgrassà fìano più elevato.

Dove li muscoli si separano l'ù dal-l'altro, farai pi'roffìli, e dove s'apìcìano insieme . . .

W. 239 (= W. L. 139)]

DE FIGURA VMANA.

Qual parte è quella nell'omo che nel suo ingrassìre mai cresce carne?

Quale è quella parte che nel dimagrìre dell'omo mai nò dimagra con dimagratiò troppo sèssibile? Infra le parti che ingrassano qual è quella che più ingrassa?

809. Make the rule and give the measurement of each muscle, and give the reasons of all their functions, and in which way they work and what makes them work &c.

[4] First draw the spine of the back; then clothe it by degrees, one after the other, with each of its muscles and put in the nerves and arteries and veins to each muscle by itself; and besides these note the vertebre to which they are attached; which of the intestines come in contact with them; and which bones and other organs &c.

The most prominent parts of lean people are most prominent in the muscular, and equally so in fat persons. But concerning the difference in the forms of the muscles in fat persons as compared with muscular persons, it shall be described below.

810. Describe which muscles disappear in growing fat, and which become visible in growing lean.

And observe that that part which on the surface of a fat person is most concave, when he grows lean becomes more prominent.

Where the muscles separate one from another you must give profiles and where they coalesce . . .

811. OF THE HUMAN FIGURE.

Which is the part in man, which, as he grows fatter, never gains flesh?

Or what part which as a man grows lean never falls away with a too perceptible diminution? And among the parts which grow fat which is that which grows fattest?

809. The two drawings given on Pl. CVIII no. 1 come between lines 3 and 4. A good and very early copy of this drawing without the written text exists in the collection of drawings belonging to Christ's College Oxford, where it is attributed to Leonardo.
Infra le parti che dimagran a qua l'è quella che si fa più magra?

Degli omini poterti in forze quali muscoli son di maggiore grossezza e più elevati?

Tu ai a figurare nella tua anatomia tutti li gradi del'osso magro della creatio dell'omo insino alla sua morte, e insino alla morte dell'osso, e qual parte d'esso prima si cosuma e qual più si coscrúa.

E similemente dall'ultima magrezza all'ultima grossezza.

Among those which grow lean which is that which grows leanest?

In very strong men which are the muscles which are thickest and most prominent?

In your anatomy you must represent all the stages of the limbs from man's creation to his death, and then till the death of the bone; and which part of him is first decayed and which is preserved the longest.

And in the same way of extreme leanness and extreme fatness.

Notomia.

3' I membri semplici sono vndici; cioè cartilagine ossi nerii vene arterie panniculi legameti e corde, cotica e carne e grasso.

Le parti del uso del capo sono 10; cioè 5 contenenti e 5 cötenute; le contenenti sono: capelli cotica carne muscolosa panniculò grosso e l'cranee le containe quende: du'ra madre pia madre ciervello diso letto ritorna la pia e dura madre che dentro a se rinchiudono il ciervello, poi la rete mirabile, poi è l'osso, fondamenté del celabro e donde nascono li nerii.

The divisions of the head are 10, viz. 5 external and 5 internal, the external are the hair, skin, muscle, fascia and the skull; the internal are the dura mater, the pia mater, [which enclose] the brain. The pia mater and the dura mater come again underneath and enclose the brain; then the rete mirabile, and the occipital bone, which supports the brain from which the nerves spring.

Del capo.

813.

a capelli
n cotica
c carne muscolosa
m panniculò grosso
5o cranee ciervello
b dura madre
d pia madre
f ciervello
10r: pia madre di sotto
l: dura madre
r: rete mirabile
s: osso fondameto.

There are eleven elementary tissues:— Cartilage, bones, nerves, veins, arteries, fascia, ligament and sinews, skin, muscle and fat.

Of the head.

The divisions of the head are 10, viz. 5 external and 5 internal, the external are the hair, skin, muscle, fascia and the skull; the internal are the dura mater, the pia mater, which encloses the brain. The pia mater and the dura mater come again underneath and enclose the brain; then the rete mirabile, and the occipital bone, which supports the brain from which the nerves spring.

S. K. M. III. 68a]
814. By the side of this text stands the pen and ink drawing reproduced on Pl. CVIII, No. 4; a skull with indications of the veins in the fleshy covering.

815. The tears come from the heart and not from the brain. Define all the parts, of which the body is composed, beginning with the skin with its outer cuticle which is often chapped by the influence of the sun.

W. An. II. 37 (814.)

Causa dell’alitare, 2 causa del moto del core, 3 causa del umoto, 4 causa del disce- dere il scibo dallo stomaco, 6 causa del votare li 7 testini;
8 Causa del moto delle 9 superfluità per le intestini; 11 Causa dello inghiottire, 12 causa dello tossire, 13 causa dello sbadigliare, 14 causa dello starnuto, 15 causa dell’adormetame 16 to di diverse membra;
17 Causa del perdere il séso 18 ad alcuni membri;
19 Causa del solletico;
20 Causa della lussuria e al 21 tre necessità del corpo, 22 causa dell’orinare, 23 e così di tutte le lotioni naturali del corpo.

W. An. III. 230 (815.)

Le lagrime vengono dal 3 core e no dal 4 ceruello.
Difinisci tutte le parti di che si có- pone il corpo, co’ inclinadosi dalla 9 cute colla sua soi 10 praveste, la qual 11 è spesso spicata 12 mediante il sole.

815. 2. vengano. 5. disfirschiente. 6. parte. 8. misciadosi. 9. cutic. 10. pravessta. 11. spicha.
ZOOLOGY AND COMPARATIVE ANATOMY.

816. **Man.** The description of man, which includes that of such creatures as are of almost the same species, as Apes, Monkeys and the like, which are many, *The Lion* and its kindred, as Panthers, *Wildcats* (?) Tigers, Leopards, Wolves, Lynxes, Spanish cats, common cats and the like. *The Horse* and its kindred, as Mule, Ass and the like, with incisor teeth above and below. *The Bull* and its allies with horns and without upperincisors as the Buffalo, *Stag Fallow Deer*, Wild Goat, Swine, Goat, wild Goats Muskdeers, Chamois, Giraffe.

817. Describe the various forms of the intestines of the human species, of apes and such like. Then, in what way the leonine species differ, and then the bovine, and finally birds; and arrange this description after the manner of a disquisition.

816. 3. *Leone*—wild cat? “Secondo alcuni, lo stesso che Leomone; e secondo altri con più certezza, lo stesso che Pantera.” FANFANI, Vocabolario page 838.
Procure the placenta of a calf when it is born and observe the form of the cotyledons, if their cotyledons are male or female.

Describe the tongue of the woodpecker and the jaw of the crocodile.

Of the flight of the 4th kind of butterflies that consume winged ants. Of the three principal positions of the wings of birds in downward flight.

Of the way in which the tail of a fish acts in propelling the fish; as in the eel, snake and leech.

Then I will discourse of the hands of each animal to show in what they vary; as in the bear, which has the ligatures of the sinews of the toes joined above the instep.

A second demonstration inserted between anatomy and [the treatise on] the living being. You will represent here for a comparison, the legs of a frog, which have a great resemblance to the legs of man, both in the bones and in the muscles. Then, in continuation, the hind legs of the hare, which are very muscular, with strong active muscles, because they are not encumbered with fat.

A sketch of a fish, swimming upwards is in the original, inserted above this text.—Compare No. 1114.

This text is written by the side of a drawing in black chalk of a nude male figure, but there is no connection between the sketch and the text.
824.

Here I make a note to demonstrate the difference there is between man and the horse and in the same way with other animals. And first I will begin with the bones, and then will go on to all the muscles which spring from the bones without tendons and end in them in the same way, and then go on to those which start with a single tendon at one end.

825.

Note on the bendings of joints and in what way the flesh grows upon them in their flexions or extensions; and of this most important study write a separate treatise: in the description of the movements of animals with four feet; among which is man, who likewise in his infancy crawls on all fours.

826.

The walking of man is always after the universal manner of walking in animals with 4 legs, inasmuch as just as they move their feet crosswise after the manner of a horse in trotting, so man moves his 4 limbs crosswise; that is, if he puts forward his right foot in walking he puts forward, with it, his left arm and vice versa, invariably.

C. A. 292 a; 888 a]

DELLO ANDARE DELL'OMO.

L'andare dell'omo è sempre a uso dell'universale andare delle animali di 4 piedi, imperocch'è siccome essi 4 movono i loro piedi in croce a vso del trotto del caiullo, così l'omo in croce si move le sue 4 · membra, cioè se caccia inizi il pi° destro per caminare, egli caccia inizi có quello il braccio sinistro, e sempre così seguita.

824. See Pl. CVIII, No. 2.
Ho trovato nella composizione del corpo vmano che, come in tutte le composizioni dell'animali, esso è di siv ottusi e grossi sentimeti; 6così è composto di strume manco incognosco e di lochi maco capaci di ricevere la uirtù de' sensi; ò veduto nella spetie leoni5na il senso dell'odorato auere parte della sustantia del celabro, e discè6dere li narici, capace ricettaculo contro al senso dello odorato, 7il quale entra infra grà numero di saccoli cartilaginosi con assai 8vie contro all'avenvimento del predetto celabro.

9Li ochi della spetie leonina ànano gran parte della lor testa per lor 10ricettacolo, e li nerui ottici immediate conguignersi col celabro; il che al11li omini si uede in contrario, perché le casse della ochi sono una picco12la parte del capo, e li nerui ottici sono sottili e lunghi e deboli, e per debo13le operatione si uede di loro il di, e peggio la notte, e li predetti animali 14vedono in nella notte che l giorno; 15e l segno se ne vede, perché predano di notte 16e domo il giorno come fano ancora li ucelli notturni.

II.

PHYSIOLOGY.

I have found that in the composition of the human body as compared with the bodies of animals the organs of sense are duller and coarser. Thus it is composed of less ingenious instruments, 9and of spaces less capacious for receiving the faculties of sense.

I have seen in the Lion tribe that the sense of smell is connected with part of the substance of the brain which comes down the nostrils, which form a spacious receptacle for the sense of smell, which enters by a great number of cartilaginous vesicles with several passages leading up to where the brain, as before said, comes down.

The eyes in the Lion tribe have a large part of the head for their sockets and the optic nerves communicate at once with the brain; but the contrary is to be seen in man, for the sockets of the eyes are but a small part of the head, and the optic nerves are very fine and long and weak, and by the weakness of their action we see by day but badly at night, while these animals can see as well at night as by day. The proof that they can see is that they prowl for prey at night and sleep by day, as nocturnal birds do also.

827. Comparative study of the organs of sense in men and animals.
PHYSIOLOGY.

828.

Every object we see will appear larger at midnight than at midday, and larger in the morning than at midday.

This happens because the pupil of the eye is much smaller at midday than at any other time.

In proportion as the eye or the pupil of the owl is larger in proportion to the animal than that of man, so much the more light it can see at night than man can; hence at midday it can see nothing if its pupil does not diminish; and, in the same way, at night things look larger to it than by day.

G. 41a

DELL'I OCI DELL' Animali.

1 Li ochi di tutti li animali àno le loro papille, le quali per loro medesime crescono e diminuiscono secondo il maggiore e minore lume del sole o altro chiarore; Ma nelli uccelli fa maggior differenia, e massima nelli notturni, come gufi, barbagianni, e all'ochi che son di specie di civetta; a questi cresce la popilla in modo che quasi occupa tutt'uno l'occhio, e diminuisce insino alla gran dezza d'un gra di miglio e sempre osser va figura circulare; Ma la specie de lionina come pàtere, pardi, leóze, tigiri, lupi, cieruieri, gatti di Spagna e altri similii diminuiscono la lucie dal perfetto circulo alla figura biagolare, cioè questa è come si dimostra in margin; Ma l'uomo per avere più debole vista che nesun altro animal, meno è offeso dalla superchia luce, e m'è s'avmeta nelli lochel tenebrosi; ma all'ocielli li detti animali notturni — al gufo vociello cornuto, il quale è il massimo nella specie dell' uccelli notturni: a questo s'au meta tanto la uirtù, che nel minimo

829. OF THE EYES IN ANIMALS.

The eyes of all animals have their pupils adapted to diurnal and diminish of their own accord in proportion to the greater or less light of the sun or other luminaries. But in birds the variation is much greater; and particularly in nocturnal birds, such as horned owls, and in the eyes of one species of owl; in these the pupil dilates in such a way as to occupy nearly the whole eye, or diminishes to the size of a grain of millet, and always preserves the circular form. But in the Lion tribe, as panthers, pards, ounces, tigers, lynxes, Spanish cats and other similar animals the pupil diminishes from the perfect circle to the figure of a pointed oval such as is shown in the margin. But man having a weaker sight than any other animal is less hurt by a very strong light and his pupil increases but little in dark places; but in the eyes of these nocturnal animals, the horned owl—a bird which is the largest of all nocturnal birds—the power of vision increases so much that in the faintest nocturnal light (which we call darkness) it sees

829. Compare No. 24, lines 8 and fol.
PHYSIOLOGY.

with much more distinctness than we do in the splendour of noon day, at which time these birds remain hidden in dark holes; or if indeed they are compelled to come out into the open air lighted up by the sun, they contract their pupils so much that their power of sight diminishes together with the quantity of light admitted.

Study the anatomy of various eyes and see which are the muscles which open and close the said pupils of the eyes of animals.

Br. M. 614

a b n is the membrane which closes the eye from below, upwards, with an opaque film, c n b encloses the eye in front and behind with a transparent membrane.

It closes from below, upwards, because it [the eye] comes downwards.

When the eye of a bird closes with its two lids, the first to close is the nictitating membrane which closes from the lacrimal duct over to the outer corner of the eye; and the outer lid closes from below upwards, and these two intersecting motions begin first from the lacrimal duct, because we have already seen that in front and below birds are protected and use only the upper portion of the eye from fear of birds of prey which come down from above and behind; and they uncover first the membrane from the outer corner, because if the enemy comes from behind, they have the power of escaping to the front; and again the muscle called the nictitating membrane is transparent, because, if the eye had not such a screen, they could not keep it open against the wind which strikes against the eye in the rush of their rapid flight. And the pupil of the eye dilates and contracts as it sees a less or greater light, that is to say intense brilliancy.

L'ochio che di notte s'interporrà in fra l' lume e l'ochio della gatta, vedrà esso occhio parere di foco.

If at night your eye is placed between the light and the eye of a cat, it will see the eye look like fire.

830.

a b n è il coperchio di sotto che chiude l'occhio di sotto in sù con coperchio oppaco. c n b chiude l' occhio dinanzi direitò con coperchio transparetè.

Chiudesi sotto in sù perché da alto discèdè.

Quando l' occhio dell' ucelli si chiude colle sue due coprimente, esso chiusude prima la secondina la qual chiude dal lagrimateo alla costra d' esso occhio, e la prima si chiede da basso in alto, e quei due moti interseghati occupano in prima dal lacrimateo, perchè già abbiamo veduto che dinanzi e di sotto si sono assicurati, e sol serba nò la parte di sopra per li pericolli dell' ucelli rapiaci che discendono di sopra e direitò; e scoprano prima il pannicolo di verso la coda, perchè se l' nemico viene direitò, egli a la como dittà del fugire innazi, e ancora tiene il pannicolo detto secondino e trasparente, perchè se non avesse tale scudo, e nò potrebbe tener li ochi aperti còtro al vèto che percuote l' occhio nel furore del suo veloce volare; E la sua popilla crescie e discrescie nel udere minore o maggiore lume cioè splèdore.
La lingua è trouata auere 24 muscoli li quali rispondono allori sei muscoli di che è composta la qualità della lingua che si move per la bocca. 

E quando a o u si pronüttiano con intelligibile e spedita pronu-tia, egli è necessario che nella continua lor pronuüttazione senza intermissioni di tépo, che l’apritura de’ labri si uadi al cótinuo restri-
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nendo, cioè larghi sarano nel dire a, più stretti nel dire o, e assai pív stretti nel prüonun-tiare i.
Perché nell'omini attēpata il vedere è meglio discosto.

Il vedere è meglio discosto che da press'so in quelli omini, li quali s'attēpano, perché vna medesima cosa māda di se minore impressione nell'oc'chio, essendo remota che quādo li è vīcina.

Il sēso comune è quello che givdica le cose a l'ui date dal' altri seni; li antich'i speculatori ano còccoli che quella parte del giudizio che è data all'omo, sia causata da vno strumēto, al quale referiscono li altri 5 mediate la ipressiva, e a detto strumēto ano posto nome sēso comvne, e dicono questo sēso essere situato in mezzo il capo jfà la ipressiva e la memoria; E questo nome di sēso comvne dicono solamēto, perché è the air if they are not illuminated[8]; and the eye being thus constituted cannot receive that from the air, which the air does not possess, although it touches its surface. If you choose to say that there are many animals that prey at night, I answer that when the little light which suffices the nature of their eyes is wanting, they direct themselves by their strong sense of hearing and of smell, which are not impeded by the darkness, and in which they are very far superior to man. If you make a cat leap, by daylight, among a quantity of jars and crows you will see them remain unbroken, but if you do the same at night, many will be broken. Night birds do not fly about unless the moon shines full or in part; rather do they feed between sun-down and the total darkness of the night.

No body can be apprehended without light and shade, and light and shade are caused by light.

835.

Why men advanced in age see better at a distance.

Sight is better from a distance than near in those men who are advancing in age, because the same object transmits a smaller impression of itself to the eye when it is distant than when it is near.

The Common Sense, is that which judges of things offered to it by the other senses. The ancient speculators have concluded that that part of man which constitutes his judgment is caused by a central organ to which the other five senses refer everything by means of impressibility; and to this centre they have given the name Common Sense. And they say that this Sense is situated in the centre of the head between Sensation and Memory. And this name of Common Sense
PHYSIOLOGY.

A Common Sense is acted upon by means of Sensation which is placed as a medium between it and the senses. Sensation is actuated by means of the images of things presented to it by the external instruments, that is to say the senses which are the medium between external things and Sensation. In the same way the senses are acted upon by objects. Surrounding things transmit their images to the senses and the senses transfer them to the Sensation. Sensation sends them to the Common Sense, and by it they are stamped upon the memory and are there more or less retained according to the importance or force of the impression. That sense is most rapid in its function which is nearest to the sensitive medium and the eye, being the highest is the chief of the others. Of this then only we will speak, and the others we will leave in order not to make our matter too long. Experience tells us that the eye apprehends ten different natures of things, that is: Light and Darkness, one being the cause of the perception of the nine others, and the other its absence:—Colour and substance, form and place, distance and nearness, motion and stillness.

Though human ingenuity may make various inventions which, by the help of various machines answering the same end, it will never devise any inventions more beautiful, nor more simple, nor more to the purpose than Nature does; because in her inventions nothing is wanting, and nothing is superfluous, and she needs no counterpoise when she makes limbs proper for motion in the bodies of animals. But she puts into them the soul of the body, which forms them that is the soul of the mother which first constructs in the womb the form of the man and in due time awakens the form to be inhabited. And this at first lies dormant

is given to it solely because it is the common judge of all the other five senses i.e. Seeing, Hearing, Touch, Taste and Smell.

Their images are presented to the external instruments, that is to say the senses which are the medium between external things and Sensation. In the same way the senses are acted upon by objects. Surrounding things transmit their images to the senses and the senses transfer them to the Sensation. Sensation sends them to the Common Sense, and by it they are stamped upon the memory and are there more or less retained according to the importance or force of the impression. That sense is most rapid in its function which is nearest to the sensitive medium and the eye, being the highest is the chief of the others. Of this then only we will speak, and the others we will leave in order not to make our matter too long. Experience tells us that the eye apprehends ten different natures of things, that is: Light and Darkness, one being the cause of the perception of the nine others, and the other its absence:—Colour and substance, form and place, distance and nearness, motion and stillness.

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PHYSIOLOGY.

HOW THE FIVE SENSES ARE THE MINISTERS OF THE SOUL.

The soul seems to reside in the judgment, and the judgment would seem to be seated in that part where all the senses meet; and this is called the Common Sense and is not all-pervading throughout the body, as many have thought. Rather is it entirely in one part. Because, if it were all-pervading and the same in every part, there would have been no need to make the instruments of the senses meet in one centre and in one single spot; on the contrary it would have sufficed that the eye should fulfill the function of its sensation on its surface only, and not transmit the image of the things seen, to the sense, by means of the optic organs, so that the soul—for the reason given above—may perceive it in the surface of the eye. In the same way as to the sense of hearing, it would have sufficed if the voice had mere-

838. 57. lettere incoronate. By this term Leonardo probably understands not the Bible only, but the works of the early Fathers, and all the books recognised as sacred by the Roman Church.
PHYSIOLOGY.

[839.] 839. The peculiar use of the words nervo, muscolo, corda, senso comune, which are here literally rendered by nerve, muscle cord or tendon and Common Sense may be understood by reference to lines 27 and 28.

W. An. II. 203 a (B.1)

COME I NERI OPERANO QUALCHE VOLTA PER LORO SANZA COMANDAMETO DELLI ALTRI OFFITIALI DELLEFun. 839

...chiaramente apparecchi imperchi tu vedrai movere a piè paralieti e a

mvnc. 12. essoboca, abbia dischierere al chomone givdito [jiodor]. 13. Schora, chostretto a chichorrere. 14. jedito [il] gusto el tutto. 15. Il tutto nò passa elli per le chorde... chorde si unno [di]. 16. spregiudo chìon... ramiadizione innella... circhiade le chorporre. 18. [s nervi] "le corde... portano...ii sentimento... chommandameto essentimento. 19. chorde... muscoli. 20. auclie... quelli obediscano [cholosco] etale. 21. chollo schifare ipero chef... rachorta... lungaeta etteri. 22. tessano, particelle. 23. chagione... chòtauto. 24. choi... mwcicoli... servno... chorde chome chòdottiere... elle chorde. 25. seruano... chomvne chome i chòdotier al chapitano el sèom chomne serve. 26. [adunque il nervo... serve... al muscolo el mwcicol]. 27. muscholo el muscolo... chorde. 28. ella chorde... chomvne... chomvne essedda... ella... essua. 29. amnsuffone... ella impresse essa referadaria [e il chore essuou]. 30. chome... de all... tèmecha. 31. tèmecha... apare. 32. ellorbo.

839. 1. chome. 2. chommandameto. 3. aparriscie ipero... chetut vedera... fredollet. 4. chome. 5. chon... essi... benbi.
Physiology.

There are four powers: memory and intellect, desire and covetousness. The two first are mental and the others sensual. The three senses: sight, hearing and smell cannot well be prevented; touch and taste not at all. Smell is connected with taste in dogs and other glutinous animals.

W. A. IV. 1514]

Io scopro alli omni l'origine della prima o forse secoda cagione del loro essere.

W. Am. II. 436 (8)]

Lussuria è causa della generazione.

How the body of animals is constantly dying and being renewed.

Il corpo di qualunque cosa la qual si nutrica, al continuo muore e al continuo nasce, perché entrare non può nutrimeto se non in quelli lochi, dove il passato nutrimeto è spirato, e s'elli è spiratoelli più nò a vita, e se tu nò li rendi nutrimeto equale al nutrimeto partito, allora and their trembling limbs, as their head and hands quake without leave from their soul and their soul with all its power cannot prevent their members from trembling. The same thing happens in falling sickness, or in parts that have been cut off, as in the tails of lizards. The idea or imagination is the helm and guiding-rein of the senses, because the thing conceived of moves the sense. Pre-imagining, is imagining the things that are to be. Post-imagining, is imagining the things that are past.

840. The law of nutrition and the support of life (843-846).

W. 14.

4 sono le potentie: memoria e intelletto, lascibili e cocupiscibili, le 2 prime son ragionevoli e l'altre sensuali; 1 3 sensi vedere, udire, odorato sono di poca probitio, tato e gusto; il'odorato mena con seco il gusto nel cane e altri golosi animali.

W. 841. I reveal to men the origin of the first, or perhaps second cause of their existence.

Lust is the cause of generation.

Appetite is the support of life. Fear or timidity is the prolongation of life and preservation of its instruments.

W. 842.

Lussuria è causa della generazione.

843. How the body of animals is constantly dying and being renewed.

Il corpo di qualunque cosa la qual si nutrica, al continuo muore e al continuo nasce, perché entrare non può nutrimeto se non in quelli lochi, dove il passato nutrimeto è spirato, e s'elli è spirato.elli più nò a vita, e se tu nò li rendi nutrimeto equale al nutrimeto partito, allora and their trembling limbs, as their head and hands quake without leave from their soul and their soul with all its power cannot prevent their members from trembling. The same thing happens in falling sickness, or in parts that have been cut off, as in the tails of lizards. The idea or imagination is the helm and guiding-rein of the senses, because the thing conceived of moves the sense. Pre-imagining, is imagining the things that are to be. Post-imagining, is imagining the things that are past.

W. 843.

Come il corpo dell'animale al continuo more e rinascie.

Trie mino questo medessi. 6. schade... mal chaducho... midir... chome chode. 7. e 'elma... impero chella chessa. 9. preimaginare... chose... chessaranno... choose.

840. 1. lascibili e chescupiscibili. 2. ellalire. 3. de [a] 3 sensi... vidire... pocha... tato. 4. chelose... chane... golos.

841. 1. schopro... 2. della loro "prima offorse secodo" seconda chagione di loro.

842. 1-7 R. 1. chausa. 6. delo e salumeto.

843. 1. chhorpo... 2. rinascie. 3. chosa... nutrich... chon. 4. chontinuoo rinascie. 5. sennon. 6. easpirato esselli he... non... 7. [trusscic] vita esecetu. 8. mancha. 9. valudine essetulli... tuc. 10. ressta desnucta Massettu. 11. desvol. II.
la vita manca di sua valetudine, e se tu li levi esso nutrimento, la uita in tott'eta resta distrutta: Ma se tu ne redi tanto quanto si intre distrugge alla giornata, allora tanto rinasci di uita, quanto se ne consuma a similitudine del lume della candela col nutrimeto datol dal'omone di essa candela, il quale lume ancora lui al conintueno che collumano piu sensibile socorso restaura di sotto, guato di sopra se ne consuma morendo, e di splendi'da lucie si converte morendo in tenebroso fumo, la qual 8 morte e continua, siccome e cotinuo esso fumo, e la cointunuita di tal fumo e equale al cotinuto nutrimeto, e in istante tutto il lume e morto e tutto rigenerato insieme col moto del nutrimento suo.

W. An. III. 2410

844. Come tu a'descritto il r del'ani
di besticche essendo tu la maggiore perch non li ai uccisi, acci che possino poi darti li lor figlioli in benifiicio della tua gola colla quale tu ai tattato farli sepultura di tutti li animali, e più oltre direi, se' il dire il uero mi fusse integramente lecito: Ma non usciamo delle cose vmane, dicendo vna somma scelerata'gine, la qual non accade nelli animali miti, 8iperché in quelli nò si trovano animali che magina della loro 9 specie sc non per macaceto di celatro (in poche infra loro, e de'manidri come infra li omini, b'che nò sieno in tato numero); e questo non accade se nò nell'li

844. We are led to believe that Leonardo himself was a vegetarian from the following interesting passage in the first of Andrea Corsali's letters to Giuliano de'Medici: Alcuni gentili chiamati Guazzaroti non si cibano di cosa alcuna che tenga sangue, nò fra essi loro, consentono che si noccia ad alcuna cosa animata, come il revento Leonardo da Vinci.

5—18. Amerigo Vespucci, with whom Leonardo was personally acquainted, writes in his second letter to Pietro Soderini, about the inhabitants of the Canary Islands after having stayed there in 1503: "Hanno una scelte liberta di viure; ... si cibano di carne humana, di maniera che il padre magia il figliuolo, et all'incontro il figliuolo il padre secondo che a caso e per sorte avviene. Io viddi un certo uomo scelleratissimo che si vantaua, e si teneva a non piccola gloria di haver mangiato piu di trenta humani. Viddi anche una certa città, nella quale io dimorai forse ventissette giorno, dove le carni humane, huamendole salute, eran affigate alli traui, e si come noi alli traui di cucina.
PHYSIOLOGY.

animals rapaci, come nella spetie leonina 11 e pardi, pardere, cervieri, gatte e simili, 11 li quali alcuna volta si mägiano i figlioli; ma tu oltre 12 alli figlioli ti mägi il padre, madre, fratelli e amici, e nö 12 ti basta questo, chè tu vai a caccia per le altrui isole, pi- 17 glando li altri omini e questi mezzo nudi il nébro e li testi 13 cui fai ingrassare e te li cacci giù per la tua gola; or 19 non pro- duce la natura tàti semplici, che tu ti possa satia 20 re? e se nö ti cötenti de' semplici, non puoi tu có la misti 21 di quelli fare infiniti composti, come scrisse il Platina 22 e li altri autori di gola? 4

845. Facciamo nostra vita coll' altrui morte. 3

In nella cosa morta rimä vitä dissensata, la quale ricäogiuta alli stomachi de' vivi 5 ripiglia uita säsitiva e 6 itellettiva.

846. La natura pare qui in molti 2 o di molti animali stata più pre' sto crudele matrignia che ma'dre, e d'alcuni nö matrignia 5 ma pietosa madre.

847. L'omo e li animali sono propi träsito e condotto di cibo, sepoltura - d'animali - albergo de' morti, facciédo a se vna 2 del- l'altrui morte guaina di corruzione!

Our life is made by the death of others.

In dead matter insensible life remains, which, reunited to the stomachs of living beings, resumes life, both sensual and intellectual.

Man and animals are really the passage and the conduit of food, the sepulchre of animals and resting place of the dead, one causing the death of the other, making themselves the covering for the corruption of other dead [bodies].

chate essimili. 14. mägiano i figlioli, watta. 15. figlioli. 16. bassa . . . chaccia. 17. mezzudi. 18. etelli caccigu. 19. chet-
tusti. 20. esse nö . . . pol. 22. elli . . . alteri.

845. 1—7 R. 1. faciano nostra . . . choll. 3. jnesta. 4. disensata. 5. stomaci. 7. itellettiva.

846. 1. immoti. 5. pianta.


appačchiamo le carni de' ciaghi coche al sole o al fiomo, et massimamente saliscke, et altre simil cose: ansi si ma- ranuigiamo grädenite che noi non mägiammo della carne de' nemici, le quali dicono mäsoore appetito, et essere di marauigiamo sapore, et le lodano come ciòi saci et deliciati (Lettere due di Amerigo Vespucci Fiorentino drizate al

magnifico Pietro Soderini, Gonfaloniere della ecclesia Re-
pubblica di Firenze; various edition). 21. Come scrisse il Platina (Bartolomeo Sacchi, a famous humanist). The Italian edition of his treatise De arte coquinaria, was published under the title De la homestra volupfate, e volatudine, Venezia 1487.
848.

La morte ne' vecchi sanza febre si causa dalle sue vene che òa dalla miza alla porta del fegato e s'ingrossan tanto di pelle ch'elle si richiudono e non danno più transito al sangue che li nutrice.

Il continuo corso che fa il sangue per le sue vene fa che tali vene s'ingrossano e fanno si callose in tal modo che al fine si riserrano e proibiscono il corso al sangue.

Leic. 2146

Raggirasi l'acque con còtivno moto dal'infine profondità del mari alle altissime sohità del molti, non osseruando la natura delle cose gruai, e in questo caso fanno come il sangue delli animali che sempre si move dal mare del core e provocà alla sohità delle loro teste, e che quivi ròpósì le vene, come si uede una vena rota nel naso, che tutto il sangue da basso si leua alla altezza della rota vena; — Quando l'acqua esce dalla rota vena della terra essa ossera la natura delle altre cose piv gravi che l'aria, onde sempre cerca i lochi bassi.

W. A. III. 226 (\textit{M})

Come il sangue che torna indirieto, quiò il core si riapre, non è quel che riserra le porte del core.

Bir. M. 147 8

Fattevi dare la difinitione e riparo del caso secondo . . . . e vedrete che omini son eletti per medici di mala-tiee da loro non conosciute.

849. From this passage it is quite plain that Leonardo had not merely a general suspicion of the circulation of the blood but a very clear conception of it. Leonardo's studies on the muscles of the heart are to be found in the MS. W. An. III. but no information about them has hitherto been made public. The limits of my plan in this work exclude all purely anatomical writings, therefore only a very brief excerpt from this note book can be given here. \textbf{William Harvey} (born 1578 and Professor of Anatomy at Cambridge from 1615) is always considered to have been the discoverer of the circulation of the blood. He studied medicine at Padua in 1598, and in 1628 brought out his memorable and important work: \textit{De motu cordis et sanguinis}.

Death in old men, when not from fever, is caused by the veins which go from the spleen to the valve of the liver, and which thicken so much in the walls that they become closed up and leave no passage for the blood that nourishes it.

[6] The incessant current of the blood through the veins makes these veins thicken and become callous, so that at last they close up and prevent the passage of the blood.

849. The waters return with constant motion from the lowest depths of the sea to the utmost height of the mountains, not obeying the nature of heavier bodies; and in this they resemble the blood of animated beings which always moves from the sea of the heart and flows towards the top of the head; and here it may burst a vein, as may be seen when a vein bursts in the nose; all the blood rises from below to the level of the burst vein. When the water rushes out from the burst vein in the earth, it obeys the law of other bodies that are heavier than the air since it always seeks low places.

850. That the blood which returns when the heart opens again is not the same as that which closes the valves of the heart.

851. Make them give you the definition and remedies for the case and you will see that men are selected to be doctors for diseases they do not know.
852. A remedy for scratches taught me by the Herald to the King of France. 4 ounces of virgin wax, 4 ounces of colophony, 2 ounces of incense. Keep each thing separate; and melt the wax, and then put in the incense and then the colophony, make a mixture of it and put it on the sore place.

853. Medicine is the restoration of discordant elements; sickness is the discord of the elements infused into the living body.

854. Those who are annoyed by sickness at sea should drink extract of wormwood.

855. To keep in health, this rule is wise: Eat only when you want and relish food. Chew thoroughly that it may do you good. Have it well cooked, unspiced and undisguised. He who takes medicine is ill advised.

856. I teach you to preserve your health; and in this you will succeed better in proportion as you shun physicians, because their medicines are the work of alchemists.
XV.

Astronomy.

Ever since the publication by Venturi in 1797 and Libri in 1840 of some few passages of Leonardo's astronomical notes, scientific astronomers have frequently expressed the opinion, that they must have been based on very important discoveries, and that the great painter also deserved a conspicuous place in the history of this science. In the passages here printed, a connected view is given of his astronomical studies as they lie scattered through the manuscripts, which have come down to us. Unlike his other purely scientific labours, Leonardo devotes here a good deal of attention to the opinions of the ancients, though he does not follow the practice universal in his day of relying on them as authorities; he only quotes them, as we shall see, in order to refute their arguments. His researches throughout have the stamp of independent thought. There is nothing in these writings to lead us to suppose that they were merely an epitome of the general learning common to the astronomers of the period. As early as in the XIVth century there were chairs of astronomy in the universities of Padua and Bologna, but so late as during the entire XVIIth century Astronomy and Astrology were still closely allied.

It is impossible now to decide whether Leonardo, when living in Florence, became acquainted in his youth with the doctrines of Paolo Toscanelli the great astronomer and mathematician (died 1482), of whose influence and teaching but little is now known, beyond the fact that he advised and encouraged Columbus to carry out his project of sailing round the world. His name is nowhere mentioned by Leonardo, and from the dates of the manuscripts from which the texts on astronomy are taken, it seems highly probable that Leonardo devoted his attention to astronomical studies less in his youth than in his later years. It was evidently his purpose to treat of Astronomy in a connected form and in a separate work (see the beginning of Nos. 866 and 892; compare also No. 1167). It is quite in accordance with his general scientific thoroughness that he should propose to write a special treatise on Optics as an introduction to Astronomy (see Nos. 867 and 877). Some of the chapters belonging to this Section bear the title
"Prospettiva" (see Nos. 867 and 870), this being the term universally applied at the time to Optics as well as Perspective (see Vol. I, p. 10, note to No. 13, l. 10).

At the beginning of the XVIth century the Ptolemaic theory of the universe was still universally accepted as the true one, and Leonardo conceives of the earth as fixed, with the moon and sun revolving round it, as they are represented in the diagram to No. 897. He does not go into any theory of the motions of the planets; with regard to these and the fixed stars he only investigates the phenomena of their luminosity. The spherical form of the earth he takes for granted as an axiom from the first, and he anticipates Newton by pointing out the universality of Gravitation not merely in the earth, but even in the moon. Although his acute research into the nature of the moon's light and the spots on the moon did not bring to light many results of lasting importance beyond making it evident that they were a refutation of the errors of his contemporaries, they contain various explanations of facts which modern science need not modify in any essential point, and discoveries which history has hitherto assigned to a very much later date.

The ingenious theory by which he tries to explain the nature of what is known as earth shine, the reflection of the sun's rays by the earth towards the moon, saying that it is a peculiar refraction, originating in the innumerable curved surfaces of the waves of the sea may be regarded as absurd; but it must not be forgotten that he had no means of detecting the fundamental error on which he based it, namely: the assumption that the moon was at a relatively short distance from the earth. So long as the motion of the earth round the sun remained unknown, it was of course impossible to form any estimate of the moon's distance from the earth by a calculation of its parallax.

Before the discovery of the telescope accurate astronomical observations were only possible to a very limited extent. It would appear however from certain passages in the notes here printed for the first time, that Leonardo was in a position to study the spots in the moon more closely than he could have done with the unaided eye. So far as can be gathered from the mysterious language in which the description of his instrument is wrapped, he made use of magnifying glasses; these do not however seem to have been constructed like a telescope—telescopes were first made about 1600. As LIBRI pointed out (Histoire des Sciences mathématiques III, 101) Fracastoro of Verona (1473—1553) succeeded in magnifying the moon's face by an arrangement of lenses (compare No. 910, note), and this gives probability to Leonardo's invention at a not much earlier date.
I.

THE EARTH AS A PLANET.

857.

The equator, the line of the horizon, the earth's place in the universe.

858.

These lines are those which in all their parts are equidistant from the centre of the globe.

859.

The earth is not in the centre of the Sun's orbit nor at the centre of the universe, but in the centre of its companion elements, and united with them. And any one standing on the moon, when it and the sun are both beneath us, would see this our earth and the element of water upon it just as we see the moon, and the earth would light it as it lights us.

859.

Force arises from dearth or abundance; it is the child of physical motion, and the grand-child of spiritual motion, and the mother and origin of gravity. Gravity is limited to the elements of water and

859. Only part of this passage belongs, strictly speaking, to this section. The principle laid down in the second paragraph is more directly connected with the notes given in the preceding section on Physiology.

8
Il peso: se proprio non resti nel suo sito, e dove si moverà? Moversi intorno il centro; e perché non per altre linee? perché il peso, che non a resistenza, discienderà in basso per la sua piva breve, e li più basso sito è il cieco del mondo; e perché lo sa così al peso trovarlo con tanta breuità? perché non va come insensibile prima vagando per diverse linee.

Movasi la terra da che parte voglia, ma la superficie dell'acqua uscirà fori della sua spera, ma sempre sarà equidistante al centro del mondo.

Dato che la terra si rmovessi dal centro del mondo, che farebbe l'acqua?

Resterebbe intorno a esso centro con equal grossezza, ma minore diametro, che quando ella aeu la terra in corpo.

Why does not the weight $o$ remain in its place? It does not remain because it has no resistance. Where will it move to? It will move towards the centre of gravity. And why by no other line? Because a weight which has no support falls by the shortest road to the lowest point which is the centre of the world. And why does the weight know how to find it by so short a line? Because it is not independent and does not move about in various directions.

Let the earth turn on which side it may the surface of the waters will never move from its spherical form, but will always remain equidistant from the centre of the globe.

Granting that the earth might be removed from the centre of the globe, what would happen to the water? It would remain in a sphere round that centre equally thick, but the sphere would have a smaller diameter than when it enclosed the earth.
THE EARTH AS A PLANET.

862. Se la terra deli antipodi che sostiene l'oceano, s'inalzasse e si scoprisse assai fori d'esso mare, essendo quasi piana, in che modo sarebbe poi col tetto a crearli motti e le valli.

6 E li sassi di diverse falde?

863. Ogni omo sempre si trova nel mezzo del modo e sotto il mezzo del suo emisferio, e sopra il cielo d'esso modo.

Tr. 28] Each man is always in the middle of the surface of the earth and under the zenith of his own hemisphere, and over the centre of the earth.

Leic. 10] Ricordo come io ho in prima a dimostrare la distanza del sole dalla terra, e con cui de' suoi raggi passati per ispia'raocolo in loco oscuro ritrovare la sua qualità vera, e oltre a di questo per lo mezzo della spera del acqua ritrovare la grandezza della terra.

8 Qui si dimostra come, quind'è il sole è nel mezzo del nostro emisferio, che li antipodi orientali cogli occidentali uson dono in un medesimo tempo cias'cun per se spechiare il sole nella loro acqua, e il simile quelli del po'dio artico col antartico, se abito'tori ui sono.

C. A. 111 s; 345 s] Come la terra è una stella.

That the earth is a star.

F. 26 s] Tu nel tuo discorso a c'è lode dare 2 la terra essere una stella quasi simile alla luna, e la nobiltà del nostro modo;

5 E così farai un discorso delle grandezze di molte stelle, se'co'do li autori.

866. In your discourse you must prove that the earth is a star much like the moon, and the glory of our universe; and then you must treat of the size of various stars, according to the authors.

864. 10. 11. Antipodi orientali cogli occidentali. The word Antipodes does not here bear its literal sense, but—as we may infer from the simultaneous reference to inhabitants of the North and South—is used as meaning men living at a distance of 90 degrees from the zenith of the rational horizon of each observer.

862. 1. sella. 2. simulass... scoprisse essi. 5. eile. 6. cilli.
864. 1. chome... in po'dio a dim. 2. distanza. 3. razì. 4. ehalu illocho oscuro. 6. mezo. 7. grandez. 8. dimostra chome.
9. mezo... nostro. 10. emisferio cheli antipodi di. 11. orientali. 12. gono nuv. 13. scun. 14. acue... quelgli. 15. anticho chel antardico.
865. R. 865. 1. tutto tuo discorsa a c'è cladere. 3. luna [e cosi proverra]. 6. altori.
864. 10. 11. Antipodi orientali cogli occidentali.
867.

THE METHOD OF PROVING THAT THE EARTH IS A STAR.

First describe the eye; then show how the twinkling of a star is really in the eye and why one star should twinkle more than another, and how the rays from the stars originate in the eye; and add, that if the twinkling of the stars were really in the stars—as it seems to be—that this twinkling appears to be an extension as great as the diameter of the body of the star; therefore, the star being larger than the earth, this motion effected in an instant would be a rapid doubling of the size of the star. Then prove that the surface of the air where it lies contiguous to fire, and the surface of the fire where it ends are those into which the solar rays penetrate, and transmit the images of the heavenly bodies, large when they rise, and small, when they are on the meridian. Let $a$ be the earth and $n d m$ the surface of the air in contact with the sphere of fire; $hfg$ is the orbit of the moon or, if you please, of the sun; then I say that when the sun appears on the horizon $g$, its rays are seen passing through the surface of the air at a slanting angle, that is $a m$; this is not the case at $d k$. And so it passes through a greater mass of air; all of $e m$ is a denser atmosphere.

The method of proving that the earth is a star.

868.

Beyond the sun and us there is darkness and so the air appears blue.

869.

PERSPECTIVE.

It is possible to find means by which the eye shall not see remote objects as much

W. XVII

Infra 'l sole e noi è tenebre, e però l'aria pare azzurra.

868.

PERSPECTIVE.

2 Possible è fare che l'ochio nò uedrà le cose remote molto diminuite, come fa

869.

PERSPECTIVE.

It is possible to find means by which the eye shall not see remote objects as much...
la prospettiva naturale, i quali diminuono mediante la curviltà dell’occhio, che è costretto a tagliare sopra di sé le piramidi di qualunque spetcie che viene al occhio • infra angoli retti spereci; Ma 9 l’arte, che io insegni qui in margine, taglia esse piramidi con angoli retti vicino alla superficie di tal popilla; Ma 12 la convessa popilla dell’occhio piglia sopra 13 di se tutto il nostro emissario, e que’sta mostrerà solo una stella; ma dove 15 molte piccole stelle si ricevono per similitudine nella superficie della popilla, 17 le quali stelle sono minime, di queste mostrerà una sola stella, ma fa grade; 19 E così la luna di maggiore gradezza, e le sur-·e macule di più nota figura; A questo 21 nostro occhio si debbe fare 5 ueto pieno di 22 quell’acqua di che si fa mietone 23 nel 4 del libro 113 delle cose naturali, 24 la quale acqua fa parere spogliate di 25 vetro quelle cose che sono congielate nel 26 le palle del uetro cristallino.

Dell’occhio.

28 Infra li corpi minori della popilla del- l’occhio 29 quella fia manco nota a essa popilla, 30 la quale le sarà più vicina 1 2 E con questa 31 spierietà ci si è fatto noto che la virtu visiva nò 32 si riduce in puto perché se la ecc.; 33 Leggi i margini.

31 Quella cosa si 35 dimostra maggiore, che viene 37 all’occhio ciò più 38 grosso angolo.

39 Ma le spetie dell’obiòbitetti, che co- corenanno alla popilla 42 dell’occhio, si compa- rtono sopra tal popiti alla nel medesimo 43 modo, ch’esse son 44 5 partite infra l’aria; 47 e la prova di questi 48 è in seeguito: quando noi 50 riguardiammo il 51 cielo stellato 52 sanza por la uj 53 sta più a una stel 54 la che all’altra, 55 che allora ci si mo 56 sstra il cielo seminato 57 di stelle, e sò pro 58 porti- nate nell’occhio 59 siccome lo sono in 60 cielo, e così li loro 61 spati fanno il simile.

62 chostretteta ategliare. 7. piramide... specie viene. 8. iochio... angholi. 90. lia [le] esse piramide chon angholi.


869. 9. 32. in margine: lines 34—61 are, in the original, written on the margin and above them is the diagram to which Leonardo seems to refer here.

20 and fol. Telescopes were not in use till a century later. Compare No. 910 and page 136.

diminished as in natural perspective, which diminishes them by reason of the convexity of the eye which necessarily intersects, at its surface, the pyramid of every image conveyed to the eye at a right angle on its spherical surface. But by the method I here teach in the margin[9] these pyramids are intersected at right angles close to the surface of the pupil. The convex pupil of the eye can take in the whole of our hemisphere, while this will show only a single star; but where many small stars transmit their images to the surface of the pupil those stars are extremely small; here only one star is seen but it will be large. And so the moon will be seen larger and its spots of a more defined form[20]. You must place close to the eye a glass filled with the water of which mention is made in number 4 of Book 113 "On natural substances"[23]; for this water makes objects which are enclosed in balls of crystalline glass appear free from the glass.

OF THE EYE.

Among the smaller objects presented to the pupil of the eye, that which is closest to it, will be least appreciable to the eye. And at the same time, the experiments here made with the power of sight, show that it is not reduced to speck if the &c.[32].

Read in the margin.

[34]Those objects are seen largest which come to the eye at the largest angles.

But the images of the objects conveyed to the pupil of the eye are distributed to the pupil exactly as they are distributed in the air: and the proof of this is in what follows; that when we look at the starry sky, without gazing more fixedly at one star than another, the sky appears all strewn with stars; and their proportions to the eye are the same as in the sky and likewise the spaces between them[61].

23. libro 113. This is perhaps the number of a book in some library catalogue. But it may refer, on the other hand, to one of the 120 Books mentioned in No. 796. l. 84.

33. Compare with this the passage in Vol. I, No. 52, written about twenty years earlier.
PROSPETTIVA.

Delle cose remote dall'occhio con eguale distanza, quella parà esser me diminuita che prima era più.

Delle cose remote dall'occhio con eguale distanza dal loro primo sito quella me diminuisce, che prima era più distante da esso occhio; e tal è la proporzione della diminuzione, qual fu la proporzione delle distanze ch'esse avea da l'occhio auanti il loro moto.

Come dire il corpo \( e \) e 'l corpo \( e \) e che la proporzione delle loro distanze dall'occhio \( a \) è quinquale; io rimovo ciascuno dal suo sito \( s \) e lo fo più distante dal-

\[
\begin{array}{cccc}
& & & \\
& b & & a \\
& & & \\
& & & \\
& & & \\
& & & \\
& k & s & j \\
\end{array}
\]

l'occhio vno d'essi \( s' \) in che è diuisa la proporzione; accade dunque che il più vicino all'occhio avrà doppiata la distanza, e per la penultima di questo esso è diminuito la metà del suo tutto, e 'l corpo \( e \) per lo medesimo moto è diminuito \( \frac{1}{4} \), di esso suo tutto; adunque per la detta penultima è vero quel che in questa ultima s'è proposto; e questo dico per li motivi de' corpi celesti in 3500 miglia di distanza che piv esses'indo in oricile che sopra di noi, non crescono o diminuiscono con sensibile dimostrazione.

Among objects moved from the eye at equal distance, that undergoes least diminution which at first was most remote.

When various objects are removed at equal distances farther from their original position, that which was at first the farthest from the eye will diminish least. And the proportion of the diminution will be in proportion to the relative distance of the objects from the eye before they were removed.

That isto say in the object \( e \) and the object \( e \) the proportion of their distances from the eye \( a \) is quintuple. I remove each from its place and set it farther from the eye by one of the 5 parts into which the proposition is divided. Hence it happens that the nearest to the eye has doubled the distance and according to the last proposition but one of this, is diminished by the half of its whole size; and the body \( e \), by the same motion, is diminished \( \frac{1}{5} \) of its whole size. Therefore, by that same last proposition but one, that which is said in this last proposition is true; and this I say of the motions of the celestial bodies which are more distant by 3500 miles when setting than when overhead, and yet do not increase or diminish in any sensible degree.

\( a \) \( b \) è lo spiraculo donde \( s \) passa il sole, e se tu po' tesori misurare la grossezza de' razi solari in \( n m \), tu po' estesi per bene le ucre linie del concurso d'essi razi solari, stante lo specchio in \( a \) \( b \), e \( s \) poi fare i
A, the side of the body in light and shade, $n$, faces the whole portion of the hemisphere $b c d e f$, and does not face any part of the darkness of the earth. And the same occurs at the point $o$; therefore the space $a o$ is throughout one and the same brightness, and $s$ faces only four degrees of the hemisphere $d e f g h$, and also the whole of the earth $s h$, which will render it darker; and how much must be demonstrated by calculation.

Prueba dell'accrescimento del sole in nel occidente.

Alcuni matematici dimostrano il sole cresciere nel ponente; perché l'occhio sèpre lo vede al luogo di maggiore grossezza, allegato che le cose oltre nella nebbia e nel acqua non son maggiori; ai quali io risponderò di no, incomperò le cose viste fra la equal angles to $n m$; but, as you want to have them at $n m$, take them at the inner side of the aperture at $cd$, where they may be measured at the spot where the solar rays fall. Then place your mirror at the distance $ab$, making the rays $d b$, $b c$ fall and then be reflected at equal angles towards $d c$; and this is the best method, but you must use this mirror always in the same month, and the same day, and hour and instant, and this will be better than at no fixed time because when the sun is at a certain distance it produces a certain pyramid of rays.

872. 873.

The reason of the increased size of the sun in the west.

Some mathematicians explain that the sun looks larger as it sets, because the eye always sees it through a denser atmosphere, alleging that objects seen through mist or through water appear larger. To these I reply: No; because objects seen through a mist are
nebbia sò simili per colore alle lóctane; e non essendo simili per diminuzione appariscono di maggiore grandezza; Ancora nessuna cosa cresce in acqua piana, e la prova ne farai a lucidare un asse mezza sotto l'acqua; Ma la ragione che 'l sol cresce si è che Ogni corpo luminoso quanto pìu s'allótana, pìu pare grade.

874. Nell'acqua crescono i simulacri della cosa che in lor si specchia.

875. Le onde dell'acqua crescono i simulacri della cosa che in lor si specchia. 3a sia il sole, ha in acqua inondata, b è l'acqua inondata, f sia l'occhio che uede esso simulacro in tutte l'onde che si rinchiodano nella basa del triangolo e f; adunque il sole che nella superficie sanza onde occupava l'acqua c d, ora nella superficie inondata occupa tutta l'acqua e e (come è prospetto nel 4. similar in colour to those at a distance; but not being similarly diminished they appear larger. Again, nothing increases in size in smooth water; and the proof of this may be seen by throwing a light on a board placed half under water. But the reason why the sun looks larger is that every luminous body appears larger in proportion as it is more remote.

874. In my book I propose to show, how the ocean and the other seas must, by means of the sun, make our world shine with the appearance of a moon, and to the remoter worlds it looks like a star; and this I shall prove. Show, first that every light at a distance from the eye throws out rays which appear to increase the size of the luminous body; and from this it follows that 2. . . . [10].

[11] The moon is cold and moist. Water is cold and moist. Thus our seas must appear to the moon as the moon does to us.
della mia prospettiva), e tanto più occupa-
rebbe d'acqua quanto esso simulacro fosse
più distante dall'occhio.

Il simulacro del sole si dimostrerà
di lucente nell'onde mi²nute che nelle onde
grandi\(^{18}\); E questo accade perché le simili-
tudini over simulacrì del sole sono più
spesse nell'onde minute \(^{14}\) che nelle grandi,
e li più spessi splendori rendono maggiore
l'umè che li splendori più rari.

L'onde intersegate a uso di scorza di
pigna rendono il si²mulacro del sole di
grandissimo splendore, \(^{18}\) e questo accade
perché tanto son li simulacci quanto son
li gio
ghi del'onde vedute dal sole, e

l'ombre che infra esse onde s'inter²pongono
son piccole e di poca oscurità, e li splen-
dori di tanti \(^{21}\) simulacci insieme s'infondono
nelle similitudini che di lor \(^{18}\) viene all'occhio,
in modo tale che esse ombre sono insen-
sibili; \(^{1}\)

\(^{21}\) Quel simulacro del sole occuperà
più lochi nella superfitie dell'acqua, che
sarà più distante dall'occhio che lo uede;
\(^{26}\) a sia il sole, \(p\) \(g\) è il simulacro d'esso
sole, \(a\) \(b\) è la superfitie dell'acqua doue
il sol \(^{28}\) si spechia, \(r\) sia l'occhio che uede
esso si²mulacro nella superfitie dell'acqua
occupare \(^{30}\) lo spatio \(o\) \(m\); \(c\) è l'occhio
più remoto \(^{31}\) da essa superfitie dell'acqua,
e così dal simulacro, onde esso simulacro
occupa maggiore spatio d'acqua,—quanto
è lo spatio \(n\) \(o\).

14. alli .. rendan magore. 15. chelli. 16. distorsa di pina rendano [luss] il si. 17. pldongre [e chiavera]. 18. oechape
achade. 19. elonbre. 20. pongono .. pichelle .. pocha oscurita alli. 21. sinfondano .. similitudine. 22. sole [se]
oechuper. 25. chel uede. 27. ella. 28. zispezach. 29. acq"" ocupare. 30. Losspaito .. eloce. 32. oechupa magore
.. etc.

9. Nel quarto della mia prospevtiva. If this reference
is to the diagrams accompanying the text—as is
usual with Leonard—and not to some particular
work, the largest of the diagrams here given
must be meant. It is the lowest and actually the
fifth, but he would have called it the fourth, for the
text here given is preceded on the same page of
the manuscript by a passage on whirlpools, with
It is impossible that the side of a spherical mirror, illuminated by the sun, should reflect its radiance unless this mirror were undulating or filled with bubbles.

You see here the sun which lights up the moon, a spherical mirror, and all of its surface, which faces the sun is rendered radiant.

Whence it may be concluded that what shines in the moon is water like that of our seas, and in waves as that is; and that portion which does not shine consists of islands and terra firma.

This diagram, of several spherical bodies interposed between the eye and the sun, is given to show that, just as the reflection of the sun is seen in each of these bodies, in the same way that image may be seen in each curve of the waves of the sea; and as in these many spheres many reflections of the sun are seen, so in many waves there are many images, each of which at a great distance is much magnified to the eye. And, as this happens with each wave, the spaces the diagram belonging to it also reproduced here.

The words *della mia prospettiva* may therefore indicate that the diagram to the preceding chapter treating on a heterogeneal subject is to be excluded. It is a further difficulty that this diagram belongs properly to lines 9-10 and not to the preceding sentence. The reflection of the sun in water is also discussed in the Theoretical part of the Book on Painting; see Vol. I, No. 206, 207.

876. In the original, at letter A in the diagram "Sole" (the sun) is written, and at o "occhio" (the eye).
THE EARTH AS A PLANET.

sumare gli spati interposti infra l’onde, 3 e
per questa tal cagione e’ pare tutto vn
sole continuato nelle molti soli 3 spechiati
nalle molte onde, e le parti onbrose miste
colle spetie luminose 3 fan che tale splen
dore non è lucido come quel del sole in
esse òde spechiato.

F. 77.[1]
Questa avrà inazio a se il trattato de’
onbra e lumi.
3 Li stremi della luna
sara più alluminati e si
dimostre1ran più lumino-
si, perché in quelli non
appare se nò le sò-
5mità dell’òde delle sue
acque.

W. x]
Il sole parà
maggiore nell’ac-
qua movente e
ődegiat2 che nel-
la ferma: esemplo
del lume visto so-
pra le corde 3 del
monocordo.

877. 1. ara. 2. ellumi. 3. dimostre. 4. apare.
878. 1. magiore. 2. õdegiato. 3. esempl. 4. chorode.

877. 5. I have thought it unnecessary to re-
produce the detailed explanation of the theory of
reflection on waves contained in the passage which
follows this.
II.

THE SUN.

If you look at the stars, cutting off the rays (as may be done by looking through a very small hole made with the extreme point of a very fine needle, placed so as almost to touch the eye), you will see those stars so minute that it would seem as though nothing could be smaller; it is in fact their great distance which is the reason of their diminution, for many of them are very many times larger than the star which is the earth with water. Now reflect what this our star must look like at such a distance, and then consider how many stars might be added—both in longitude and latitude—between those stars which are scattered over the darkened sky. But I cannot forbear to condemn many of the ancients, who said that the sun was no larger than it appears; among these was Epicurus, and I believe that he founded his reason on the effects of a light placed in our atmosphere equidistant from the centre of the earth. Any one looking at it never sees it diminished in size at whatever distance; and the rea-


LAUDE DEL SOLE.

The question of the true and of the apparent size of the sun (879-884).

Se guarderai le stelle sanza razi (come colla strema pura dalla sottile aguglia, e questo posto quasi a toccare l'occhio), tu uederai esse stelle essere tanto minime che nulla cosa pare essere minore, e ueramente la luja di stàtia le fa ragionevolmente diminuire, ancoraché molte vi sono che son moltissime volte maggiori che la stella cioè la terra coll'acqua; ora pensa quel che parrebbe essa nostra stella in tanta distanza, e conside lìa poi, quante stelle si metterebbero e per longitudine e latitudine infrà esse stelle, le quali sono seminatìte per esso spazio tenebroso; mai non posso fare ch'io non biasimi molti di quegli antichi, li quali disesero che il sole non avesse altra gràdezza che quella che mostra, ifra quali fu Epicuro, e credo che caua si tale ragione da vn lume posto in questa nostra aria, equidistàte al ceto; chi lo uede, non lo uede mai di minuto di gràdezza in nessuna distàtia; e le ragi-

879. 1. lede. 2. rabi. 3. pichola. 4. acuschia ecque posto. 5. magore chella. 9. coe. 24UA che pa. 11. metterebbe e per. ella. 14. quali disco. 15. no chel sole. gràdeza. 16. mostra [alla] ifra. 18. noluide. 19. minuto. gràdeza insennua. elle.

879—882. What Leonardo says of Epicurus—who according to Lewis, The Astronomy of the ancients, and Mädler, Geschichte der Himmelskunde, did not devote much attention to the study of celestial phenomena—, he probably derived from Book X of Diogenes Laertius, whose Vitae Philosophorum was not printed in Greek till 1533, but the Latin translation appeared in 1475.
Epicurus perhaps saw the shadows cast by columns on the walls in front of them equal in diameter to the columns from which the sun rises. He wished to serve me to blame those who are far to exalt the worship of men more than that of the sun; for in the whole universe there is nowhere to be seen a body of greater magnitude and power than the sun. Its light gives light to all the celestial bodies which are distributed throughout the universe; and from it descends all vital force, for the heat that is in living beings comes from the soul [vital spark]; and there is no other centre of heat and light in the universe as will be shown in Book 4; and certainly those who have chosen to worship men as gods—as Jove, Saturn, Mars and the like—have fallen into the gravest error, seeing that even if a man were as large as our earth, he would look no bigger than a little star which appears but as a speck in the universe; and seeing again that these men are mortal, and putrid and corrupt in their sepulchres. Marcellus[23] and many others praise the sun.

**F. 6o**

Fors Epicuro vide le òbre delle colonne ripercosse nelli an^típosti muri essere equali al diametro della colòna ^dónde si partì a sons of its size and power I shall reserve for Book 4. But I wonder greatly that Socrates[2] should have depreciated that solar body, saying that it was of the nature of incandescent stone, and the one who opposed him as to that error was not far wrong. But I only wish I had words to serve me to blame those who are far to exalt the worship of men more than that of the sun; for in the whole universe there is nowhere to be seen a body of greater magnitude and power than the sun. Its light gives light to all the celestial bodies which are distributed throughout the universe; and from it descends all vital force, for the heat that is in living beings comes from the soul [vital spark]; and there is no other centre of heat and light in the universe as will be shown in Book 4; and certainly those who have chosen to worship men as gods—as Jove, Saturn, Mars and the like—have fallen into the gravest error, seeing that even if a man were as large as our earth, he would look no bigger than a little star which appears but as a speck in the universe; and seeing again that these men are mortal, and putrid and corrupt in their sepulchres. Marcellus[23] and many others praise the sun.

88. 2. Socrates; I have little light to throw on this reference. Plato's Socrates himself declares on more than one occasion that in his youth he had turned his mind to the study of celestial phenomena (Μετεόπη) but not in his later years (see C. Lewis, *The Astronomy of the ancients*, page 109; Mädler, *Geschichte der Himmelskunde*, page 41). Here and there in Plato's writings we find incidental notes on the sun and other heavenly bodies. Leonardo may very well have known of these, since the Latin version by Cicero was printed as early as 1491; indeed an undated edition exists which may very likely have appeared between 1480—90. There is but one passage in Plato, Epinomis (p. 983) where he speaks of the physical properties of the sun and says that it is larger than the earth.

Aristotle who goes very fully into the subject says the same. A complete edition of Aristotle's works was first printed in Venice 1495—98, but a Latin version of the Books *De Coelo et Mundo* and *De Physica* had been printed in Venice as early as in 1483 (H. Möller-Steudning).

23. I have no means of identifying Marcellus who is named in the margin. It may be Nonius Marcellus, an obscure Roman Grammarian of uncertain date (between the 11th and 14th centuries A. D.) the author of the treatise *De compendiosa doctrina per litteras ad filiam* in which he treats of rébus omnibus et quibusdam aliis. This was much read in the middle ages. The *edicio princeps* is dated 1470 (H. Möller-Steudning).

881. In the original the writing is across the diagram.
d'obra era insisibile 10 per la lunga distanza del sole; se il sole fosse minore della terra, le stelle di grà parte del nostro emisfero sarebbero sà^zeta lume; còtro a Epicuro che dice, tato è grade il sole, quato e' pare.

Dice Epicuro il sole essere tato quato esso si dimostra; a'dunque e'pare essere vn piè, e così l'abbiamo a tenere; seguirebbe che la luna quâ'd'ella fa oscurare il sole, il so'le non l'avâzerebbe di grâdezza come e'fa, onde, sendo la luna minor del sole, essa luna sarebbe meno d'un piede, e per conseguèza quando il nostro mòdo fa oscurare la luna, sarebbe minore a un dito del piedi, conciò sia se il so'le è un piede, e la nostra terra fa onbra piramidale inverso la luna, egli è necessario che sia maggiore il lumi'nosso, causa della piramide óbrosa, che l'opaco, causa d'essa piramide.

Epicurus says the sun is the size it looks. Hence as it looks about a foot across we must consider that to be its size; it would follow that when the moon eclipses the sun, the sun ought not to appear the larger, as it does. Then, the moon being smaller than the sun, the moon must be less than a foot, and consequently when our world eclipses the moon, it must be less than a foot by a finger's breadth; inasmuch as if the sun is a foot across, and our earth casts a conical shadow on the moon, it is inevitable that the luminous cause of the cone of shadow must be larger than the opaque body which casts the cone of shadow.

882. a. labia 10 attenerre. 3. seguirebbe chella. 4. nollauçerebbe... grâdeza chome. 5. medun piedi. 6. consegueza... oscurare. 7. susconzia. 8. piedi ella. 9. luna "la" egli... magore. 10. causa dela.
883.

To measure how many times the diameter of the sun will go into its course in 24 hours.

Make a circle and place it to face the south, after the manner of a sundial, and place a rod in the middle in such a way as that its length points to the centre of this circle, and mark the shadow cast in the sunshine by this rod on the circumference of the circle, and this shadow will be—let us say—as broad as from a to n. Now measure how many times this shadow will go into this circumference of a circle, and that will give you the number of times that the solar body will go into its orbit in 24 hours. Thus you may see whether Epicurus was [right in] saying that the sun was only as large as it looked; for, as the apparent diameter of the sun is about a foot, and as that sun would go a thousand times into the length of its course in 24 hours, it would have gone a thousand feet, that is 300 braccia, which is the sixth of a mile. Whence it would follow that the course of the sun during the day would be the sixth part of a mile and that this venerable snail, the sun will have travelled 25 braccia an hour.

884.

Posidonius composed books on the size of the sun.

885.

Of the proof that the sun is hot by nature and not by virtue.

That the heat of the sun resides in its nature and not in its virtue (or mode of illumination). Kleomedes, a later Greek Naturalist also mentions this observation of Poseidonius' without naming the title of his work; however, as Kleomedes' Cyclia Theorica was not printed till 1535, Leonardo must have derived his quotation from Strabo. He probably wrote this note in 1508, and as the original Greek was first printed in Venice in 1516, we must suppose him to quote here from the translation by Guaranus Veronensis, which was printed as early as 1471, also at Venice (H. MULLER-STUBING).
ASTRONOMY.

per lo splendore del corpo solare, nel quale non si può fermare l'occhio vmano, e oltre a di questo manifestissima mente di notare a tanta e più di lume, che l'occhio non lo possa sopportare, allora essa per- cussione sarà di tato splendente, che l'occhio non lo possa sopportare, allora essa percussione avrà splendore simile al sole nel suo proprio sito; e che sia vero, pro- vato che se tale specchio è alla sua cavità tal quale si richiede alla generazione di tale razzo, allora nessuna cosa creata reggerà alla caldezza di tale percussione di razzo riflesso d'un specchio, io ti rispondo, che l'occhio viè dal sole ed è il razzo dello specchio concava, passato a traverso della finestra.

w. l. 1324]

Il sole non si move.

Let the sun does not move.

886. 887.

PROOF THAT THE NEARER YOU ARE TO THE SOURCE OF THE SOLAR RAYS, THE LARGER WILL THE REFLECTION OF THE SUN FROM THE SEA APPEAR TO YOU.

4 If it is from the centre that the sun employs its radiance to intensify the power of its whole mass, it is evident that the farther its rays extend, the more widely they will be divided; and this being so, you, whose eye is near the water that mirrors the sun, see but a small portion of the rays of the sun strike the surface of the water, and reflecting the form of the sun. But if you were near to the sun—as would be the case when the sun is on the meridian and the sea to the westward—you would see the sun, mirrored in the

sopo. 12. percussione ar. 13. ara. 15. va chese tale... alla. 17. razzo. 18. regiera. 20. refresso. 21. essetto... chello. 22. freddo... razzi. 23. razzo. 24. razzo. 28. to [per il fol]. Lines 32—47 are much effaced and some words remain doubtful: 32. delle plan (?). 33. cedove. 34. su tmando (?). 35. si


This sentence occurs incidentally among mathematical notes, and is written in unusually large letters.
sea, of a very great size; because, as you are nearer to the sun, your eye taking in the rays nearer to the point of radiation takes more of them in, and a great splendour is the result. And in this way it can be proved that the moon must have seas which reflect the sun, and that the parts which do not shine are land.

Take the measure of the sun at the solstice in mid-June.

Every object seen through a curved medium seems to be of larger size than it is.

Because the eye is small it can only see the image of the sun as of a small size. If the eye were as large as the sun it would see the image of the sun in water of the same size as the real body of the sun, so long as the water is smooth.

Take a piece of paper and pierce holes in it with a needle, and look at the sun through these holes.

888. At A is written sole (the sun), at B terra (the earth).
THE MOON.

Volendo io trattare della essentia della luna è necessario in prima descrivere la prospettiva della spechi piani, côcaui e cô-uessi; e prima che cosa è razzo luminoso, e come si piega per varie nature di mezzi; Dipoi dove il razzo riflesso è più potête, o nell’esser l’angolo dell’incidentia acuto retto o ottuso, o nelle côuesiti o piano o côcavità, o da corpo dêso e trasparète; Oltre a questo, come li razzi solari, che percuotono l’onde marine, si dimostrano al

892. In the diagram Leonardo wrote sole at the place marked A.
93. The image of the sun in the moon is powerfully luminous, and is only on a small portion of its surface. And the proof may be seen by taking a ball of burned gold and placing it in the dark with a light at some distance from it; and then, although it will illuminate about half of the ball, the eye will perceive its reflection only in a small part of its surface, and all the rest of the surface reflects the darkness which surrounds it; so that it is only in that spot that the image of the light is seen, and all the rest remains invisible, the eye being at a distance from the ball. The same thing would happen on the surface of the moon if it were polished, lustrous and opaque, like all bodies with a reflecting surface.

26. The problem here propounded by Leonardo was not satisfactorily answered till Newton in 1682 formulated the law of universal attraction and gravitation. Compare No. 902, lines 5—15.
Show how, if you were standing on the moon or on a star, our earth would seem to reflect the sun as the moon does.

And show that the image of the sun in the sea cannot appear one and undivided, as it appears in a perfectly plane mirror.

894.

How shadows are lost at great distances, as is shown by the shadow side of the moon which is never seen.

895.

Either the moon has intrinsic luminosity or not. If it has, why does it not shine without the aid of the sun? But if it has not any light in itself it must of necessity be a spherical mirror; and if it is a mirror, is it not proved in Perspective that the image of a luminous object will never be equal to the extent of surface of the reflecting body that it illuminates? And if it be thus[13], as is here shown at $r$ $s$ in the figure, whence comes so great an extent of radiance as that of the full moon as we see it, at the fifteenth day of the moon?

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895. 13. At $A$, in the diagram, Leonardo wrote "sole" (the sun), and at $B$ "luna o noi terra" (the moon or our earth). Compare also the text of No. 576.
THE MOON.

896. Of the moon.

The moon has no light in itself; but so much of it as faces the sun is illuminated, and of that illuminated portion we see so much as faces the earth. And the moon's night receives just as much light as is lent it by our waters as they reflect the image of the sun, which is mirrored in all those waters which are on the side towards the sun. The outside or surface of the waters forming the seas of the moon and of the seas of our globe is always ruffled little or much, or more or less—and this roughness causes an extension of the numberless images of the sun which are repeated in the ridges and hollows, the sides and fronts of the numberless waves; that is to say in as many different spots on each wave as our eyes find different positions to view them from. This could not happen, if the aqueous sphere which covers a great part of the moon were uniformly spherical, for then the images of the sun would be one to each spectator, and its reflections would be separate and independent and its radiance would always appear circular; as is plainly to be seen in the gilt balls placed on the tops of high buildings. But if those gilt balls were rugged or composed of several little balls, like mulberries, which are a black fruit composed of minute round globules, then each portion of these little balls, when seen in the sun, would display to the eye the lustre resulting from the reflection of the sun, and thus, in one and the same body many tiny suns would be seen; and these often combine at a long distance and appear as one. The lustre of the new moon is brighter and stronger, and if the moon is full; and the reason of this is that the angle of incidence is more obtuse in the new than in the full moon, in which the angles [of incidence and reflection] are highly acute. The waves of the moon therefore mirror the sun in the hollows of the waves as well as on the ridges, and the sides remain in shadow. But at the sides

896. i. dase. 2. venado...ecquella...vede. 4. Ella...chelli pres. 5. nostre acque...refletterli. 6. vedavo...elluna si spechia. 7. dichessi...luna edel. 8. [la nostra luna] mare...nostra...esse rughoso. 9. oppocho...o Hippocr. 10. che chelli e chichavits iliat. 11. te effritte...delle immemoriali...is spechiano...ciascuna. 12. rughos. 13. che sii...chelli venado. 14. chadere...scilla...achu'ta...vesette. 15. luno fissi. 16. uno...”accias cuno ochio” ella...reffracione...partich. 17. essere...aperfeicione chome. 18. assegna. 19. essare...rughoso...globuleti chome. 20. “neri” chernostis...”rotonde” allora ciascuna...delle partie”. 21. elluminoso...mestiera. 22. chosi nii...charpo. 22. derere...luna disstastia. 23. viniascho...eppaione chousnat...oipiu cido epi. 24. pleninno acceusto...cha. 25. laghoso. 26. vechei...tale angoli...achtissimi...elleone. 27. chosi...chome...chelli ell. 28. ressione...aschur. 29. venado...massole...vede...quessto. 30. choli...ettal. 31. elluminos chosi...influssi...veghano.

DELLA LUNA.

La luna non av lume da seu, se no quato ne vede il sole tanto l'alumnia, della qual luminosità tanto ne vediamo quato è quella che vede noi; e la sua notte riceve tanto di splendore, quato è quello che li prestanto le nostre acque nel rifletterli il simulacro del sole, che in tutte quelle che vedono il sole e la luna, si spechia; La pelle over superf[icie] del-l'acqua, di che si cipone il mare della luna e il 8 mare della nostra terra, è sempre rugoso, 9o poco o assai, o più, o meno, e tale rugosità è causa di dila
tare l'immumerabil simularci del sole, che nei colli e còcavità e lati e fròti delle immumerabil rughe si spechiano, cioè in tati vari siti di ciascuna 10 rugho quato son vari li siti che àno li ochi che le vedono, jh che ac
cederò no potrebbe, se la sèra dell'acqua, che ì grà parte di se veste la 11 luna fusse d'uniforme spéricità, perché allora il simulacro del 15 sole sarebbe uno a ciascuno occhio, e la sua reflession sarebbe particu-
lare e sempre sarebbe splédero sperico, come manifestam
te ci assegnano le palle dorate, poste nelle sommità dell'alti edifi-
fiti; Ma se tali palle dorate fussino rugose o globuletì come son le mo
tre, frutti neri composti di minute globosità rotonde, allora ciascuna delle parti d'essa 20 globosità, ve-
dute dal sole e dall'ochio, mostrerà a esso occhio il lustro gi
erato dal simulacro d'esso sole, e così in ì medesimo corpo si ue
drebbero molti minimi soli, li quali spese sò le volte che per lunga distà
ta si uniscono e paiono cótïnati; E il lustro della luna nuova è più lucido e più potète che quàdo è in plenilunio, e questo si ca
vasa perché l'angolo dell'incidètia è molto più ottuso nella luna nuo
da che nella vecchia, dove tali angoli sono actissimi; e l'onde della 27 luna spechiano il sole così nelle lor valli come nelle colli, e li lati 28 restano oscuri; ma ne' lati della luna li fondi dell'onore 29 vedono il sole, ma
solo uedonole cime d'essè òde, e per questo li simùlacrì son più rari e più misti coll'ombre delle valli, e tal mistione ù' delle spetie òbrose e luminose, così in-
sieme infuse, vengono all'o'chio čò poco splèdore, e nell' stremi sarà piv oscurle per essere 31 la curuità de' lati di tale òde in-
suffiètè a riflettere all' ochio li ri'cievuti razzi; La luna nova per natura riflette li 35 razzi solari più inverso l' ochio per tali of the moon the hollows of the waves do
not catch the sunlight, but only their crests;
and thus the images are fewer and more
mixed up with the shadows in the hollows;
and this intermingling of the shaded and
illuminated spots comes to the eye with a
mitigated splendour, so that the edges will
be darker, because the curves of the sides
of the waves are insufficient to reflect to the
eye the rays that fall upon them. Now
the new moon naturally reflects the solar
rays more directly towards the eye from the

òde stremè, 36 che per nessuno altro loco,
come mostra la figura della luna che
37 percuotèdo con razzi a nell' onda b riflette
in b d, dou' è situà38 lo ochio d; E questo
accadere nò può nel plenilunio dove 39 il
razzo solare, stando all' occidète, percuote
l' onda stremè della 40 luna all' orietè de' n
in m, e non riflette inverso l' ochio occi-
dètale, ma risalta all' orietè, poco piegà
do la rettitud' dine d' esso razzo solare, e così
l' angolo della incidètia è grossissimo.
41 La luna è corpo
opàtico e solido, e se
per lo atversario ella
fusse traspar'sente, ella
nò riciverebbe 42 il lume
del sole.
43 Il rosseume over tu-
orlo dell' o'vovo sta 5 in
mezzo al suo al' bume
sanza discèdere 55 d'alcuna
parte, ed è pi'sv lieve o
più grave o euale d' esso
51 albume; e s'elli è
più lìseve egli doverebbe surgès're sopra
tutto l'albume e 57 fermarsi in cotatto del-

crests of the waves than from any other part,
as is shown by the form of the moon, whose
rays a strike the waves b and are reflected
in the line b d, the eye being situated at d.
This cannot happen at the full moon, when
the solar rays, being in the west, fall on the
extreme waters of the moon to the East
from n to m, and are not reflected to the
eye in the West, but are thrown back east-
wards, with but slight deflection from the
straight course of the solar ray; and thus
the angle of incidence is very wide
indeed.

The moon is an opa-
que and solid body and
if, on the contrary, it
were transparent, it would
not receive the light of the
sun.
The yellow or yolk
of an egg remains in the
middle of the albumen,
without moving on either
side; now it is either lighter
or heavier than this albumen, or equal to it; if
it is lighter, it ought to rise above all the
albumen and stop in contact with the shell

32. chò pocho . osschure. 33. chrunita . arfretfere. 34. raza da qual chosa la luna . rafrette. 35. razi . tale,
36. lochò . mostrà la fghura. 37. perchò tendo cho razi b e rafrette. 38. Ecuesto achadere . dove 11 o. 39. razo
solare [que] perchò stando alloccidète perchò lonte. 40. rafrette. 41. pocho piegàhò. 42. chosì langholo. 43. chorpo,
44. cho essòlido esse. 45. e fussì. 46. enò. 49. sta [in in al più delle]. 50. voltà in. 51. discèdère. 52. dalchuna.
53. greve "o euale" desso. 54. esselli. 55. eve edovere vesurgèse. 57. chìtratto. 58. la [sua scho] schòrza. 59. hovo

896. 48 – 64. Compare No. 861.
The innumerable images of the solar rays reflected from the innumerable waves of the sea, as they fall upon those waves, are what cause us to see the very broad and continuous radiance on the surface of the sea.
in such a way as that so much of its surface as is illuminated by the sun, should reflect the moon unless it had a surface adapted to reflect it—in waves and ridges, like the surface of the sea when its surface is moved by the wind.

The waves in water multiply the image of the object reflected in it.

These waves reflect light, each by its own line, as the surface of the fire cone does. [14]

These are 2 figures one different from the other; one with undulating water and the other with smooth water.

It is impossible that at any distance the image of the sun cast on the surface of a spherical body should occupy the half of the sphere.

Here you must prove that the earth produces all the same effects with regard to the moon, as the moon with regard to the earth.

The moon, with its reflected light, does not shine like the sun, because the light of the moon is not a continuous reflection of that of the sun on its whole surface, but only on the crests and hollows of the waves of its waters; and thus the sun being confusedly reflected, from the admixture of the shadows that lie between the lustrous waves, its light is not pure and clear as the sun is. [38]

The earth between the moon on the fifteenth day and the sun. [39] Here the sun is in the East and the moon on the fifteenth day in the West. [40] The moon on the fifteenth [day] between the earth and the sun. [41] Here it is the moon which has the sun to the West and the earth to the East.

WHAT SORT OF THING THE MOON IS.

The moon is not of itself luminous, but is highly fitted to assimilate the character of light after the manner of a mirror, or of water, or of any other reflecting body; and it grows larger in the East and in the West, like the sun and the other planets. And the reason is that every luminous body looks

A. 640]
899.

THE MOON.

899. Of the nature of the moon.

When the moon is entirely lighted up to our sight, we see its full daylight; and at that time, owing to the reflection of the solar rays which fall on it and are thrown off towards us, its ocean casts off less moisture towards us; and the less light it gives the more injurious it is.

Della qualità della luna.

18 La luna quâdo è tutta luminata – al nostro vedere, noi vediamo tutto il suo giorno, e allora per riflessione de' razi del sole, percossi in lei e risaltati a noi, l'oceano nostro i ci gitta. meno vividità, e quato mè è luce pav noce.

Leic. 50a]

Dei la luna.

2 Dico che non avendo la luna lume da se, essendo luminosa, egl' è necessario che tale lume sia causato da altri.
Leic. 36§

DELLA LUNA.

Tutte le còtradizioni dell' auersario a dir che nella lunà non è acqua.

Leic. 1§

Risposta a maestro Andrea da Imola, che disse come li razzi solari riflessi dal corpo dello specchio convesso si confondono e si consumano in brieve spatio, e che per conseguenza non essere nato tale lume dalla innumerable multitudine dell' onde di quel 4unare, il quale io proponeuo essere quella parte della luna che s'alluminava per li razzi solari; 5o 6p: sia il corpo del sole, eu s sia la luna, b sia l'occhio, che in su la basa eu del cateto eu m vede specchiare il corpo del sole infra li equali angoli eu, e l' similme fa remouendosi l'occhio da b in a.

Leic. 10§

DELLA LUNA.

4° Nessun denso è pìv lieue che l'aria.

Avendo noi provato come la parte della luna che risplende è acqua, che specchia il corpo del sole, 4la quale ci riflette lo splendore da lui ricevuto; E come, se tale acqua fusse sanza öde, ch'ella 5picola si dimostrerebbe, ma di splendore quasi simile al sole; Al presente bisognia provare, se essa 4luna è corpo grave o lieue, inperoche se fusse grave, — confessando che dalla terra in su in ogni grado d'altezza s'acquista gradi di leultà, còcosiachè l'acqua è più lieue che la terra, e l'aria che l'acqua, c'l foco che l'aria, e così 6seguitando successuamènte,—e'parrebbe che, se la luna auesse densità com' ella à, ch'ella auesse gravità, e avèdo 9gravità che lo

900. The objections are very minutely noted down in the manuscript, but they hardly seem to have a place here.

901. The large diagram on the margin of page 161 belongs to this chapter.

900. Of the Moon.

All my opponent’s arguments to say that there is no water in the moon.

901. Answer to Maestro Andrea da Imola, who said that the solar rays reflected from a convex mirror are mingled and lost at a short distance; whereby it is altogether denied that the luminous side of the moon is of the nature of a mirror, and that consequently the light is not produced by the innumerable multitude of the waves of that sea, which I declared to be the portion of the moon which is illuminated by the solar rays.

Let o p be the body of the sun, eu s the moon, and b the eye which, above the base eu of the catheus eu m, sees the body of the sun reflected at equal angles eu; and the same again on moving the eye from b to a.

902. Of the Moon.

No solid body is less heavy than the atmosphere.

Having proved that the part of the moon that shines consists of water, which mirrors the body of the sun and reflects the radiance it receives from it; and that, if these waters were devoid of waves, it would appear small, but of a radiance almost like the sun; —[5] It must now be shown whether the moon is a heavy or a light body: for, if it were a heavy body—admitting that at every grade of distance from the earth the greater levity must prevail, so that water is lighter than the earth, and air than water, and fire than air and so on successively—it would seem that if the moon had density as it really has, it would have weight, and having weight, that it could not be sustained in the space

900. 2. acqua “a”.

901. 1. razi . . refinetti . . chonverso . . confondendo. 2. essa . . luna.

902. 3. disspichio e per chonseguenza . . innumerable. 4. chesu-

交付。
spatio, ove essa si troua, non la potesse sostenere, e per conseguenza avesse a discendere in verso il centro dell’universo, e congiungersi colla terra, e senza lo acque auestesino a cadere e spogliarla di se e cadere in verso il céstro e lasciar di se la luna spogliata e senza luce; oé, nò seguitando quel che di lei la ragione ci promette, egli è manifesto segno che tal luna è vestita de'sua elemeti, cioè acqua, aria e foco, e così in se, per se si sostenga in quello spazio come fa la nostra ter'tra coi suoi elemeti in quest’altro spazio, e che tale affetto faccino le cose gravi ne’ suoi elemeti, qual fanno l’altr’ cose gravi nell’ elemeti nostri.

Quando l’occhio in orizzonte vede la luna in occidente vicin’al tramétoato sole, esso la vede colla sua parte onbrosa circundata da parte luminosa, del quale lume la parte laterale e superiore deriva dal sole, e la parte inferiore deriva dallo oceano occidentale, il quale ancora lui riceve li razzi solari e li riflette nelle inferiori mari della luna, e ancora per tutta la parte obrosa della luna da tanto di splendore, qual’è quel che da la luna alla terra nella mez’zanotte, e perció no resta integralmente scura, e di qui è alcuno creduto, che la luna abbia in parte lume da se oltre a quel che gli è dato dal sole, il quale lume diria dalla atti’detta causa delle nostri mari alluminati dal sole.

Ancora si potrebbe dire che l’ cerchio dello splendore where it is, and consequently, that it would fall towards the centre of the universe and become united to the earth; or if not the moon itself, at least its waters would fall away and be lost from it, and descend towards the centre, leaving the moon without any and so devoid of lustre. But as this does not happen, as might in reason be expected, it is a manifest sign that the moon is surrounded by its own elements: that is to say water, air and fire; and thus is, of itself and by itself, suspended in that part of space, as our earth with its element is in this part of space; and that heavy bodies act in the midst of its elements just as other heavy bodies do in ours.

When the eye is in the East and sees the moon in the West near to the setting sun, it sees it with its shaded portion surrounded by luminous portions; and the lateral and upper portion of this light is derived from the sun, and the lower portion from the ocean in the West, which receives the solar rays and reflects them on the lower waters of the moon, and indeed affords the part of the moon that is in shadow as much radiance as the moon gives the earth at midnight. Therefore it is not totally dark, and hence some have believed that the moon must in parts have a light of its own besides that which is given by the sun; and this light is due, as has been said, to the above-mentioned cause,—that our seas are illuminated by the sun.

Again, it might be said that the circle of radiance

10. congugneresi ... esse ... nàicho. 11. chadere ... ellascia ... spogliata essanza lui. 12. ragun ... “segno” cheital. 13. coe ... essocho echosi ... sostengha. 14. tra cossaa ... cheitale ... grave. 15. nostri. 16. oischamento ... vede [la luna]. 17. circhiumeata ... luminoso. 18. ensuperiore ... ella. 19. razzi ... elli refrente. 20. displenatore ... nella me. 21. percorso ... integralmente luminosa e di “combios” oscura ... alcuna ... chella. 22. parte di lume dasce ... accotuel chelle. 23. chavera nostri. 24. Anchora si p’er’rebbe ... cheff. 25. occidente ... diriversi ... choll ocho esismato. 26. dimosstra. 27. Al-

15. This passage would certainly seem to establish the discoverer of the cause of the ashy colour of the new moon (lumen cinereum). His observations
che fa la luna, quand’el’è col sole in \sout{25}occidente, dirvasse dal sole integralmente, quando essa col sole e col’ ochio è situata nel \sout{26}modo che qui disopra si dimostra.

17 Alcuni potrebbero dire che l’aria, eleméto della luna, pigliando il lume del sole, come fa la nostra spera dell’aria, fusse quella che finisce il cerchio luminoso al corpo della luna.

19 Alcuni an’creduto che la luna abbia alquanto di lume da se, la quale opes\sout{39}ione è falsa, perché l’anno fondata sopra quel chiarore che si uede in mezzo ali \sout{31}corni quando la luna è nova, la quale alli confini dello splendore pare oscuра, \sout{3}e al confine della oscurità del campo pare si chiara, che molti credono essere \sout{33}un cerchio di nouo splendore, che finisca di circundare, doue le punte de’ corni \sout{34}aluminati dal sole terminano il loro splendore; e questa varietà di campo nasce \sout{35}perché quella parte d’esso campo, che termina colla parte luminosa della luna, per tal \sout{3}paragone di splendore si dimostra pivo oscuра che non è, e quella parte di sopra, doue \sout{34}pivo pezzo di cerchio luminoso d’uniforme larghezza, nasce ché quiui la luna, essendo più chiara che \sout{36}il mezzo over il campo, oue essa si troua; pel paragò di tale oscurità si dimostra in tale confine pivo lu\sout{35}minoa che non è, la quale luminosità in tal tempo nasce dal nostro oceano colli altri mediterrani \sout{40}che in quel tépò è alluminato dal sole che già è tramontato, in modo che il mare allora fa tale offito alla \sout{41}parte oscura della luna, qual fa la luna in quita decima a noi, shown by the moon when it and the sun are both in the West is wholly borrowed from the sun, when it, and the sun, and the eye are situated as is shown above.

Some might say that the air surrounding the moon as an element, catches the light of the sun as our atmosphere does, and that it is this which completes the luminous circle on the body of the moon.

Some have thought that the moon has a light of its own, but this opinion is false, because they have founded it on that dim light seen between the horns of the new moon, which looks dark where it is close to the bright part, while against the darkness of the background it looks so light that many have taken it to be a ring of new radiance completing the circle where the tips of the horns illuminated by the sun cease to shine\[34\]. And this difference of background arises from the fact that the portion of that background which is conterminous with the bright part of the moon, by comparison with that brightness looks darker than it; while at the upper part, where a portion of the luminous circle is to be seen of uniform width, the result is that the moon, being brighter there than the medium or background on which it is seen by comparison with that darkness it looks more luminous at that edge than it is. And that brightness at such a time itself is derived from our ocean and other inland-seas. These are, at that time, illuminated by the sun which is already setting in such a way as that the sea then fulfils the same function to the dark side of the moon as the moon at its fifteenth day does to us when the

 however, having hitherto remained unknown to astronomers, Moestlin and Kepler have been credited with the discoveries which they made independently a century later.

Some disconnected notes treat of the same subject in MS. C. A. 239; 718 and 719: "Perché la luna cinta della parte alluminata dal sole in ponente, tra maggior splendore in mezzo a tal cerchio, che quando essa edissua il sole. Questo accade perché nell’ edissare il sole ella embrassa il nostro oceano, il qual caso non accade essendo in ponente, quando il sole alluma esso oceano." The editors of the "Saggio" who first published this passage (page 12) add another short

one about the seasons in the moon which I confess not to have seen in the original manuscript:

"La luna ha ogni mese un verno e una state, e ha maggiori freddi e maggiori caldi, e i suoi equinoci sono più freddi de’ nostri."

23. 24. The larger of the two diagrams reproduced above stands between these two lines, and the smaller one is sketched in the margin. At the spot marked A Leonardo wrote corpo solare (solar body) in the larger diagram and Sole (sun) in the smaller one. At C luna (moon) is written and at B terra (the earth).

34. See Pl. CVIII, No. 5.
903. The Moon.

... And the small amount of light which the dark side of the moon receives bears the same proportion to the light of that side which is illuminated, as that... [42].

If you want to see how much brighter the shaded portion of the moon is than the background on which it is seen, conceal the luminous portion of the moon with your hand or with some other more distant object.

904. Of the spots on the moon.

Others say that the moon is composed of more or less transparent parts; as though one part were something like alabaster and others like crystal or glass. It would follow from this that the sun casting its rays on the less transparent portions, the light would remain on the surface, and so the denser part would be illuminated, and the transparent portions would display the shadow of their darker depths; and this is their account of the structure and nature of the moon. And this opinion has found favour with many philosophers, and particularly with Aristotle, and yet it is a false view—for, in the various phases and frequent changes of the moon and sun to our eyes, we should see these spots vary, at one time looking dark and at another light: they would be dark when the sun is in the West and the sun is set.

42. Here the text breaks off; lines 43—52 are written on the margin.
si farebbono oscure, e quàdo ch'èare; scure
si farebbono, quàdo il sole è in oc
cidità
e la luna nel mezzo del celo, chè allora le
cócauità transparéti piglierebbono l'ombre
ingrino alle sommità de' labibri di tal có
cauità trásparéti, perché il sole nò potrebbe
penetrare li 25 suoi razzi dentro alle boche
tali cócauità, e le quali parrebbono chiare
nel plenilunio, 23 doue la luna in oriète
guarda il sole all'occiède; allora il sole
alluminebbe insino ne' fòs dei tali trans-
paréti, e così, nò generadosi 26 onbre, la
luna non ci mostrerebbbe in tal tempo 27 le
predette machie, e così ora piov ora meno,
secondo le mutáti del sol dalla luna e
della lu'na dai lochi nostri, come di sopra
dissi.

F. 85b

DELLLE MACULE DELLA LUNA.

25Si è detto che le macule della luna
son create in essa luna, 3 da essere in se
di uaria rarità e dèsit, il che se così fusse,
nell'eclissi della luna i razzi solari pene-
trebbono per 5 alcuna parte della predetta
rarità, e, nò si ueden do tale effetto, detta
opinione è falsa;

7 Altri dicono che la superbite della luna,
essendo tersa 8 e pulita, che essa, a simili-
tudine di specchio, riceve in 9 sc la simili-
tudine della terra; Questa opinione 10 è falsa, conciosiachè la terra, scoperta dal-
l'acqua, per diueri 11si aspetti à diuere
figure; adunque, quando la luna 12 è al-
loriète, essa specchierebbo altre machie,
che quàdolo essa ci è di sopra, o quàdo
essa è in ocçitàe; però 14 le machie della
luna, come si uede nel pleni-
lunio, 15mai si variano nel
moto da lei fatto nel nostro
emisferio; 2a ragione è, che
e la cosa specchiàta nella con-
vessità piglia piccola parte d'
esò specchio, com'è provato
in prospettua; 3a ragione 19 è, che nel
plenilunio la luna vede solo il mezzo 26 della
moon in the middle of the sky; for then the
transparent hollows would be in shadow as
far as the tops of the edges of those trans-
parent hollows, because the sun could not
then fling his rays into the mouth of the
hollows; which however, at full moon,
would be seen in bright light, at which time
the moon is in the East and faces the sun
in the West; then the sun would illuminate
even the lowest depths of these transparent
places and thus, as there would be no
shadows cast, the moon at these times
would not show us the spots in question;
and so it would be, now more and now
less, according to the changes in the position
of the sun to the moon, and of the moon
to our eyes, as I have said above.

25 Sei detto chelle. 3 rareta. 4 razii. 5 penetrerene. 5 rareta il ce nò. 6 salo. 27 mostrerebbe. 8 alla lu.

905. 0. Esi detto chelle. 3 rareta. 4 razii. 5 penetrerene. 5 rareta il ce nò. 6 to tale. 7 opzione effalsa.
7 dicano chella. 8 assimilitudine disaspechio. 10 conciosiache. 10 acqua. 11 aspetti. 12 specchierebbe. 13 oscurero oc-
dëte il che. 14 plenilunio che. 16 he chella. 17 specchi. 18 chicca. 19 ragione. 19 mezo. 21 locane. 28 plen-

3—5. Edili. This word, as it seems to
me, here means eclipses of the sun; and the sense
of the passage, as I understand it, is that by the
foregoing hypothesis the moon, when it comes be-
tween the sun and the earth must appear as if
pierced,—we may say like a sieve.

18. come è prevoto. This alludes to the accom-
paving diagram.
THE MOON.

spera della terra illuminata, nella quale l'oceano colle altre acque risplendono, e la terra fa macule in esso splendore, e così siuedrebbe 25 la metà della nostra terra cinta dallo splendore del mare illuminato dal sole, e nella luna tal similitudine sarebbe minima parte d'essa luna; 26 4° è che la cosa splendida non si specchia nell'altra splendida; adunque il mare, pigliando splendore dal sole, siccome fà la luna, e nò si potrebbe in lei specchiare tal terra, che ancora specchiar non vi si vedesse 30 particolarméte il corpo del sole e di ciascuna stella a lei opposta.

If you keep the details of the spots of the moon under observation you will often find great variation in them, and this I myself have proved by drawing them. And this is caused by the clouds that rise from the waters in the moon, which come between the sun and those waters, and by their shadow deprive these waters of the sun's rays. Thus those waters remain dark, not being able to reflect the solar body.

Se terrai osservate le particelle delle macchie della luna, 2° tu troverai in quelle spesse volte gran varietà, e di questo 3° fatto pruova io medesimo disegnándole; E questo nasce da nuovoli che si leuano dal l'acque d'essa luna, li quali s'interpongono infra il sole e essa acqua, e colla loro onbra tolgono i razi del sole a tale acqua, onde essa acqua viene a rimanere oscura, per non potere specchiare il corpo solare.

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Come le mac'ché della luna son variate da quel che già fu trò, per causa del corso delle acqua.

How the spots on the moon must have varied from what they formerly were, by reason of the course of its waters.

DE' CIERCHI DELLA LUNA.

Ho trovato che quelli cierchi, li quali par che di notte circđnino la luna, di varie grandezze e grossezze, 3° sono causati da varie qualità di grossezze d'umori, i quali in varie altezze infra la luna e li ochi nostri sono situati; E quel cierchio maggiore è di rosso ed è nella prima parte più bassa di detti umori, il secondo minore è di rosso alt, e pare pivo rosso, perché è visto per

De' cierchi della luna.

De' cierchi della luna.

I have found, that the circles which at night seem to surround the moon, of various sizes, and degrees of density are caused by various gradations in the densities of the vapours which exist at different altitudes between the moon and our eyes. And of these halos the largest and least red is caused by the lowest of these vapours; the second, smaller one, is higher up, and looks redder because it is

Of halos round the moon.

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2 umori; e così quanto 6 piv alti sieno, minori e piv rossi appariranno, perché infra l'occhio e quello fia piv solidi umori, 7 e per questo si puova che dove apparisce maggiore rossore ·li è piv somma d'umori. 

w. xxvii]

909.

Come tu vuoi provarre, la luna mostrarsi maggiore che essa non è, giungendo all'orizzonte; 3 tu torrai vn ochiale colmo da una superficie e concau dalla superficie opposita, e tieni 4 l'occhio dal concavo, e guarda l'obbiotto fori 6 della superficie conuessa, e così 7avrai fatto vn vero simile 8 all'aria, che si include int'fra la spera del foco e de'9 l'acqua, la quale aria è 10 concau diuerso la terra e 11 conuessa diuerso il foco. 

910.

If you want to prove why the moon appears larger than it is, when it reaches the horizon; take a lens which is highly convex on one surface and concave on the opposite, and place the concave side next the eye, and look at the object beyond the convex surface; by this means you will have produced an exact imitation of the atmosphere included beneath the sphere of fire and outside that of water; for this atmosphere is concave on the side next the earth, and convex towards the fire.

C. A. 187 a; 561 a]

Fa ochiali da vedere la luna grande. Construct glasses to see the moon magnified.

909. 1. voli · mostrare. 2. magore · gugnendo. 6. infraochio ecquello · solidomori. 7. aparisce maggiore · domori.

910. See the Introduction, p. 136, Fracastoro ays in his work Homocentres: "Per duo specilla ocularia si quis perspicat, alteri altero superposito, majora multo et profinquiora videbit omnia.—Quis ino quadrum specilla ocularia sunt tantae densitatis, ut si per ea quis aut luna, aut alium siderum spectet, adeo profinqua illa indicit, ut ne turres ipsas excedant" (sect. II c. 8 and sect. III, c. 23).
VI.

THE STARS.

F. 564]

Veggonsì le stelle di notte e nó di di,
per esser noi sotto la grossezza dell'aria,
la quale è piena d'infinito particulè d'umidità,
le quali, ciascuna per se quàdo è per
ossa dalla luce del sole, rendono splen-
dore, e così l'inúmerabili splendori occupano
esse stelle, e se tale aria nó fusse, il celo
sempre ci mostrerebbe le stelle nelle sua
tenebre.

F. 574]

Se le stelle ànno lume dal sole o
da se.

2Dicono di aver il lume da se, alle-
gando che se Venere e Mercurio non
avessino il lume da se, quàdo essa s'inter-
pone infra l'ochio nostro e il sole, esse
oscurerebbero tanto d'esso sole, quàto
esse ne coprono al ochio nostro; E quest'è
falso, perché prouato come l'onbrosi,
posto nel luminoso, è cinto e coperto
tutto da razzi laterali del rimanète di tal
luinmoso, e così resta invisibile, come si

911. The stars are visible by night and not by day, because we are beneath the dense
atmosphere, which is full of innumerable
particles of moisture, each of which inde-
dependently, when the rays of the sun fall upon
it, reflects a radiance, and so these number-
less bright particles conceal the stars; and if
it were not for this atmosphere the sky would
always display the stars against its darkness.

912. Whether the stars have their light from
the sun or in themselves.

Some say that they shine of themselves,
alleging that if Venus and Mercury had not
a light of their own, when they come between
our eye and the sun they would darken so
much of the sun as they could cover from
our eye. But this is false, for it is proved
that a dark object against a luminous body
is enveloped and entirely concealed by the
lateral rays of the rest of that luminous body
and so remains invisible. As may be seen

911. See Vol. I, No. 296, which also refers to
starlight.
912. From this and other remarks (see No. 902,
Vol. II.) it is clear that Leonardo was familiar
with the phenomena of Irradiation.
di'mostra: quando il sole è veduto per la
rappresentazione delle piante senza foglie in
lùga di'istantia, essi rami non occupano
parte all'ecuna d'esso sole alli ochi nostri;
15 il simile 16 accade a' predetti pianeti, li quali
ancora 16 che da se sieno senza luce, egli
non oc'cupano, com'è detto, parte alcuna
del sole 18 all'ocio nostro.

Seconda 20 Prova.

22 Dicono le stelle nella notte parere
lucidissime 23 quato più ci sò superiori,
e che, se esse nò auessino lume 23 da se,
che l'ombra che fa la terra, che s'interpone 24 fra loro e 'l sole, ver-
rebbe a scurarle, non vedendosi esse,
ne sèdo vedute dal corpo solare; Ma
26 questi non ànnno considerato, che
l'ombra piramidale de'lla terra non
aggiugne infra troppa stelle, e in
28 quelle ch'ella aggiugne, la piramide
è tanto diminuita, che poco occupa
del corpo della stella; e 'l ri'manètè è
alluminato dal sole.

913. Why the planets appear larger in the
East than they do overhead, whereas the
contrary should be the case, as they are 3500
miles nearer to us when in mid sky than when
on the horizon.

All the degrees of the elements, through
which the images of the celestial bodies pass
to reach the eye, are equal curves and the
angles by which the central line of those images
passes through them, are unequal angles [13]; and
the distance is greater, as is shown by the excess of
a b beyond a d; and the enlargement of these

F. 60 a

Perchè li pianeti appariscono maggiori
2 in oderie che sopra di noi, che dovrebbe
3 essere il contrario, essendo 43500 miglia
pù vicini a noi, essendo 5 nel mezzo del
celo, che essendo al
6 orizzonte.

7 Tutti li gradi dell' elemèti, donde passa-
8 no le petite de' corpi celesti, 9 che vengono
all'occhio, sono 10 equali, e li angoli, 11 donde li
penetra 12 la linea cé-
trale di tali spetie, so-
nono 13 inequali, e la di-
stantia è 14 maggiore,
come mostra l'eccesso
a b so'pra a d, e per
la 9 de'la 7 la gran-
dezza 16 d'essi corpi celesti nell'orizzonte è
celesti bodies on the horizon is shown by
the 9th of the 7th.

on the margin. 20. pruocu. 21. Dicano. 22. superiore e cheselle nò auessino. 23. che obra cheffà . . chesainterpone.
24. le verebe assuare. 25. nessèdo. 26. nòna . . chellonbra. 27. nònagugne . . stelle ege. 28. chellagugale . . ettono .
29. ochupa. 30. aluminato.
913. l. 13. inequali, here and elsewhere does not mean unequal in the sense of not being equal to
each other, but angles which are not right angles.
THE STARS.—TIME.

914. To see the real nature of the planets open the covering and note at the base one single planet, and the reflected movement of this base will show the nature of the said planet; but arrange that the base may face only one at the time.

915. Cicero says in [his book] De Divinatione that Astrology has been practised five hundred seventy thousand years before the Trojan war.

916. Although time is included in the class of Continuous Quantities, being indivisible and immaterial, it does not come entirely under the head of Geometry, which represents its divisions by means of figures and bodies of infinite variety, such as are seen to be continuous in their visible and material properties. But only with its first principles does it agree, that is with the Point and the Line; the point may be compared to an instant of time, and the line may be likened to the length of a certain quantity of time, and just as a line begins and terminates in a point, so such a space of time.

914. 4. refresso. 5. compless. 8. duna.


914. 4. bassa. This probably alludes to some instrument, perhaps the Camera obscura.

915. The statement that CICERO, De Divin. ascribes the discovery of astronomy to a period 57000 years before the Trojan war I believe to be quite erroneous. According to ERNESTI, Clavis Ciceroniana, Ch. G. SCHULZ (Lexic. Cicer.) and the edition of De Divin. by Giese the word Astrologia occurs only twice in CICERO : De Divin. II. 42. Ad Chaldeorum monstra venientes, de quibus Euanderz, Platonic auditor, in astrologia judicio decissimorum hominum facile principec, sic opinatur (et quod scriptum reliquit): Chaldea in predictione et in notazione cauibus vile ex natali die minime esse credendum.” He then quotes the condemnatory verdict of other philosophers as to the teaching of the Chaldaeans but says nothing as to the antiquity and origin of astronomy. CICERO further notes De oratore I. 16 that Aratus was “ignorat astrologia” but that is all. So far as I know the word occurs nowhere else in CICERO; and the word ASTRONOMIA he does not seem to have used at all. (H. MÜLLER-STÜRING.)

916. This passage is repeated word for word on page 190b of the same manuscript and this is accounted for by the text in Vol. I, No. 4. Compare also No. 1216.
sò termine e principio di qualüche dato spatio di tenpo;—e se 9 la linia è diuisibile in infinito, lo spatio d'ü tenpo di tal diuisione non è alieno, 10 e se le parti diuisa della linia sono proportionabili infra se, ancora le parti del tenpo 11 saranno proportionabili infra loro.

917. Scriui la qualità del 2tenpo, separata dalla 3geometrica.

918. Fa che vn ora sia diuisa in 3000 parti, e 3questo farai coll'oriolo 4alleggeredo o aggravado 3il côtrapeso. Divide an hour into 3000 parts, and this you can do with a clock by making the pendulum lighter or heavier.

begins and terminates in an instant. And whereas a line is infinitely divisible, the divisibility of a space of time is of the same nature; and as the divisions of the line may bear a certain proportion to each other, so may the divisions of time.

Describe the nature of Time as distinguished from the Geometrical definitions.
Leonardo's researches as to the structure of the earth and sea were made at a
time, when the extended voyages of the Spaniards and Portuguese had also excited a
special interest in geographical questions in Italy, and particularly in Tuscany. Still, it
need scarcely surprise us to find that in deeper questions, as to the structure of the globe,
the primitive state of the earth's surface, and the like, he was far in advance of
his time.

The number of passages which treat of such matters is relatively considerable;
like almost all Leonardo's scientific notes they deal partly with theoretical and partly
with practical questions. Some of his theoretical views of the motion of water were
collected in a copied manuscript volume by an early transcriber, but without any
acknowledgment of the source whence they were derived. This copy is now in the Library
of the Barberini palace at Rome and was published under the title: "De moto e mi-
sura dell'acqua," by FRANCESCO CARDINALI, Bologna 1828. In this work the texts
are arranged under the following titles: Libr. I. Della spera dell'acqua; Libr. II.
Del moto dell'acqua; Libr. III. Dell'onda dell'acqua; Libr. IV. Dei retrosi d'acqua;
Libr. V. Dell'acqua cadente; Libr. VI. Delle rotture fatte dall'acqua; Libr. VII.
Delle cose portate dall'acqua; Libr. VIII. Dell' oncia dell'acqua e delle canne; Libr. IX.
De molini e d'altri ordigni d'acqua.

The large number of isolated observations scattered through the manuscripts,
accounts for our so frequently finding notes of new schemes for the arrangement of
those relating to water and its motions, particularly in the Codex Atlanticus: I have
printed several of these plans as an introduction to the Physical Geography, and I have
actually arranged the texts in accordance with the clue afforded by one of them which
is undoubtedly one of the latest notes referring to the subject (No. 920). The text
given as No. 930 which is also taken from a late note-book of Leonardo's, served as a
basis for the arrangement of the first of the seven books—or sections—, bearing the
title: Of the Nature of Water (Dell'acque in se).
As I have not made it any part of this undertaking to print the passages which refer to purely physical principles, it has also been necessary to exclude those practical researches which, in accordance with indications given in 920, ought to come in as Books 13, 14 and 15. I can only incidentally mention here that Leonardo—as it seems to me, especially in his youth—devoted a great deal of attention to the construction of mills. This is proved by a number of drawings of very careful and minute execution, which are to be found in the Codex Atlanticus. Nor was it possible to include his considerations on the regulation of rivers, the making of canals and so forth (No. 920, Books 10, 11 and 12); but those passages in which the structure of a canal is directly connected with notices of particular places will be found duly inserted under section XVII (Topographical notes). In Vol. I, No. 5 the text refers to canal-making in general.

On one point only can the collection of passages included under the general heading of Physical Geography claim to be complete. When comparing and sorting the materials for this work I took particular care not to exclude or omit any text in which a geographical name was mentioned even incidentally, since in all such researches the chief interest, as it appeared to me, attached to the question whether these acute observations on the various local characteristics of mountains, rivers or seas, had been made by Leonardo himself, and on the spot. It is self-evident that the few general and somewhat superficial observations on the Rhine and the Danube, on England and Flanders, must have been obtained from maps or from some informants, and in the case of Flanders Leonardo himself acknowledges this (see No. 1008). But that most of the other and more exact observations were made, on the spot, by Leonardo himself, may be safely assumed from their method and the style in which he writes of them; and we should bear it in mind that in all investigations, of whatever kind, experience is always spoken of as the only basis on which he relies. Incidentally, as in No. 984, he thinks it necessary to allude to the total absence of all recorded observations.
INTRODUCTION.

These books contain in the beginning: Schemes for the nature of water itself in its motions, the arrangement of the others treat of the effects of its currents, which change the world in its centre and its shape.

DIVISIONS OF THE BOOK.

Book 1 of water in itself.
Book 2 of the sea.
Book 3 of subterranean rivers.
Book 4 of rivers.
Book 5 of the nature of the abyss.
Book 6 of the obstacles.
Book 7 of gravels.
Book 8 of the surface of water.
Book 9 of the things placed therein.
Book 10 of the repairing of rivers.
Book 11 of conduits.
Book 12 of canals.
Book 13 of machines turned by water.
Book 14 of raising water.
Book 15 of matters worn away by water.
First you shall make a book treating of places occupied by fresh waters, and the second by salt waters, and the third, how by the disappearance of these, our parts of the world were made lighter and in consequence more remote from the centre of the world.

First write of all water, in each of its motions; then describe all its bottoms and their various materials, always referring to the propositions concerning the said waters; and let the order be good, for otherwise the work will be confused.

Describe all the forms taken by water from its greatest to its smallest wave, and their causes.

A book of driving back armies by the force of a flood made by releasing waters. A book showing how the waters safely bring down timber cut in the mountains. A book of boats driven against the impetus of rivers. A book of raising large bridges higher. Simply by the swelling of the waters. A book of guarding against the impetus of rivers so that towns may not be damaged by them.
INTRODUCTION.

Libro della disposizione de' fiumi a cö-seruati dell'argine sue,
2 Libro dell' monti, che si spicerharano, e fià la terra sotto il nostro emisperio scoperta dall'acqua,
3 Libro del terreno portato dall'acqua a riépiere la grà profondità de' pelaghi,
4 Libro de' modi che la fortuna per se netti li riépiuti porti del mare,
5 Libro dell'argine de' fiumi e lor permanentia,
6 Libro del fare che li fiumi con lor corso tègini netti li fondi loro per le città dòde passano,
7 Libro del fare o rifondare li ponti sopra li fiumi,
8 Libro di ripari che farsi debbò alli muri e argini de' fiumi percosso dall'acqua.
9 Libro del generare li collì dall'arena o ghiaja sopra le gran profondità dell'acque.

L'acqua dà principio al moto suo,
2 Libro liuellamenti d'acque per diversi modi,
3 Libro del discostare li fiumi dai lochi da loro offesi,
4 Libro del dirizzar li fiumi che occupano superchìo terreni,
5 Libro del dividere li fiumi in molti rami e farli guadabili,
6 Libro dell'acque che cò diversi moti passà pe' pelaghi loro,
7 Libro del profondare li letti alli fiumi cò uari corsi d'acque,
8 Libro di disporre li fiumi i modo che li piccoli pricipij de' sua danni non accre-scino,
9 Libro de' uari moti dell'acque che passan per diversi figure di canali,
10 Libro del fare che li piccoli fiumi non pieghino il maggiore percosso dalle loro acque.
11 Libro della maggior bassezza che trouar si possa nella corrète della super-fitie de' fiumi.

A book of the ordering of rivers so as to preserve their banks.
A book of the mountains, which would stand forth and become land, if our hemi-sphere were to be uncovered by the water.
A book of the-earth carried down by the waters to fill up the great abyss of the seas.
A book of the ways in which a tempest may of itself clear out filled up sea-ports.
A book of the shores of rivers and of their permanency.
A book of how to deal with rivers, so that they may keep their bottom scourèd by their own flow near the cities they pass.
A book of how to make or to repair the foundations for bridges over the rivers.
A book of the repairs which ought to be made in walls and banks of rivers where the water strikes them.
A book of the formation of hills of sand or gravel at great depths in water.

Water gives the first impetus to its motion.
A book of the levelling of waters by various means.
A book of diverting rivers from places where they do mischief.
A book of guiding rivers which occupy too much ground.
A book of parting rivers into several branches and making them fordable.
A book of the waters which with various currents pass through seas.
A book of deepening the beds of rivers by means of currents of water.
A book of controlling rivers so that the little beginnings of mischief, caused by them, may not increase.
A book of the various movements of waters passing through channels of different forms.
A book of preventing small rivers from diverting the larger one into which their waters run.
A book of the lowest level which can be found in the current of the surface of rivers.
Libro dell’origine de’ fiumi che versà per l’alte cime de’ monti.

Libro della varietà de’ moti dell’acque ne’ lor fiumi.

[4] Della inequality della concavità del nauili,
[5] Libro della inequality della curvita de’ lati de’ nauili,
[6] Libro della inequality del sito del timone,
[7] Libro della inequality della carena de’ nauili,
[8] Libro della varietà deli’ spiraculi dove l’acqua si uersa,
[9] Libro dell’acqua inclusa ne’ vasi insieme coll’aria e sua moti,
[10] Libro del moto dell’acqua per le cicongole,
[11] Libro delle scontri e concorsi del’acque venute da diuersi aspetti,
[12] Libro delle varie figure deli’ argini traversati dalli’ fiumi,
[13] Libro delle uarie secche generate sotto le chiuse de’ fiumi,
[14] Libro delle torture e pieghamèti delle corrici de’ fiumi,
[15] Libro de’ uari siti donde si de’ trar l’acqua de’ fiumi,
[16] Libro delle figure dellargini de’ fiumi e lor permanita,
[17] Libro dell’acqua cadente perpendicularly sopra diuersi obbietti,
[18] Libro del corso dell’acqua impedito in diuersi siti,
[19] Libro delle uarie figure dell’ obbietti che impediscono il corso del acque,
[20] Libro delle concavità e globosità fatte dal fondo istorno a vari obbietti,
[21] Libro del condurre li canali navigabili sopra o sotto li fiumi che l’itersegano,
[22] Libro dell’acque de’ canali e lor ripari,
[23] Libro della creatiò de’ corsi de’ fiumi che votano il letto de’ fiumi riempitì di terreno.

A book of the origin of rivers which flow from the high tops of mountains.
A book of the various motions of waters in their rivers.

[9] A book of the various places whence the waters of rivers are derived.
[12] A book of the course of water when it is impeded in various places.
[13] A book of the various forms of the obstacles which impede the course of waters.
[15] A book of conducting navigable canals above or beneath the rivers which intersect them.
[16] A book of creating currents for rivers, which quit their beds, [and] for rivers choked with soil.

928. 1. The first line of this passage was added subsequently, evidently as a correction of the following line. 7. cicongole, see No. 966, 11, 17.
L'omo è detto da li antiqui modo minore, e certo la dizione d'esso nome è bene collocata, simpero chè, siccome l'omo è composto di terra, acqua, aria e foco, questo corpo della terra è il simigliante; se l'omo à in se ossi, sostentitori e armadura della carne, il modo à i sassi, i sostentitori della terra; se l'omo à in se il lago del sangue, dove cresce e discresce il polmone nello alitare, il corpo della terra à il suo oceano mare, il quale ancora lui cresce e discresce ogni sei ore per lo alitare del modo; se dal detto lago di sangue diriuan ve ne, che si vanno ramificàdo per lo corpo vmano, similmente il mare oceano enpie il corpo della terra d'infinito vene d'acqua; mancano al corpo della terra i neriui, i quali non ui sono, perché i nervi sono fatti al proposito del movimeto, e il modulo sendo di perpetua stabilità, non accade movimeto e, nò accade movimeto; i nervi non ui sono necissari; Ma in tutte l'altre cose sono molto simil.

The Beginning of the Treatise on Water.

By the ancients man has been called the world in miniature; and certainly this name is well bestowed, because, inasmuch as man is composed of earth, water, air and fire, his body resembles that of the earth; and as man has in him bones the supports and framework of his flesh, the world has its rocks the supports of the earth; as man has in him a pool of blood in which the lungs rise and fall in breathing, so the body of the earth has its ocean tide which likewise rises and falls every six hours, as if the world breathed; as in that pool of blood veins have their origin, which ramify all over the human body, so likewise the ocean sea fills the body of the earth with infinite springs of water. The body of the earth lacks sinews and this is, because the sinews are made expressly for movements and, the world being perpetually stable, no movement takes place, and no movement taking place, muscles are not necessary.—But in all other points they are much alike.
OF THE NATURE OF WATER.

930.

THE ORDER OF THE FIRST BOOK ON WATER.

Define first what is meant by height and depth; also how the elements are situated one inside another. Then, what is meant by solid weight and by liquid weight; but first what weight and lightness are in themselves. Then describe why water moves, and why its motion ceases; then why it becomes slower or more rapid; besides this, how it always falls, being in contact with the air but lower than the air. And how water rises in the air by means of the heat of the sun, and then falls again in rain; again, why water springs forth from the tops of mountains; and if the water of any spring higher than the ocean can pour forth water higher than the surface of that ocean. And how all the water that returns to the ocean is higher than the sphere of waters. And how the waters of the equatorial seas are higher than the waters of the North, and higher beneath the body of the sun than in any part of the equatorial circle; for experiment shows that under the heat of a burning brand the water near the brand boils, and the water surrounding this ebullition always sinks with
OF THE NATURE OF WATER.

181

discends on an ondula circular and come l'acque
settìtrionali son piv basse che li altri
mari e tanto più, quàsìto esse son piv freddo,
isin che si convertono in ghiaccio.

C 266 (4)

CHE COSA È ACQUA.

Acqua è infra i quatro eleméti il se-
códo mà grave e di seconda volubilità.

1. e 24 a and d]

PRINCIPIO DEL LIBRO DELL'ACQUE.

Pelago è detto quello, il quale à figura
largà e profonda; nel quale l'acque stanno
con poco moto.

Leic. 34.]

Lì centri della spéricità dell'acqua sono
due: l'uno è della vniuersale acqua, l'altro
è particolare; l'universale è quello, il
quale serue a tutte l'acque sanza moto, che
sono in se in grà qualità; come canali,
fossi, viuai, fonti, pozzi, fiumi morti, laghi,
paduli, stagni e mari, li quali, ancorché
sieno di varie altezzè ciascuno per se, àno
li termini delle loro superficie equi-distanti
al centro del mondo, come sono i laghi
posti nelle comes dell alti méti come sopra
9 Pietra Pana e Lago della Sibilla a Norcia,
e tutti li laghi che dà principio a grandi
fiumi, come Tesino dal Lago Maggiore,
Adda dal lago di Como, Mincio dal lago
di Garda e Reno dal lago di Costantìa
e di Coira e dal lago di Lucerne, e come
Tigron, il quale passa per la Minore Asia,
il quale ne porta con seco l'acqua di 3
paduli, l'un dopo l'altro, di varie altezzè,
de quali il piv alto è Munace, il mezzano
è Pallas e l piv basso è Triton; ancora
el Nilo diriu da 3 altíssimi paduli in Eti-
opia.

993.

OF WHAT IS WATER.

Among the four elements water is the
second both in weight and in instability.

Definitions (931-932).

THE BEGINNING OF THE BOOK ON WATER.

Sea is the name given to that water
which is wide and deep, in which the waters
have not much motion.

993.

The centres of the sphere of water are the
other particular. The universal one is the
mo de common to all waters not in
motion, which exist in great quantities. As
canals, ditches, ponds, fountains, wells, dead
rivers, lakes, stagnant pools and seas, which,
although they are at various levels, have
each in itself the limits of their superficies
equally distant from the centre of the earth,
such as lakes placed at the tops of high moun-
tains; as the lake near Pietra Pana and
the lake of the Sybil near Norcia; and all
the lakes that give rise to great rivers, as
the Ticino from Lago Maggiore, the Adda
from the lake of Como, the Mincio from
the lake of Garda, the Rhine from the lakes
of Constance and of Chur, and from the lake
of Lucerne, like the Tigris which passes through
Asia Minor carrying with it the waters of three
lakes, one above the other at different heights
of which the highest is Munace, the middle one
Pallas, and the lowest Triton; the Nile again
flows from three very high lakes in Ethiopia.

932. Only the beginning of this passage is here
given, the remainder consists of definitions which
have no direct bearing on the subject.

933. [Pietra Pana, a mountain near Florence. If
Norcia, we may read Norchia, the remains of

the Etruscan city near Viterbo, there can be no doubt
that by *Lago della Sibilla*—a name not known else-
where, so far as I can learn—Leonardo meant
Lago di Vico (Lacus Ciminus, Aen. 7).
934.

THE CENTRE OF THE OCEAN.

The centre of the sphere of waters is the true centre of the globe of our world, which is composed of water and earth, having the shape of a sphere. But, if you want to find the centre of the element of the earth, this is placed at a point equidistant from the surface of the ocean, and not equidistant from the surface of the earth; for it is evident that this globe of earth has nowhere any perfect rotundity, excepting in places where the sea is, or marshes or other still waters. And every part of the earth that rises above the water is farther from the centre.

935.

OF THE SEA WHICH CHANGES THE WEIGHT OF THE EARTH.

The shells, oysters, and other similar animals, which originate in sea-mud, bear witness to the changes of the earth round the centre of our elements. This is proved thus: Great rivers always run turbid, being coloured by the earth, which is stirred by the friction of their waters at the bottom and on their shores; and this wearing disturbs the face of the strata made by the layers of shells, which lie on the surface of the marine mud, and which were produced there when the salt waters covered them; and these strata were covered over again from time to time, with mud of various thickness, or carried down to the sea by the rivers and floods of more or less extent; and thus these layers of mud became raised to such a height, that they came up from the bottom to the air. At the present time these bottoms are so high that they form hills or high mountains, and the rivers, which wear away the sides of these mountains, uncover the strata of these shells, and thus the softened side of the earth continually rises and the antipodes sink closer to the centre of the earth, and the ancient bottoms of the seas have become mountain ridges.
Let the earth make whatever changes it may in its weight, the surface of the sphere of waters can never vary in its equal distance from the centre of the world.

Some assert that it is true that the earth, which is not covered by water is much less than that covered by water. But considering the size of 7000 miles in diameter which is that of this earth, we may conclude the water to be of small depth.

The great elevations of the peaks of the mountains above the sphere of the water may have resulted from this that: a very large portion of the earth which was filled with water that is to say the vast cavern inside the earth may have fallen in a vast part of its vault towards the centre of the earth, being pierced by means of the course of the springs which continually wear away the place where they pass.

Sinking in of countries like the Dead Sea in Syria, that is Sodom and Gomorrah.

It is of necessity that there should be more water than land, and the visible portion of...
lo dimostra, onde bisogna che molta acqua sia dentro alla terra, sanza quella che' infusa nella bassa arie e che scorre per li fiumi e uene.

939.

**The figures of the elements.**

Of the figures of the elements; and first as against those who deny the opinions of Plato, and who say that if the elements include one another in the forms attributed to them by Plato they would cause a vacuum one within the other. I say it is not true, and I here prove it, but first I desire to propound some conclusions. It is not necessary that the elements which include each other should be of corresponding magnitude in all the parts, of that which includes and of that which is included. We see that the sphere of the waters varies conspicuously in mass from the surface to the bottom, and that, far from investing the earth when that was in the form of a cube that is of 8 angles as Plato will have it, that it invests the earth which has innumerable angles of rock covered by the water and various prominences and concavities, and yet no vacuum is generated between the earth and water; again, the air invests the sphere of waters together with the mountains and valleys, which rise above that sphere, and no vacuum remains between the earth and the air, so that any one who says a vacuum is generated, speaks foolishly.

But to Plato I would reply that the surface of the figures which according to him the elements would have, could, not exist.
ispazio • di 3000 • miglia e versare nelle mediterrane o dove ai liti d'Egitto, e se no • vogliamo • dare a questo • di calo quelle 5dici • braccia per miglio, le quali convnalmè • si concede • alla • universalità • del corso • de • fiumi, 6 noi troveremo • il Nilo • avere il suo • fine piov • basso • che l'principio • miglia dieci •; 7 Ancora • vediamo il Reno, Rodano e Danubio • partirsì dalle germann • che • parti, quasi cieco 8d'Europa •, e l'uno • a Oriète, l'altro a settentrione •, e l'ultimo • a meridiani mario fa suo corso; 9 se tu còsiderai • bene tutto, vedrai dello pianvire d'Europa fare vno cocorso molto 10piv elevato •, che nò • sono • l'alte cime de' marittimi monti; or pësa, quàto le loro cime 11si trovano • piv • alte • che liti marini.

A. 584

**DEL CALDO CHE NEL MÔDO • È.**

2 Dovè è • vita li è calore •, e douè • cal • lore • vitale, qui è moomèto • d'umori; 3 Questo • si prouva •, inperòché se uede • per effetto • che • il cald • del elemento • del foco • sempre • tira • a se 4i umidi • vapori • e • solte nebbie • e spessi • nuvoli •, i quali • spiccano • da • mari • e altri • paduli • e fiumi • e vmi de 5valli, e quelle tirà • a poco a poco • insino • alla • freda • regione, quella prima parte si ferma, 6 perché • il caldo • e vmiido nò si affà • col freddo • e secco; onde • ferma • la prima parte li asetta la altre • parti, e così, aggiungìosi parte có parte •, si fa • spesse • e oscure nboloe; e spesso sono 8remosse e portate da vèt di una • in altra • regione; dove per la densità loro fanno si spessa gravezza, 9 che cadono có spessa • pioggia •; è se l caldo • del sole s'aggivgnie • alla potètia dello elemento 10del foco •, i nuvoli fieno • tirati piv • alti • e trovano • piv freddo, in nel quale si ghìacciano e cavasasi 11tèpestosa • gràdine •; Òra • quel medesimo • caldo, che tiene • si grà • peso • d'acqua •, come si uede 12pivole • de • nboloe, svolge • l'acque di basso • in alto • dalle base delle mòtagnie, e còducie e, e tiene 13detrò • alle • cime • delle mòtagnie,—le quali, tro • vado qualche fissurna, al • continuo vscièdo, 14 causà i fumi.

nelle inmediatene 5de a liti e se • degitto acquiessto • de cholo quelle. 5dici br. • quale chomnynamè • • chonciecle. 6 no trovremo • pivcipo • • diecio. 7 vedemo • • delle. 8 elluno • assettàrione • • chorno. 9 setu chisiderai be veri [lev] le • deropia • chìchòoro. 10. cîme.

**OF THE HEAT THAT IS IN THE WORLD.**

947. 1. chaldo. 2. vis • "li" • e chalore • quie • domo. [Èse 1 chaldo move lumido • "il freddo lo ferma." 3. chaldo • focho • asse. 4. effotte • neble espessi suboli • • spica de • • fiumi. 5. quele • • apoco apoco • • freda regione [i] e. 6. chaldo • • cholo • esche • li assetta latrè. 7. chòsi aggiugndò • chì. • onacure • espesso sono • [portale]. 8. fano • graucea. 9. chadano chïospa • pioggia essecchisko • • saviggnie. 10. focho • • fredo inel • • diaccion • • cassis. 11. chaldo chetie • • chome. 12. nboli • [iene] diessu • • delle mòtagnie e chòducie le etielle. 13. mòtagnie le quali .. li chomini vscièdo. 14. cassano i fumi.

3000 miles and flow into the Mediterranean by the shores of Egypt; and if we will give to this a fall of ten braccia a mile, as is usually allowed to the course of rivers in general, we shall find that the Nile must have its mouth ten miles lower than its source. Again, we see the Rhine, the Rhone and the Danube—starting from the German parts, almost the centre of Europe, and having a course one to the East, the other to the North, and the last to Southern seas. And if you consider all this you will see that the plains of Europe in their aggregate are much higher than the high peaks of the maritime mountains; think then how much their tops must be above the sea shores.

A. 558

**The Theory of the elevation of water within the mountains.**

Where there is life there is heat, and where vital heat is, there is movement of vapours. This is proved, inasmuch as we see that the element of fire by its heat always draws to itself damp vapours and thick mists as opaque clouds, which it raises from seas as well as lakes and rivers and damp valleys; and these being drawn by degrees as far as the cold region, the first portion stops, because heat and moisture cannot exist with cold and dryness; and where the first portion stops the rest settle, and thus one portion after another being added, thick and dark clouds are formed. They are often wafted about and borne by the winds from one region to another, where by their density they become so heavy that they fall in thick rain; and if the heat of the sun is added to the power of the element of fire, the clouds are drawn up higher still and find a greater degree of cold, in which they form ice and fall in storms of hail. Now the same heat which holds up so great a weight of water as is seen to rain from the clouds, draws them from below upwards, from the foot of the mountains, and leads and holds them within the summits of the mountains, and these, finding some fissure, issue continuously and cause rivers.

**VOL. II.**
Del mare che a molti senplici par più alto che la terra che gli fa liti.

†\text{b} d è una pianura, donde corre \text{v} un fiume al mare, la qual pianura à per termine esso mare; e perché in vero essa terra scoperta \text{n}ò è nel sito dell'equalità, perché seco
til fusse, il fiume non avrebbe mo\text{t}o—onde, movendosi, questo sito \text{t}ù à piu
tosto da essere detto spiaggia, che pianura; e così essa pia
tura \text{d} b termina in tal modo colla spera dell'acqua che, chi la producesse in continua rettitudine in \text{b} a, \text{e} essa entrecbbe sotto il mare, e \text{di} qui nasce, che s\text{a e b} pare più alto che la terra discoperta.

\text{4\textsuperscript{n}}\text{a}Naturalmente nes\text{si}una parte della\text{d} terra discoperta da \text{l'acqua} \text{fia mai} \text{più bassa} che la \text{superficie} della \text{spera d'essa acqua.}

D'ALCUNI che dicono, L'ACQUA ESSERE PIV ALTA che la TERRA SOPUERTA.

\text{2\textsuperscript{a}}Certo non poca ammirazione mi da, la comv\text{ne} opinione fatta còtro al uero dallo universale \text{v} egromor\text{e}’-gividiti dell'omini, e questo è che tutti s'accordano che la superficie del mare \text{sia piv alta} che l'altissime cime delle montagne, alle\text{gàdo molte vane e puerili ragioni, \text{còtro ai quali io n'all'eg\text{er}o solo vna semplice e breve ragione; Noi vediamo chiaro, che \text{se si toggie via l'argine al mare}, che lui verità la terra e faralla di per\text{fetta rotòdità; ever s\text{i}dera quiata terra si leuerebbe a fare che l'èode marine coprisso \text{il} modo; aduce\text{ciò}, che si leuasse, sarebbe piv alto che la ruia del mare.}

Of the sea, which to many fools appears to be higher than the earth which forms its shore.

\text{b} \text{d} is a plain through which a river flows to the sea; this plain ends at the sea, and since in fact the dry land that is uncovered is not perfectly level—for, if it were, the river would have no motion—as the river does move, this place is a slope rather than a plain; hence this plain \text{d} \text{b} so ends where the sphere of water begins that if it were extended in a continuous line to \text{b} \text{a} it would go down beneath the sea, whence it follows that the sea \text{a e b} looks higher than the dry land.

Obviously no portions of dry land left uncovered by water can ever be lower than the surface of the watery sphere.

Of certain persons who say the waters were higher than the dry land.

Certainly I wonder not a little at the common opinion which is contrary to truth, but held by the universal consent of the judgment of men. And this is that all are agreed that the surface of the sea is higher than the highest peaks of the mountains; and they allege many vain and childish reasons, against which I will allege only one simple and short reason: We see plainly that if we could remove the shores of the sea, it would invest the whole earth and make it a perfect sphere. Now, consider how much earth would be carried away to enable the waves of the sea to cover the world; therefore that which would be carried away must be higher than the sea-shore.
A. 964]

Opponente d'alcuni che dicono che l'acqua d'alcuni mari è più alta che le iv alte sommità de' monti; e però sia sospita l'acqua a esse sommità.

L'acqua no si moverà da loco a loco se la bassezza non la tira; ed è per corso naturale, non potrà mai ritornare a altezza simile al primo loco, donde nel uscire de'monti si mostrò al cielo; e quella parte del mare, che falso falso, imaginezione, di diceri, essere si alta, che uesta per le cime de'luì alti monti, per tati secoli sarebbe co-somita e uesta per l'uscita d'esse montagne; Tu puoi bene pesare che tanto teto che Tigris ed Eufrates

anno versato per le sommità de' monti Armeni, che si può credere che tutta l'acqua dell'oceano sia moltissime volte passate per dette bocche; or non credi tu che l'Nilo abbi messo ivacqua in mare, che non è al presente tutto lo elemente dell'acqua, cierto si, e se detta acqua fusse caduta fori di questo corpo della terra, questa machina sarebbe già lungo teto stata sata acqua, sicch'ei può concludere che l'acqua vadi dai fiumi al mare e dal mare ivi fivmi, sempre così raggriràdo e voltàdo, e che tutto il mare e i fivmi sieno passati per la bocca del Nilo infinito volte.


945. 1. mòti erminis che si po . che ["tutta"]lacoq"ta". 2. boche . abì. 3. imare e "al presèteto" tutto esse. 4. fusai caduta . chorro . tara . sarebe. 5. chëchìdcere . 6. ragìgùdo . chettutto . sia passato . bocha; the last two words infinite volte are written on the margin.

945. Monti Armeni. Ermini in the original, in M. Ravaissone's transcript "montis crusingi [le loro ruine]". He renders this "Le Tigre et l'Euphrate se sont déversés par les sommets des montagnes [avec leurs eaux destructrices] on peut croire" &c. Leonardo always writes Ermini, Erminia, for Armeni, Armenis (Arabic: Irminish). M. Ravaissone also deviates from the original in his translation of the following passage: "On tu ne crois pas que le Nil ait mis plus d'eau dans la mer qu'il n'y en a à présent dans tout l'élément de l'eau. Il est certain que si cette eau avait tombée" &c.
II.

ON THE OCEAN.

G. 488]

PERCHÉ L'ACQUA È SALSA.

2 Dicic Pliniio nel 2° suo libro, al 103 capitolo, che l'acqua del mare è salata perchè quell'ardore del sole secca l'umidità c e quello succia, e questo al mare, che è molto s'allarga, dà sapore di sale; 7 Ma questo nò si còcie, perchè se l'acqua del mare avesse causato dallo ardore del sole, 9 e c'è non è dubbio che tanto maggiormente li laghi, stagni e paduli 10 sarebbono più insalati, quanto 11 le loro acque son manco mobili e di minore profondità, e la speranza ci mosse il contrario; tali paduli ci mostrò 14 le loro acque essere al tutto private di saltie semente: Ancora s'assegnia da Pliniio nel medesimo 8 capitolo che tal salside

946. 1 essa ala. 2 a 103 capitoli. 3 chiusaqua . . essalata. 4 [li razi solari] Lardore . . seche “abriore c (1)}",iumi. 5 ecquello . . ecquesto. 6 allargha . . sale [gial.]. 7 Macquesto . . sella. 8 avessi causa della. 9 chelli “tanto maggiormente” iatghi. 10 dove lacque sarebbono. 11 [le] le . . manco . . eddi. 12 ella . . moss. 13 in contrario . . mostrò. 14 tucio. 15 Acora sasegna [nel me]. 16 chapitolo chettal. 17 nascre . . leuato [“oe ogni” porte. 18 dolicie [dellacqua"r] restta laaspra]

946. See Pliny, Hist. Nat. II, CIII [C]. Rughe Solis ardore sicat inquir non: et hoc esse maris sidus accepitmus, torrens cane ta serenaque. (ep. CIV.) Si mara late patenti saporem incogniti salis, aut quia exhausto inde dulci tenuique, quod facilime tractat vis ignem, omne asporius crassiusque linquitur: ideo summa aquarum aqua dulceum profundiain; hanc esse veritatem causam, quam quod mare terrae sube sit ardens; aut quia plurimum ex arido miscatur illi sapore: aut quia terrae natura sient medicatus aquas inficeat . . (ep. CV): altissimum mare XV, stadiorn Fabianus tradit. Alii n Ponto coadverso Coraxorum gentis (sottoma Bala Ponti) trecentis fere a continent dum insidias immensus altitudinem maris tradunt, vidi quamquam reparit. (ep. CVI [CIII]) Mirabilis id faciunt aquae dulces, juxta mare, ut stilis emicant. Nam nec aquarum natura a miraculci caust. Dulces mari invenantur, leviore hau die dulce, Ideo et marinse, quarum natura gravior, magis inveniuntur. Quod si qui vero et dulces inter se superneunt alios,
Terza e vili'ma ragione d'iremo, il sale
4essere in tutte 5ie cose create 6e questo c'7segniano 8ie acque passa9te per tutte le ci10eneri e calci11ni delle cose 12bruciate, e le 13orine di qual14iche anima15le e le super16fulità usci17te de' lor cor18pi e le terre, 19nelle quali si 20cöuerono 21le corru12zioni 22di tutte le cose.

23Ma a dire meglio, essendo dato il modo eterno, egli è necessario 24che li suoi popoli sieno acora loro eterni; ode 25eternalmente fu e sarebbe la spetc vnana cos26matricie del sale; e se tutta la massa

because all the sweet and subtle portions which
the heat attracts easily being taken away, the
more bitter and coarser part will remain, and
thus the water on the surface is fresher than
at the bottom; but this is contradicted by
the same reason given above, which is,
that the same thing would happen in marshes
and other waters, which are dried up by the
heat. Again, it has been said that the
saltness of the sea is the sweat of the
earth; to this it may be answered that
all the springs of water which penetrate
through the earth, would then be salt. But
the conclusion is, that the saltness of the sea
must proceed from the many springs of water which,
as they penetrate into the earth, find
mines of salt and these they dissolve in part,
and carry with them to the ocean and the other
seas, whence the clouds, the begetters of
rivers, never carry it up. And the sea
would be salter in our times than ever it
was at any time; and if the adversary were
to say that in infinite time the sea
would dry up or congeal into salt, to this I an-
swer that this salt is restored to the earth
by the setting free of that part of the earth
which rises out of the sea with the salt it
has acquired, and the rivers return it
to the earth under the sea.

G. 494]

For the third and last reason we will
say that salt is in all created things; and
this we learn from water passed over the
ashes and cinders of burnt things; and the
urine of every animal, and the superfluities
issuing from their bodies, and the earth into
which all things are converted by corruption.

But,—to put it better,—given that the
world is everlasting, it must be admitted that
its population will also be eternal; hence
the human species has eternally been and
would be consumers of salt; and if all the mass
of the earth were to be turned into salt, it

22. Compare No. 948.
della terra fas*7si sale, non basterebbe alli
cibi vmani, per la qual *8cosa ci bisoglia
confessare, o che la pettie del sale *9sia
eterna isieme col modo, o che quella*mora e rinascia insieme cogli omini d’essa
di*1voratori; Ma se la esperienza c’inginna
quel *3non tutte morte per il foco si
manife*istà, il qual non la cosauma, e per
l’acqua che di tato si *4sala di quasto ella
se ne risolute, evaporà*5qua, sempre
il sale resta nella prima quità, *6deve
passare per li corpi vmani che in orina,
*7o sudore, o altre superflìtia fia ritrovato,
and ques*8to è il sale che ogni anno si porta
alle città; adique *9cavasi il sale de’lochi,
dov’è pischia;—li porci e li vetti marini so
salati;—
*10Diremo che la *11pioggia pen*2tratrice
della *31terra sia que’tulla, ch’è sotto *45alli
fonda*3miti delle città e popoli, *48e sia
quella che *49per li meati del*50terra ré
*51da la saltsedi*52ne leutata dal *53mare, e
che *54la mutatì *55del mare, sata*56sopra
tutti *57li monti, lo la*58sci per le minie*59re
ritrovate *60in essi monti ecc.

948.

The waters of the salt sea are fresh at the
greatest depths.

949.

The ocean does not penetrate under
the earth.

The ocean does not penetrate under
the earth, and this we learn from the many
and various springs of fresh water which, in many
parts of the ocean make their way up from
the bottom to the surface. The same thing
is farther proved by wells dug beyond the
distance of a mile from the said ocean,
which fill with fresh water; and this happens
because the fresh water is lighter
than salt water and consequently more penetrating.

Which weighs most, water when frozen
or when not frozen?
ON THE OCEAN.

FRESH WATER PENETRATES MORE AGAINST SALT WATER THAN SALT WATER AGAINST FRESH WATER.

That fresh water penetrates more against salt water, than salt water against fresh is proved by a thin cloth dry and old, hanging with the two opposite ends equally low in the two different waters, the surfaces of which are at an equal level; and it will then be seen how much higher the fresh water will rise in this piece of linen than the salt; by so much is the fresh lighter than the salt.

All inland seas and the gulfs of those seas, are made by, rivers which flow into the sea.

HERE THE REASON IS GIVEN OF THE EFFECTS PRODUCED BY THE WATERS IN THE ABOVE MENTIONED PLACE.

All the lakes and all the gulfs of the sea and all inland seas are due to rivers which distribute their waters into them, and from impediments in their downfall into the Mediterranean—which divides Africa from Europe and Europe from Asia by means of the Nile and the Don which pour their waters into it. It is asked what impediment is great enough to stop the course of the waters which do not reach the ocean.

DE ONDA.

A wave of the sea always breaks in front of its base, and that portion of the crest will then be lowest which before was highest.

952. The page of FRANCESCO DI GIORGIO'S Trattato, on which Leonardo has written this remark, contains some notes on the construction of dams, harbours &c.
953. That the shores of the sea constantly acquire more soil towards the middle of the sea; that the rocks and promontories of the sea are constantly being ruined and worn away; that the Mediterranean seas will in time discover their bottom to the air, and all that will be left will be the channel of the greatest river that enters it; and this will run to the ocean and pour its waters into that with those of all the rivers that are its tributaries.

954. How the river Po, in a short time might dry up the Adriatic sea in the same way as it has dried up a large part of Lombardy.

955. Where there is a larger quantity of water, there is a greater flow and ebb, but the contrary in narrow waters.

Look whether the sea is at its greatest flow when the moon is half way over our hemisphere [on the meridian].

956. Whether the flow and ebb are caused by the moon or the sun, or are the breathing of this terrestrial machine. That the flow and ebb are different in different countries and seas.

957. Book 9 of the meeting of rivers and their flow and ebb. The cause is the same in the sea, where it is caused by the straits of Gibraltar. And again it is caused by whirlpools.

953. acquistano . . . mero . . . lascogli. 3. essi chonsuñano Come e . . . scopiranno . . esol. 4. magor. 5. cósseco sacópagnano.
954. 1. secha. 2. assecho.
955. 1. be magior. 2. fruso e refruso. 4. gharda. 5. mero.
956. 1. fruso e refruso nasace. 2. terese . . fruso e refruso.
957. 1. isconari . . ellor fruso e refruso ella. 2. chausa . . strett[i] o di gibilatar . . achade . . voragine.

956. 1. Allusion may here be made to the mythological explanation of the ebb and flow given in the Edda. Útgardlóki says to Thor (Gylfaginning 43): "When thou wast drinking out of the horn, and it seemed to thee that it was slow in emptying a wonder beffell, which I should not have believed possible; the other end of the horn lay in the sea, which thou sawest not; but when thou shalt go to the sea, thou shalt see how much thou hast drunk out of it. And that men now call the ebb tide." Several passages in various manuscripts treat of the ebb and flow. In collecting them I have been guided by the rule only to transcribe those which named some particular spot.
DEL FLUSSO E RIFLUSSO.

Tutti li mari anno il lor flusso e riflusso in vn medesimo tempo, ma pare variarsi, perchè li giorni nò co"minciano in vn medesimo tempo in tutto l'universo, così oché, quado nel nostro emisferio è mezzo 'giorno, nell'opposto emisferio è mezzanotte, e nelle congiuntioni orizzontali dell'un e dell'altro emisferio comincia la notte che corre dirieto al giorno, e nelle congiuntioni occidentali dell'essi emisferi comincia il giorno che seguita la notte dalla sua opposita parte ; adunque è conchiuso che, ancora che 'l detto accrescimento e diminuzione delle altezze dell'acqua, per essere luì 1 lungo 3 mila miglia, e l flusso e riflusso nò fa se nò 4 volte in 24 ore, e nò s'accorderebbe tale effetto col tenpo d'esse 24 ore, se esso Mare Mediτerraneo nò fosse lungo semila miglia, perchè se lo spogliamento di tanto mare avesse a passare per lo stretto di Gibiltar nel correr dietro allora luna, e sarebbe si gráde il corso delle acque per tale stretto, e s'alzerebbe in tāta altezza, 19 che dopo esso stretto farebbe tal corso, che per molte miglia infra l'oceáno farebbe inòdatione e bollismenti grandissimi, per la qual cosa sarebbe impossibile passararui, e dopo questo subito l'oceáno non rerderebbe colla medesima furia l'acque ricevute, donde esso le riceve;


All seas have their flow and ebb in the same period, but they seem to vary because the days do not begin at the same time throughout the universe; in such wise as that when it is midnight in our hemisphere, it is midnight in the opposite hemisphere; and at the Eastern boundary of the two hemispheres the night begins which follows on the day, and at the Western boundary of these hemispheres begins the day, which follows the night from the opposite side. Hence it is to be inferred that the above mentioned swelling and diminution in the height of the seas, although they take place in one and the same space of time, are seen to vary from the above mentioned causes. The waters are then withdrawn into the fissures which start from the depths of the sea and which ramify inside the body of the earth, corresponding to the sources of rivers, which are constantly taking from the bottom of the sea the water which has flowed into it. A sea of water is incessantly being drawn off from the surface of the sea. And if you should think that the moon, rising at the Eastern end of the Mediterranean sea must there begin to attract to herself the waters of the sea, it would follow that we must at once see the effect of it at the Eastern end of that sea. Again, as the Mediterranean sea is about the eighth part of the circumference of the aqueous sphere, being 3000 miles long, while the flow and ebb only occur 4 times in 24 hours, these results would not agree with the time of 24 hours, unless this Mediterranean sea were six thousand miles in length; because if such a superabundance of water had to pass through the straits of Gibraltar in running behind the moon, the rush of the water through that strait would be so great, and would rise to such a height, that beyond the straits it would for many miles rush so violently into the ocean as to cause floods and tremendous seething, so that it would be impossible to pass through. This agitated ocean would afterwards return the waters it
PHYSICAL GEOGRAPHY.

ecce che adunque mai si passerebbe per tale stretto, e la sperienza mostra che d’ogni ora vi si passa, salvo che quando il vento vié per la linia della corrente, allora il riufluso forte s’auméta; Il mare non alza l’acqua nelle stretti che anno vescita ma ben s’ingorga e si ritarda dináti a quelli, onde con furioso moto poi ritorna il tempo del suo ritardaméto insino al fin del suo moto riflesso.

Leic. 139]

Come il flusso e riuflusso non è generale, perché in riuiera di Genova non fa niéte, a Vinegia due braccia, tra la Inghilterra e Fiandra fa 18 braccia; Come per lo stretto di Sicilia la corrente è grádisima, perché di lì passa tutte l’acque de’ fiumi che ursa nel Mare Adriatico.

Leic. 354]

Nelle parti occidentali, appresso alla Fiandra, il mare cresce e màca ogni 6 ore circa 20 braccia, e 22 quando la luna è in suo favore, ma le 20 braccia è il suo ordinario, quale ordinario manifestaméte si uede non essere per cava della luna; Questa varietà del crescere e discrescere del mare ogni 6 ore può accadere per le ringorgazion delle acqua, le quali son condotte nel Mare Mediterrano da quella quantità de’ fiumi dell’Africa Asia ed Europa, che in esse mare versano le loro acque, le quali per lo stretto di Gibraltar infra Abila

959. That the flow and ebb are not general; for on the shore at Genoa there is none, at Venice two braccia, between England and Flanders 18 braccia. That in the straits of Sicily the current is very strong because all the waters from the rivers that flow into the Adriatic pass there.

960. In the West, near to Flanders, the sea rises and decreases every 6 hours about 20 braccia, and 22 when the moon is in its favour; but 20 braccia is the general rule, and this rule, as it is evident, cannot have the moon for its cause. This variation in the increase and decrease of the sea every 6 hours may arise from the damming up of the waters, which are poured into the Mediterranean by the quantity of rivers from Africa, Asia and Europe, which flow into that sea, and the waters which are given to it by those rivers; it pours them to the ocean

958. 23. In attempting to get out of the Mediterranean, vessels are sometimes detained for a considerable time; not merely by the causes mentioned by Leonardo but by the constant current flowing eastwards through the middle of the straits of Gibraltar.

959. A few more recent data may be given here to facilitate comparison. In the Adriatic the tide rises 2 and 1/4 feet, at Terracina 1 1/4. In the English channel between Calais and Kent it rises from 18 to 20 feet. In the straits of Messina it rises no more than 2 1/2 feet, and that only in stormy weather, but the current is all the stronger. When Leo-
nardo accounts for this by the southward flow of all the Italian rivers along the coasts, the explanation is at least based on a correct observation; namely that a steady current flows southwards along the coast of Calabria and another northwards, along the shores of Sicily; he seems to infer, from the direction of the first, that the tide in the Adriatic is caused by it.

960. 5. Abila, Lat. Abyla, Gr. 'Abyla, now Sierra Ximena near Ceuta; Calpe, Lat. Calpe, Gr. Calpe, now Gibraltar. Leonardo here uses the ancient names of the rocks, which were known as the Pillars of Hercules.
e Calpe 6 promôtori rende all’oceano le acqua che da essi fiumi li son date, il quale oceano, astendendosi 7 infra le isole d’Inghilterra e l’altri più settentrionali, si uiene a ringorgare e tenere in colo per diversi golfi, 8 li quali, essendo tali mari discostiati, si colla lor superficie dal centro del modo, ò acquistato peso, il quale, 9 poichè supera la potenzia dell’avenimeto delle acque che lo cavauano, essa acqua ripiglia im 10 peto in contrario al suo avenimeto, e fa impeto contro alli stretti, che li davano l’acque e massime fa 11 contra lo stretto di Gibilter, il quale per alquito spatio di tempo rimâ ringorgato e viene a riseruarsi tut 12 te l’acque che di novo in tal tempo li sò date dalli già detti fiumi, e questa mi pare una delle ragioni che 13 si potrebbe assegnare della causa d’esso flusso e riflusso, come nella 21ª del 4ª della mia teori 14 ca è provato.

through the straits of Gibraltar, between Abila and Calpe [5]. That ocean extends to the island of England and others farther North, and it becomes dammed up and kept high in various gulfs. These, being seas of which the surface is remote from the centre of the earth, have acquired a weight, which as it is greater than the force of the incoming waters which cause it, gives this water an impetus in the contrary direction to that in which it came and it is borne back to meet the waters coming out of the straits; and this it does most against the straits of Gibraltar; these, so long as this goes on, remain dammed up and all the water which is poured out meanwhile by the aforementioned rivers, is pent up [in the Mediterranean]; and this might be assigned as the cause of its flow and ebb, as is shown in the 21st of the 4th of my theory.

6. astendendosi. 7. infra le isola digiterta ìlia altre.. settentrionali.. estenere. 8. cholla .. del mò .. ano. 9. chello .. ripiglia ò. 10. peto .. impito .. chelli. 12. ta .. lacq”a” .. ga detti .. ecquestion .. chausa .. frusso e refrusso comi. 14. cha e.
III.

SUBTERRANEAN WATER COURSES.

C. A. 1574; 466

Grădăsăimi flumă corrono sotto terra.

Very large rivers flow under ground.

962.

This is meant to represent the earth cut through in the middle, showing the depths of the sea and of the earth; the waters start from the bottom of the seas, and ramifying through the earth they rise to the summits of the mountains, flowing back by the rivers and returning to the sea.

963.

The waters circulate with constant motion from the utmost depths of the sea to the highest summits of the mountains, not obeying the nature of heavy matter; and in this case it acts as does the blood of animals which is always moving from the sea of the heart and flows to the top of their heads; and here it is that veins burst—as one may see when a vein bursts in the nose, that all the blood

963. The greater part of this passage has been given as No. 849 in the section on Anatomy.
alla altezza della rott a vena; 5 Quando l'acqua escie della rott a vena della terra, essa osserr a la natura dell' altre cose piu gravi 6 che l'aria, onde senpre cerca i lochi bassi. 7 Vaño 8 e leene scorred o con infinita ramificazione pel corpo della terra.

Br. M. 233,4] Q uella caus a, che move li umori in tutte le spetie de' corpi animati e che c0 quelle soccorre a ogni lesione, 2 move l'acqua dal-1'infima profondità del mare alla soüa altezza de' moti, 3 e come l'acqua si leua dalle 4 inferiori parti della vite all'alte tagliature.

Br. M. 236,4] L'acqua è proprio quella che per vitale umore 2 di questa arida terra è dedicata, e 3 quella caus a che la move per le sue ramificat e vene -còt o al natural corso de- 5 le cose gravi, è proprio quella che mo6ve li umori in tutte le spetie de' corpi animat i; Ma quella, con sòma amìrati o de' sua contem- planti, dall'infima pro9fondità del mare all'altissime soñità 10 de' moti si leu a, e per le rotte - vene ver12sando al basso mare - ritorna, e di novo 13 con celerità - sormòta, e all' âti- detto de'3asceno - ritorna, così dalle parti intrifisciche al- l'esteriori, così dalle infime alle 15 superiori, voltádo - quádo con naturale cor16so ruina, così insieme cogiunta, così 17 cótina revoluzione, 18 per li terrestri meati si ua raggiárd o.

G. 70a] SE L'ACQUA PÚ MÔTARE DAL MARE ALLE CIME DEI MONTI.

Il mare oceano nò può penetrare 4 dalie radici alle cime de' moti che con lui sc0- 3 Il mare oceano nò può penetrare 4 dalie radici alle cime de' moti che con lui sc0-

... ve "ne", 5. esscie. 6. grave chellaria ... cercha.
964. 1. socore ... lesione. 2. frofodità ... altezza. 3. come [il sangue] laqo'ta'. 4. tagliature de. here the text breaks off.
965. 1. laqo'ta'. 2. omore. 3. quest a ... dedicat a. 4. chióto de. 5. chose. 6. omori ... lasspetie. 7. che chüsima ami.
8. contemplant i ["e che" dall. 10. roote. 12. como celerita ... lisi. 13. scienco. 15. cho. 17. cótina revoluzione sìu

966. 1. sellaqo'ta' mûtare. 3. occean o. 4. radici ... collui. 5. sul si leua quasto la seccità. 6. Bae. 7. cheppienetra.

964—966. SUBTERRANEAN WATER COURSES.

from below rises to the level of the burst vein. When the water rushes out of a burst vein in the earth it obeys the nature of other things heavier than the air, whence it always seeks the lowest places. [7] These waters traverse the body of the earth with infinite ramifications.

The same cause which stirs the humours in every species of animal body and by which every injury is repaired, also moves the waters from the utmost depth of the sea to the greatest heights.

It is the property of water that it constitutes the vital human of this arid earth; and the cause which moves it through its ramified veins, against the natural course of heavy matters, is the same property which moves the humours in every species of animal body. But that which crowns our wonder in contemplating it is, that it rises from the utmost depths of the sea to the highest tops of the mountains, and flowing from the opened veins returns to the low seas; then once more, and with extreme swiftness, it mounts again and returns by the same descent, thus rising from the inside to the outside, and going round from the lowest to the highest, from whence it rushes down in a natural course. Thus by these two movements combined in a constant circulation, it travels through the veins of the earth.

The water of the ocean cannot make its way from the bases to the tops of the mountains.
which bound it, but only so much rises as the dryness of the mountain attracts. And if, on the contrary, the rain, which penetrates from the summit of the mountain to the base, which is the boundary of the sea; descends and softens the slope opposite to the said mountain and constantly draws the water, like a syphon[17] which pours through its longest side, it must be this which draws up the water of the sea; thus if $sn$ were the surface of the sea, and the rain descends from the top of the mountain $a$ to $n$ on one side, and on the other sides it descends from $a$ to $m$, without a doubt this would occur after the manner of distilling through felt, or as happens through the tubes called syphons[17]. And at all times the water which has softened the mountain, by the great rain which runs down the two opposite sides, would constantly attract the rain $a$ $n$, on its longest side together with the water from the sea, if that side of the mountain $a$ $m$ were longer than the other $a$ $n$; but this cannot be, because no part of the earth which is not submerged by the ocean can be lower than that ocean.

967.

**DELLE VENNE DEll'ACQUA SOPRA LE CIME DELLE MÖTANIE.**

8. Chiario . apparisce . che tutta la superficie dell'oceano, quando non à fortuna , è di pari distàtia s al ciëtro della terra, e che le cime delle mötanie sono tanto . piv lontane . da esso ciëtro . quito . elle s'alzano sopra alla superficie d' esso . mare ; Adauche se 'l corpo della terra non avesse similitudine . col'omo . sarebbe impossibile . che l'acqua . del mare . essendo pivo . bassa . che le mötanie . ch'ella potesse . di sua natura . salire . alle . sommità . d'esse mötanie ; 7 Onde è da credere . che quella . cagione . che tiene il sangue . nella . sommità della . testa . dell'omo , quella . medesima . tenga l'acqua . nella . sommità . de' monti.


967. 968. This conception of the rising of the blood, which has given rise to the comparison, was recognised as erroneous by Leonardo himself at a later period. It must be remembered that
SUBTERRANEAN WATER COURSES.

968. [A. 964]

Della còfermazione perchè l'acqua è nelle somità de'mòti.

2 Dico che siccome il naturale calore tiene il sàgue nelle uene alla sommità dell'omo, e quado lo omo è morto, esso sangue freddo si riduce in lochi bassi, e, quado il sole riscalda la testa all'omo, sòlitàpica e soprafiene tato sangue con omorì, che forzando le uene s'gienera spesso dolori di testa, similemente le uene che vanno ramificato per il corpo della terra e per lo naturale calore, ch'è sparsò per tutto il còti nete corpo, l'aqua sta per le uene elevate all'alte cime de'mòti; E quel-la acqua, che passasi per uno condotto mivrato nel corpo d'essa mòtagnia, come cosa morta non uscirà dalla sua prima bassezza, perché non è riscaldata dal vitale calore della prima vena; ancora il calore dell'elemento del fuoco, e il giorno il caldo del sole, anno potèria di suglieri l'umidità de' bassi lochi de'mòti e tirare in alto nel medesimo modo ch'ella tira i nvvoli e suglie la loro vmidità dal letto del mare.

969.

Come molte vene d'acqua salata si trovano forteméte distanti dal mare, e questo potrebbe accadere, perché tal uena passasse per qualche miniera di sale come quella d'Ungheria, che si cauà il sale per le grandi cave, come quasi cavano le pietre.

That many springs of salt water are found at great distances from the sea; this might happen because such springs pass through some mine of salt, like that in Hungary where salt is heewn out of vast caverns, just as stone is heewn.

968. 1. chòfermazione... 2. dichò cheshichome... 3. chalore tie "il sàgue" leuene alla somitá. 3. [cho] e quado [esso] "lo" omo... 4. basi [chos] echauádo il... 5. lochi pricha e soprafiene... 6. vano ramificádo. 7. lochórpo... 8. chalori chesparrau... 9. chorpor... 10. chomé chos... 11. riscaldata... 12. cheffor-zádo. 13. lochi "de mòti"... 14. svvoli essuglie... 15. quasi cauà.

969. 1. trova... 2. echó... 3. cheshi... 4. quasi cauà.

the MS. A, from which these passages are taken, was written about twenty years earlier than the MS. Leic. (Nos. 953 and 849) and twenty-five years before the MS. W. An. IV.

There is, in the original a sketch with No. 968 which is not reproduced. It represents a hill of the same shape, as that shown at No. 982. There are veins, or branched streams, on the side of the hill, like those on the skull Pl. CVIII, No. 4.

969. The great mine of Wieliczka in Galicia, out of which a million cwt. of rock-salt are annually dug out, extends for 3000 metres from West to East, and 1150 metres from North to South.
IV.

OF RIVERS.

Of the origin of rivers.

The body of the earth, like the bodies of animals, is intersected with ramifications of waters which are all in connection and are constituted to give nutriment and life to the earth and to its creatures. These come from the depth of the sea and, after many revolutions, have to return to it by the rivers created by the bursting of these springs; and if you chose to say that the rains of the winter or the melting of the snows in summer were the cause of the birth of rivers, I could mention the rivers which originate in the torrid countries of Africa, where it never rains—and still less snows—because the intense heat always melts into air all the clouds which are borne thither by the winds. And if you chose to say that such rivers, as increase in July and August, from the snows which melt in May and June from the sun's approach to the snows on the mountains of Scythia[9], and that such meltings come down into certain valleys and form lakes, into which they enter by springs and subter-

970. 9. Scythia means here, as in Ancient Geography, the whole of the Northern part of Asia as far as India.
971. Quando le correnti d'acqua dell'origine del Nilo, questo non è falso, perche è piu bassa la Scizia che l'origine del Nilo, conciosiachè la Scizia è presso al mare di Potò a 400 miglia, e l'origine del Nilo è remoto 3000 miglia dal mare d'Egitto, ove versà le sue acque.

Lecc. 50^ [Libro 9o dell' scontri de' fiumi e lor flusso e riflusso, e la medesima causa lo crea nel mare per causa dello stretto di Gribilterra, e ancora accade per le uragani; 3 Se due fiumi insieme si scontrano per una medesima linea, la quale sia retta, poi infra 2 angoli retti pigliano insieme lor corso, e' seguirà il flusso e riflusso ora a l'uno fiume, ora all'altro, avanti che si sieno visti e massime, se l'uscita nella loro vintione no sarà piii veloce, che qu'èerà div. Qui accadono 4 casi.

972. Quando il fiume minore versa le sue acque nel maggior, il quale maggior corre dall'opposita riva, allora il corso del fiume minore piegherà il suo corso inverso l'auemimo del fume maggior, e questo accade perché, quando esso maggior fiume enpie d'acqua tutto il suo letto, e' gli viene a fare ritroso sotto la bocca di tal fiume, e così spingne co seco /; t'acqua versata dal fiume minore; Quando il fiume minore versa le sue acque nel fiume maggior, il quale abbia la corrente alla foce del minore, allora le sue acque si piegheranno inverso la sua ranae caves to issue forth again at the sources of the Nile, this is false; because Scythia is lower than the sources of the Nile, and, besides, Scythia is only 400 miles from the Black sea and the sources of the Nile are 3000 miles distant from the sea of Egypt into which its waters flow.

Book 9, of the meeting of rivers and of the tide in estuaries. [3] If two rivers meet together to form a straight line, and then below two right angles take their course together, the flow and ebb will happen now in one river and now in the other above their confluence, and principally if the outlet for their united volume is no swifter than when they were separate. Here occur 4 instances.

972. When a smaller river pours its waters into a larger one, and that larger one flows from the opposite direction, the course of the smaller river will bend up against the approach of the larger river; and this happens because, when the larger river fills up all its bed with water, it makes an eddy in front of the mouth of the other river, and so carries the water poured in by the smaller river with its own. When the smaller river pours its waters into the larger one, which runs across the current at the mouth of the smaller river, its waters will bend with the downward movement of the larger river.

971. 1. iscontri . ellor fruso e refrusso alta. 2. chausa . stret [i] o di gibilter . achade . uragane. 3. retta e pol. 4. pigli. 5. refusso. 5. chessi. 6. lussita nedella. 6. achade 4 chasi.

972. 1. magore il equa "magore" corra "dall'opposita riva" [remoto dalla sua]. 2. piegera. 3. magore equesto accade . magor . letto cl. 4. affare retroso . bocha. 5. magore. 6. achade 4 chasi. 7. magore.

972. The first two lines of this passage have already been given as No. 971. In the margin, near line 3 of this passage, the text given as No. 919 is written.

972. In the original sketches the word Arno is written at the spot here marked A, at R. Bifredi, and at M. Magnone.
When the fulness of rivers is diminished, then the acute angles formed at the junction of their branches become shorter at the sides and wider at the point; like the current $a$ $n$ and the current $d$ $n$, which unite in $n$ when the river is at its greatest fulness. I say, that when it is in this condition if, before the fullest time, $d$ $n$ was lower than $a$ $n$, at the time of fulness $d$ $n$ will be full of sand and mud. When the water $d$ $n$ falls, it will carry away the mud and remain with a lower bottom, and the channel $a$ $n$ finding itself the higher, will fling its waters into the lower, $d$ $n$, and will wash away all the point of the sand-spit $b$ $c$ $n$, and thus the angle $a$ $c$ $d$ will remain larger than the angle $a$ $n$ $d$ and the sides shorter, as I said before.

G. 48a]

**Aqua.**

Del moto d'ò subito enpito fatto 3 da un fiume sopra il suo letto asciutto.

4 Tanto è più tardo o velocie il corso dell’acqua, 5 data dallo isboccato lago al secco fivime, quà to esso fiume fia più largo o piv stretto, over 7 più piano o cupo in un loco che in un altro, 8 per quel che è proposto: il flusso e rivflusso del mare che dallo oceano entra nel Mezoètiterraneo Mare e de’ fiumi, che giostrano 9 con lui, alzano tanto più o meno le loro acque, 10 quanto tal mare è piv o meno stretto.

C. A. 362; 1134]

**Water.**

Of the movement of a sudden rush made by a river in its bed previously dry.

In proportion as the current of the water given forth by the draining of the lake is slow or rapid in the dry river bed, so will this river be wider or narrower, or shallower or deeper in one place than another, according to this proposition: the flow and ebb of the sea which enters the Mediterranean from the ocean, and of the rivers which meet and struggle with it, will raise their waters more or less in proportion as the sea is wider or narrower.

Whirlpools. Voragine, cioè caverne, cioè residui d’acque precipitose.

Whirlpools, that is to say caverns; that is to say places left by precipitated waters.

...
Dei corsi sotterranci delle acque, sicome quelli che son fatti infra l'aria e la terra, son quelli che al continuo e'cosumano e profondano li letti dell'oli lor corsi.

Il fiume che esce de' moti pone gran quietà di sassi grossi in nel suo ghiareto, i quali fatti sono ancora con parte de' suoi angoli e lati, e nel processo del corso conduce pietre minori con angoli piov co-sumati, cioè le grà pietre, ma minori, e pia oltre pò ghiaia grossa, e poi minvta, e seguita renna grossa, e poi minvta, dipoi procede liita grossa, e poi piov sottile, e così seguedo giugne al mare l'acqua turbra di renna e di litta; la renna scarica sopra de' liti marini per il riguigiatàmè dell'òde salse, e segue la litta di tanta sottilità che par di natura d'acqua, la qual non si fer-ma sopra de' mari liti, ma ritorna indietro coll'acqua per la sua leuità, perché nata di foglie marcie e d'altr' cose leüissime, si che, essendo quasi, com'è detto, di natura d'acqua, essa poi in tempo di bonaccia si scarica e si ferma sopra del fondo del mare, ove per la sua sottilità si condensa e resiste all'onde che sopra vi passano per la sua lubricità, e qui stanno i nichì e quest'è terra bianca da far boccali.

Tutte l'uscite dell'acque dal monte nel mare portà ço seco li sassi del monte in esso mare, e per la inòdatione dell'acque marine contro alli sue monti, esse pietre erà ributta-te inverso il móte, e nell'àiadare e nel ritornare indietro delle acque al mare, le pietre insieme ciò quella tornavano, e nel ritornare li angoli loro insieme si per-cuoteano, e come parte men resistingente alle percosse si còsumavano e faccan le pietre sanza angoli, in figu'ra rotonda, come ne' liti dell'Élsa si dimostra, e quelle rimanèva piov grosse, che manco sarà remosù dal lor

A river that flows from mountains deposits a great quantity of large stones in its bed, which still have some of their angles and sides, and in the course of its flow it carries down smaller stones with the angles more worn; that is to say the large stones become smaller. And farther on it deposits coarse gravel and then smaller, and as it proceeds this becomes coarse sand and then finer, and going on thus the water, turbid with sand and gravel, joins the sea; and the sand settles on the sea-shores, being cast up by the salt waves; and there results the sand of so fine a nature as to seem almost like water, and it will not stop on the shores of the sea but returns by reason of its lightness, because it was originally formed of rotten leaves and other very light things. Still, being almost—as was said—of the nature of water itself, it afterwards, when the weather is calm, settles and becomes solid at the bottom of the sea, where by its fineness it becomes compact and by its smoothness resists the waves which glide over it; and in these shells are found; and this is white earth, fit for pottery.

All the torrents of water flowing from the mountains to the sea carry with them the stones from the hills to the sea, and by the influx of the sea-water towards the mountains; these stones were thrown back towards the mountains, and as the waters rose and retired, the stones were tossed about by it and in rolling, their angles hit together; then as the parts, which least resisted the blows, were worn off, the stones ceased to be angular and became round in form, as may be seen on the banks of the Elsa. And those remained larger which were less removed
nascimeto; e così quella si facea minore, che piv si rimouea dal predotto loco, in modo che nel procedere ella si couerte in ghiaja minvta, e poi in renas e in ultimo in fango ; dipoi che 'l mare si discosta dalli predetti monti, la salsedine lasciatà dal mare con altro umore della terra a fatta vna collegatione a essa ghiaja e renas, che la hghiaja in sasso e la renas in tufo s'è convertita; E' di questo si uede l'esemplò 1 in Adda all'uscire de' monti di Como e in Tesino, Adige, Oglio dall'alpi de' Tedeschi, e il si'mile d'Arno dal monte Albano intorno a Monte Lupo e Capraia, doue li sassi grandissimi son tutti di ghiaia cògelata di diuerse pietre e colori.

from their native spot; and they became smaller, the farther they were carried from that place, so that in the process they were converted into small pebbles and then into sand and at last into mud. After the sea had receded from the mountains the brine left by the sea with other humours of the earth made a concretion of these pebbles and this sand, so that the pebbles were converted into rock and the sand into tufa. And of this we see an example in the Adda where it issues from the mountains of Como and in the Ticino, the Adige and the Oglio coming from the German Alps, and in the Arno at Monte Albano[13], near Monte Lupo and Capraia where the rocks, which are very large, are all of conglomerated pebbles of various kinds and colours.

978. 13. At the foot of Monte Albano lies Vinci, the birth place of Leonardo. Opposite, on the other bank of the Arno, is Monte Lupo.
V.

ON MOUNTAINS.

Mountains are made by the currents of the formation of mountains; mountains are destroyed by the currents of rivers.

Mountains are made by the currents of rivers.

Mountains are destroyed by the currents of rivers.

That the Northern bases of some Alps are not yet petrified. And this is plainly to be seen where the rivers, which cut through them, flow towards the North; where they cut through the strata in the living stone in the higher parts of the mountains; and, where they join the plains, these strata are all of potter's clay; as is to be seen in the valley of Lamona where the river Lamona, as it issues from the Appenines, does these things on its banks.

That the rivers have all cut and divided the mountains of the great Alps one from the other. This is visible in the order of the stratified rocks, because from the summits of the banks, down to the river the correspondence of the strata in the rocks is visible on either side of the river. That the

979. Compare 789.
Le sommità de' monti per il lungo tempo senpre s'inalzano;  
I lati opposti de' monti senpre s'auicinano; le profondità delle ualli, le quali son sopra la spera dell'acqua, per lungo il tempo senpre s'appropinquano al centro del mondo;  
In equal tempo molto piu' si profondano le ualli che non s'alzano i monti;  
Le base de' monti senpre si fanno piu' strette;  
Quanto la ualle piva profonda, piva consu ma ne' suoi lato in piu' breve tempo.

In ogni concavità delle cime de' monti senpre si troveranno li piegamèti delle falde delle pietre.

Le sommità dei monti sono tutti i gradi de' fanghi posati l'un sopra l'altro per le inondazioni de' fiumi; Come le diuerse grossezze delle falde del monti piregno da diuerse inondazioni de' fiumi, cioè maggiore ondazione o minore.

The summits of mountains for a long time rise constantly.

The opposite sides of the mountains always approach each other below; the depths of the valleys which are above the sphere of the waters are in the course of time constantly getting nearer to the centre of the world.

In an equal period, the valleys sink much more than the mountains rise.

The bases of the mountains always come closer together.

In proportion as the valleys become deeper, the more quickly are their sides worn away.

In every concavity at the summit of the mountains we shall always find the divisions of the strata in the rocks.

Del mare che cigne la terra.

Io trouevo il sito della terra essere ab antico nelle sue pianure tutto occupato e coperto dall'acque salse ecc.

Of the sea which encircles the earth.

I find that of old, the state of the earth was that its plains were all covered up and hidden by salt water.

Leipzig 1873, p. 86. However, his reading of the text differs from mine.
Since things are much more ancient than the authorities for the study of the structure of the earth, it is no marvel if, in our day, no records exist of these seas having covered so many countries; and if, moreover, some records had existed, war and conflagrations, the deluge of waters, the changes of languages and of laws have consumed every thing ancient. But sufficient for us is the testimony of things created in the salt waters, and found again in high mountains far from the seas.

984. Since things are much more ancient than the authorities for the study of the structure of the earth, it is no marvel if, in our day, no records exist of these seas having covered so many countries; and if, moreover, some records had existed, war and conflagrations, the deluge of waters, the changes of languages and of laws have consumed every thing ancient. But sufficient for us is the testimony of things created in the salt waters, and found again in high mountains far from the seas.
In this work you have first to prove that the shells at a thousand braccia of elevation were not carried there by the deluge, because they are seen to be all at one level, and many mountains are seen to be above that level; and to inquire whether the deluge was caused by rain or by the swelling of the sea; and then you must show how, neither by rain nor by swelling of the rivers, nor by the overflow of this sea, could the shells—being heavy objects—be floated up the mountains by the sea, nor have carried there by the rivers against the course of their waters.

VI.

GEOLOGICAL PROBLEMS.

In questa tua opera tu ài in prima a provare, come li nichì in mille braccia d'altura nò ui furò 2 portati dal diluvio, perché si uedono a ù medesimo liuello, e si vedono auazare assai mòtì sopra 3 esso liuello, e à dimàdare se 'l diluvio fu per piogga o per ringorgamèto di mare, e poi àì 4 a mostrar, che nè per pioggia che ingrossì i fumì, nè per rigonfiamèto d'esso mare; li nichì, come cosa 5grave, non sono sospinti dal mare allì motì, nè tirati a se dallì fumì ciòtò al corso delle 6loro acque.

C. A. 152a; 452a

DUBITATIONE.

Here a doubt arises, and that is: whether the deluge, which happened at the time of Noah, was universal or not. And it would

985. The passages, here given from the MS. Leic., have hitherto remained unknown. Some preliminary notes on the subject are to be found in MS. F 80a and 80b; but as compared with the fuller treatment here given, they are, it seems to me, of secondary interest. They contain nothing that is not repeated here more clearly and fully. **LIBRI, Histoire des Sciences mathématiques III,** pages 218—221, has printed the text of F 80a and 80b, therefore it seemed desirable to give my reasons for not inserting it in this work.
Se tu dirai che li nichil, che per li confini d'Italia lontano dalli mari in tâta altezza si ueggano alli nostri tempi, siano stati per causa del diluvio che li lâ lasciò, io ti rispôdo che, credendo tu che tal diluvio superasè il piv alto monte 7 cubiti, come scrisse chi li misurò, tali nichil che sempre stanno vicini ai litri del mare, e' doveano restare sopra tali mötagni, e nó si poco sopra le radìci de' monti per tutto a vna medesima altezza a suoli a suoli; E se tu dirai che essendo tali 7 nichil vaghi di stare vicini alli litri marini e che, cresceô in tâta altezza, che li nichil si partirono da esso lor primo sito e seguirono l'accrescimento delle acque insino alla lor 9soma altezza, Qui si risponde che, sendo il nichio anima-seem not, for the reasons now to be given: We have it in the Bible that this deluge lasted 40 days and 40 nights of incessant and universal rain, and that this rain rose to ten cubits above the highest mountains in the world. And if it had been that the rain was universal, it would have covered our globe which is spherical in form. And this spherical surface is equally distant in every part, from the centre of its sphere; hence the sphere of the waters being under the same conditions, it is impossible that the water upon it should move, because water, in itself, does not move unless it falls; therefore how could the waters of such a deluge depart, if it is proved that it has no motion? and if it departed how could it move unless it went upwards? Here, then, natural reasons are wanting; hence to remove this doubt it is necessary to call in a miracle to aid us, or else to say that all this water was evaporated by the heat of the sun.

Del diluvio e de'nichil marini.

Se tu dirai che li nichil, che per li confini d'Italia lontano dalli mari in tâta altezza si ueggano alli nostri tempi, siano stati per causa del diluvio che li lâ lasciò, io ti rispôdo che, credendo tu che tal diluvio superasè il piv alto monte 7 cubiti, come scrisse chi li misurò, tali nichil che sempre stanno vicini ai litri del mare, e' doveano restare sopra tali mötagni, e nó si poco sopra le radìci de' monti per tutto a vna medesima altezza a suoli a suoli; E se tu dirai che essendo tali 7 nichil vaghi di stare vicini alli litri marini e che, cresceô in tâta altezza, che li nichil si partirono da esso lor primo sito e seguirono l'accrescimento delle acque insino alla lor 9soma altezza, Qui si risponde che, sendo il nichio anima-seem not, for the reasons now to be given: We have it in the Bible that this deluge lasted 40 days and 40 nights of incessant and universal rain, and that this rain rose to ten cubits above the highest mountains in the world. And if it had been that the rain was universal, it would have covered our globe which is spherical in form. And this spherical surface is equally distant in every part, from the centre of its sphere; hence the sphere of the waters being under the same conditions, it is impossible that the water upon it should move, because water, in itself, does not move unless it falls; therefore how could the waters of such a deluge depart, if it is proved that it has no motion? and if it departed how could it move unless it went upwards? Here, then, natural reasons are wanting; hence to remove this doubt it is necessary to call in a miracle to aid us, or else to say that all this water was evaporated by the heat of the sun.

987. Of the deluge and of marine shells.

If you were to say that the shells which are to be seen within the confines of Italy now, in our days, far from the sea and at such heights, had been brought there by the deluge which left them there, I should answer that if you believe that this deluge rose 7 cubits above the highest mountains—as he who measured it has written—these shells, which always live near the sea-shore, should have been left on the mountains; and not such a little way from the foot of the mountains; nor all at one level, nor in layers upon layers. And if you were to say that these shells are desirous of remaining near to the margin of the sea, and that, as it rose in height, the shells quitted their first home, and followed the increase of the waters up to their highest level; to this I answer, that the cockle is an animal of not more rapid movement than the snail is out of water, or even somewhat
PHYSICAL GEOGRAPHY.

18. di non più veloco moto, che si sia la lumaca, fori dell’acqua, e qualche cosa più tarda perché nó nota, a’14zi si fa vn solo per l’arena mediante i lati di tal solo ove s’appoggià, caminerà il di dalle 3 alle 4. braccia; 19. adunque questo có tale moto nó sarà caminato dal mare Adriano insino in Moöferto di Lon 19 bardia, che v’è 250 miglia di distanza, in 40 giorni, come disse chi tenne coto d’esso tempo; e se tu dici che 17 l’onde ve li portarono, essi per la lor gravezza non si reggono, se nó sopra il suo fondo; e se questo nó mi’18 concedi, fessami al meno ch’elli aveano a ‘rimanere nelle cime de’ piv alti môti e ne’ laghi che in9fia li moti si serrano, come lago di Lario o diComo, e 1 Maggiore, e di Fiesole, e di Perugia e simili; 17 E se tu dirai che liichi son 18 portati dall’onde, essèdo voti e morti, io dico che, dove andauano li morti, poco si rimueuano d’uiuì, e in queste montagnie sono trovati tutti i uiui che si cognozono che sono colli gusci appaiati, e scno 20 in vn filo doue non è nessun de’ morti, e poco piv alto è trovato doue eran gittati dall’onde tutti li morti colle loro scorze separate, apresso a dove li fiumi cascavano in 22 mare in grà profonditá; come Arno, che cadea dalla Gonfolina apresso a 23 Mûte Lupo e quiuì lasciava la ghiaia, la quale ancor si uede, che si è insieme ricogielata e di pie 19 tre di uari paesi nature e colori e durezze se n’è fatto vn sola congelatione, e poco più oltre la congelation dell’are 28 s’è fatta tufo, dou’ella s’agirauiu inverso Castel Fioritòno, più oltre si scaricava il fango, 26 nel quale abitavano i dichi, il quale s’inallzaua a gradi, secondo che le piene di Arno tortibo 27 in quel mare versauano, e di tempo in tempo s’inallzaua il fondo al mare, il quale a gradi 28 producea essi dichi, come si mostra nel taglio di Colle Gonzoli, dirupato dal fiume d’Arno, 29 che il suo pedie consuma, nel qual taglio si slower; because it does not swim, on the contrary it makes a furrow in the sand by means of its sides, and in this furrow it will travel each day from 3 to 4 braccia; therefore this creature, with so slow a motion, could not have travelled from the Adriatic sea as far as Monferrato in Lombardy[13], which is 250 miles distance, in 40 days; which he has said who took account of the time. And if you say that the waves carried them there, by their gravity they could not move, excepting at the bottom. And if you will not grant me this, confess at least that they would have to stay at the summits of the highest mountains, in the lakes which are enclosed among the mountains, like the lakes of Lario, or of Como and il Maggiore[16] and of Fiesole, and of Perugia, and others. And if you should say that the shells were carried by the waves, being empty and dead, I say that where the dead went they were not far removed from the living; for in these mountains living ones are found, which are recognisable by the shells being in pairs; and they are in a layer where there are no dead ones; and a little higher up they are found, where they were thrown by the waves, all the dead ones with their shells separated, near to where the rivers fell into the sea, to a great depth; like the Arno which fell from the Gonfolina near to Monte Lupo[23], where it left a deposit of gravel which may still be seen, and which has agglomerated; and of stones of various districts, nature, and colours and hardness, making one single conglomerate. And a little beyond the sandstone conglomerate a tufo has been formed, where it turned towards Castel Florentino; farther on, the mud was deposited in which the shells lived, and which rose in layers according to the levels at which the turbid Arno flowed into that sea. And from time to time the bottom of the sea was raised, depositing these shells in layers, as may be seen in the cutting at Colle Gonzoli, laid open by

989. 13. Monferrato di Lombardia. The range of hills of Monferrato is in Piedmont, and Casale di Monferrato belonged, in Leonardo’s time, to the Marchese di Mantova.

16. Lago di Lario. Lacus Larius was the name given, by the Romans to the lake of Como. It is evident that it is here a slip of the pen since the
The marine shells were not produced away from the sea.

Di quelli che dicono che iichi sono per molto spatio e nati remoti dali mari per la natura del sito e de' cieli, che diponde e influiscie tal loco a simile creazione d'animali; a costor si risponderà che, se tale influetia d'animali nò potrebbe accadere in vna sola linea, se nò animali di medesima sorte e età, e non il uccio col giovane, e nò alcun col coperchio e l'altro essere sanza sua copritura, e nò l'uno esser rotto e l'altro intero, se nò l'uno ripieno di rena marina e rottame minuto e grosso d'altri animali dentro alli altri interi, che li son rimasti aperti, e nò le boche de' granchi sanza il rimanètì del suo tutto, e non li ni'chi d'altrc spetie appiccati con loro in forma d'animale che sopra di quelli si mouesse, perché ancora resta il uestigio del suo andamento sopra la scorza che lui gli, a uso di tarlo sopra il legname, andò cosumato; nò si troverebbero infra loro ossa e denti di pescie, li quali alcuni dimandano saette e altri linguè di seripenti, As to those who say that shells existed for a long time and were born at a distance from the sea, from the nature of the place and of the cycles, which can influence a place to produce such creatures—to them it may be answered: such an influence could not place the animals all on one line, except those of the same sort and age; and not the old with the young, nor some with an operculum and others without their operculum, nor some broken and others whole, nor some filled with sea-sand and large and small fragments of other shells inside the whole shells which remained open; nor the claws of crabs without the rest of their bodies; nor the shells of other species stuck on to them like animals which have moved about on them; since the traces of their track still remain, on the outside, after the manner of worms in the wood which they ate into. Nor would there be found among them the bones and teeth of fish which some call arrows and others serpents' tongues, nor would so many

pianne. 27. quelli . versaura. 28. deripatio. 29. pedie . taglio si vede. 30. fango aruregante . Essi alzato . nostro. 31. emisperio . mancho. 32. perl . calpe dattile . perche[l]a il. 33. chorono sagnusono . emisperio EseSSI . fattino. 34. portati . essi sare mosi . fango enui. 35. assuoli.

988. 1. Seilla argued against this hypothesis, which was still accepted in his days; see: La vanù Speculazione, Napoli 1670.
portions of various animals be found all together if they had not been thrown on the sea shore. And the deluge cannot have carried them there, because things that are heavier than water do not float on the water. But these things could not be at so great a height if they had not been carried there by the water, such a thing being impossible from their weight. In places where the valleys have not been filled with salt sea water shells are never to be seen; as is plainly visible in the great valley of the Arno above Gfonsolina; a rock formerly united to Monte Albano, in the form of a very high bank which kept the river pent up, in such a way that before it could flow into the sea, which was afterwards at its foot, it formed two great lakes; of which the first was where we now see the city of Florence together with Prato and Pistoia, and abone Albano. It followed the rest of its bank as far as where serravalle now stands. From the Val d’Arno upwards, as far as Arezzo, another lake was formed, which discharged its waters into the former lake. It was closed at about the spot where now we see Girone, and occupied the whole of that valley above for a distance of 40 miles in length. This valley received on its bottom all the soil brought down by the turbid waters. And this is still to be seen at the foot of Prato Magno; it there lies very high where the rivers have not worn it away. Across this land are to be seen the deep cuts of the rivers that have passed there, falling from the great mountain of Prato Magno; in these cuts there are no vestiges of any shells or of marine soil. This lake was joined with that of Perugia.[23].

A great quantity of shells are to be seen where the rivers flow into the sea, because on such shores the waters are not so salt owing to the admixture of the fresh water, which is poured into it. Evidence of this is to be seen where, of old, the Appenines poured their rivers into the Adriatic sea; for there in most places great quantities of shells are to be found, among the mountains, together
e tutti li sassi, che di tal loco si cauano, son'oni di nichi; 31 Il medesimo si conosce auere fatto Arno, quando cadea dal sasso della Gonfolina nel mare, 32 che dopo quella non troppo basso si trouava, perché a quelli tempi superba l'altezza di San Miniato al Tedesco, 33 perché nelle somme altezze di quello si uedono le rife pie ne di nichi e ostriche dentro alle sue mvra; non si distesero li ni'chi inverso Val di Nievole, perché l'acque dolci d'Arno in là non si astendeano;
Come li nichii nò si 32 partirono dal mare per diluuo, perché l'acque, che di uerso la terra venuanu, àcara che esse tirassino il mare 33 inverso la terra'; esse erà quelle che percuoeteo il suo fondo, perché l'acque, che viene diuerso la terra, à 34 più corso che quella del mare, e per consegüenza è piv potente, entra sotto l'altra acqua del mare 35 e rimove il fondo e compagnia con seco tutte le cose mobili che in quella trova, come son i predetti 36 nichii e altre simili cose, e quanto l'acqua, che viè di terra, è piv torbida che quella del mare, tâñ1o piv si fa potente e grave che quella; adunque io nò ci vedo modo di tirare i predetti nichii tanto in39 fra terra, se quiui nati nò fussino; se tu mi dicesi, il fiuine Loira, che passa per la Francia, 35 nell'acrescimëto del mare si copre piv di ottanta miglia di paese, perché è loco di grà pia46 nvra, e '1 mare s'alza circa braccia 20, e nichii si uengono a trovare in tal pianvra, discò4 sta dal mare essa 80 miglia, qui si rispôde che 'l flusso e refluxo ne' nostri mediterrani 44 mari nò fanno tanta varietà, perché in Genovese nò varia nvlà, a Vinegia poco, in Af4rica poco, e dove poco varia, poco occupa di paese;
Senpre la corrète dell'acqua de' fiumi 44 s'inòda sopra del loco doue li è impedito il corso; ancora doue essa si ristirginie per passare sotto 43 i archi de' ponti.

with bluish marine clay; and all the rocks which are torn off in such places are full of shells. The same may be observed to have been done by the Arno when it fell from the rock of Gonfolina into the sea, which was not so very far below; for at that time it was higher than the top of San Miniato al Tedesco, since at the highest summit of this the shores may be seen full of shells and oysters within its flanks. The shells did not extend towards Val di Nievole, because the fresh waters of the Arno did not extend so far.
That the shells were not carried away from the sea by the deluge, because the waters which came from the earth although they drew the sea towards the earth, were those which struck its depths; because the water which goes down from the earth, has a stronger current than that of the sea, and in consequence is more powerful, and it enters beneath the sea water and stirs the depths and carries with it all sorts of movable objects which are to be found in the earth, such as the above-mentioned shells and other similar things. And in proportion as the water which comes from the land is muddier than sea water it is stronger and heavier than this; therefore I see no way of getting the said shells so far in land, unless they had been born there. If you were to tell me that the river Loire[38], which traverses France, covers when the sea rises more than eighty miles of country, because it is a district of vast plains, and the sea rises about 20 braccia, and shells are found in this plain at the distance of 80 miles from the sea; here I answer that the flow and ebb in our Mediterranean Sea does not vary so much; for at Genoa it does not rise at all, and at Venice but little, and very little in Africa; and where it varies little it covers but little of the country.
The course of the water of a river always rises higher in a place where the current is impeded; it behaves as it does where it is reduced in width to pass under the arches of a bridge.
A confutation of those who say that shells may have been carried to a distance of many days' journey from the sea by the deluge, which was so high as to be above those heights.

I say that the deluge could not carry objects, native to the sea, up to the mountains, unless the sea had already increased so as to create inundations as high up as those places; and this increase could not have occurred because it would cause a vacuum; and if you were to say that the air would rush in there, we have already concluded that what is heavy cannot remain above what is light, whence of necessity we must conclude that this deluge was caused by rain water, so that all these waters ran to the sea, and the sea did not run up the mountains; and as they ran to the sea, they thrust the shells from the shore of the sea and did not draw them towards themselves. And if you were then to say that the sea, raised by the rain water, had carried these shells to such a height, we have already said that things heavier than water cannot rise upon it, but remain at the bottom of it; and do not move unless by the impact of the waves. And if you were to say that the waves had carried them to such high spots, we have proved that the waves in a great depth move in a contrary direction at the bottom to the motion at the top, and this is shown by the turbidity of the sea from the earth washed down near its shores. Anything which is lighter than the water moves with the waves, and is left on the highest level of the highest margin of the waves. Anything which is heavier than the water moves, suspended in it, between the surface and the bottom; and from these two conclusions, which will be amply proved in their place, we infer that the waves of the surface cannot convey shells, since they are heavier than water.

If the deluge had to carry shells three hundred and four hundred miles from the sea, it would have carried them mixed with various other natural objects heaped together; and we see at such distances oysters all together, and sea-snails, and cuttlefish, and all the other shells which congregate together,

trovati tutti insieme morti, e li nichì sole-
tari trovarsi distanti l'uno dall'altro, come ne' liti marittimi 31 tutto il giorno vediamo; E se noi troviamo l'ostriche insieme appa-
rettate gràdisime, infra le quali assai vedi quelle 32 che anò ancora il coperchio con-
giunto, a significare che qui furono lasciate dal mare, che ancor vivevano quando fù
tagliato lo stretto di Gibilterra; Vedesi in nelle montagna di Parma e Piaccìa le moltitudini di nichì e coralli 34 intarlati, an-
cora appiccati all'assi, de' quali, quand'io facevo il grà sacco ne'3illa mia fabbrica da
fralli quali ve n'era assai de' conseruati
nella prima bòta;
36 Trovavasi sotto terra e sotto li pro-
fondi cavamenti de' lastroni li legnami delle traui lavorati, fatti già nerì, li qua37 Il
furò trovati a mio tempo in quel de Castel Fiorettino, e questi in tal loco profondo v'era prima che la litta gittata 38 dall'Arno nel mare, che quiu copriva, fosse abban-
donata in tanto altezza, e che le pianure del Casentino fussì tanto abbasate 39 dal terrè
che anò al continuo di li sgonberato;
30 E se tu dicessi, tali 31 nichi essere crea32 ti e creano a cò33 tinvo in simili loci per
la natura del 34 sito e de' cieli, che qui35 vi influisce, questa 37 tale opение non
38 sta in cervelli di trop39 po discorso, perché qui36 vi s'enverrà li anni 40 del loro acce-
scimento 41 sulle loro scorze, e se ne 41 ve-
dono piccoli e gràdi, 41 i quali sanza cibo nò cre41 scerebbero e non si cibarebbero sà42 za
moto, e quivi mouere nò si pot43 teano.

Leic. 104]

990.

Come 4 nelle falde, infra l'una e l'altra si trovano ancora li andamèli deli lonbrici, che caminavano infra esse 3 quàdo non erano ancora asciti; Come tutti li fanghi ma-
rii ritengono ancora de' nichi 4 ed è petri-
ficato il nichio insieme col fango; della

That in the drifts, among one and another, there are still to be found the traces of the worms which crawled upon them when they were not yet dry. And all marine clays still contain shells, and the shells are petrified together with the clay. From their firmness and unity some persons will have it that these animals were carried up to
stoltitie e senplicità di quelli, che uogliono che ta'li animali fussino alli locchi distanti dai mari portati dal diluvio: Come altra setta d'ignoranti àffermano la natura, o i celi auerli in tali locchi creati: per ifussi celesti, come in quelli ?no si trovassino l'ossa de' pesci cresciuti có lughezza di tempo, come nelle scorze de' nichis e lumache, no si potesse annumerare li anni o i mesi della lor uità, come nelle corna de' buoi e de' castroni e nella ramificazione de'lle piante, che no furò mai tagliate in alcuna parte; E auendo con tali segni di mostrato e la lunghezza della lor uità è essere manifesta, ecco bisogno confessare, che tali animali no uiiuno sanza moto per cercare il loro cibo e in loro no si uede strumëto da penetrare la terra e l'asso, ove si trovano rinchiussi; 1® Ma in che modo si potrebbe trovare in vna grà lumaca i rotami e parte de molt'altre sorti di nichis di uarie na'ture, se ad essa, sopra de' litti marini già morta, non, li fussino state gittate dalle onde del mare, come dell'al'tre cose lievi, che esso gitta a terra? Perché si truova tanto rottame e nichis interi fra fai'da e fai'da de piet'stra, se già quella sopra del lito no fusses stata ricoperta da una terra rigttata dal mare, la qual poi si uenne pe'1°trificando? E se 'l diluvio predetto li ausse in tali siti dal mare portato, tu trovresti essi nichis in nel termine d'una sola fai'da, e non al termine di molte; deuonsi poi annumerare le uernate dell'á lli, che 'l mare mvltipplicaua le falde dell'arena e fango, portatoli da fumi vicini, e ch'elli scarcitya in sui litte sua, e se 19 tu volesse dire, che piu diluvi fussino stati a produrre tali falde e nichis infra loro, e' bisognierrebbe, 20 che ancora tu affermassi ogni àno essere vn tal diluvio accaduto; Ancora infa li rot11ami di tal nichis si prosume in tal sito essere spiaggia di mare, doue tutti i nichis son gittati rotti e diiusi e no 22 mai appaiati, come infa 'l mare viui si trovano con due gusci, che fan coperchio l'uno all'al'tro; E infa 21 le falde della riviera e de' litti marittimi son trovati de' rotammi; E dentro alli termini delle piette sono trovati 24 rari e appaiati de' gusci, come quelli che fuor lasciati dal mare sottetati viui dentro al fango, il qual 25 poi si seccò e col tempo petrifìcò.

places remote from the sea by the deluge. Another sect of ignorant persons declare that Nature or Heaven created them in these places by celestial influences, as if in these places we did not also find the bones of fishes which have taken a long time to grow; and as if, we could not count, in the shells of cockles and snails, the years and months of their life, as we do in the horns of bulls and oxen, and in the branches of plants that have never been cut in any part. Besides, having proved by these signs the length of their lives, it is evident, and it must be admitted, that these animals could not live without moving to fetch their food; and we find in them no instrument for penetrating the earth or the rock where we find them enclosed. But how could we find in a large snail shell the fragments and portions of many other sorts of shells, of various sorts, if they had not been thrown there, when dead, by the waves of the sea like the other light objects which it throws on the earth? Why do we find so many fragments and whole shells between layer and layer of stone, if this had not formerly been covered on the shore by a layer of earth thrown up by the sea, and which was afterwards petrified? And if the deluge before mentioned had carried them to these parts of the sea, you might find these shells at the boundary of one drift but not at the boundary between many drifts. We must also account for the winters of the years during which the sea multiplied the drifts of sand and mud brought down by the neighbouring rivers, by washing down the shores; and if you chose to say that there were several deluges to produce these rifts and the shells among them, you would also have to affirm that such a deluge took place every year. Again, among the fragments of these shells, it must be presumed that in those places there were sea coasts, where all the shells were thrown up, broken, and divided, and never in pairs, since they are found alive in the sea, with two valves, each serving as a lid to the other; and in the drifts of rivers and on the shores of the sea they are found in fragments. And within the limits of the separate strata of rocks they are found, few in number and in pairs like those which were left by the sea, buried alive in the mud, which subsequently dried up and, in time, was petrified.

E se tu vuoi dire che tale deluio fu quello che portò tali nichi fuor de' mari cetinai a miglia, questo nò può accader, essendo stato esso deluio per cause di pioggie, perché naturalmente le pioggie spingono i fumi insieme colle cose da loro portate inuoso il mare, e nò tirano inverso de' moiti le cose morte dai lii mariti timi, e se tu dicesi che'l deluio poi s'alzò colle sue acque sopra de' moiti, il moto del mare fu si tardo col camino suo contro al corso de' fumi, che non avrebbe sopra di se tentvo a noto le cose piv gravi di lui, e se pur l'auesse sostenute, esso nel calare l'avrebbe lascate in diversi 1 lochi seminate; Ma come accomoderemo noi li coralli, li quali inverso Môte Ferrato di Lombardia esser si tutto'di trovati intarlati appiccate alli scogli, scoperti dalle corretti de'fumi e li detti scogli sono tutti coperti di parentadi e famiglie d'ostiche, le quali noi sappiamo che nò si movono, ma stà senpre appiccate col' de' gusci al sasso, e l'altri apro no per cibarsi d'animaluzi, che notà per l'acque, li quali, credendo trovar bona pastura, diuentano cibo del predetto nichio; non si trova l'arena mista coll'algà marina essersi petrificata, poichè l'algà, che la ramezza, venne meno; e di questo scopre tutto il giorno il Po nelle ruine delle sue ripe.

Perchè sono trovate l'ossa de' grà pesci e le ostriche e coralli e altri diuersi nichi e chiocciola sopra l'alte cime de' moiti Mariiti inmedesimo modo che si trovă ne' bassi mari?

Tu à ora a provare come li nichi nò nascono, se nò in acque salse, quasi tutte le sorte, e che li nichi di Lombardia ànno And if you choose to say that it was the deluge which carried these shells away from the sea for hundreds of miles, this cannot have happened, since that deluge was caused by rain; because rain naturally forces the rivers to rush towards the sea with all the things they carry with them, and not to bear the dead things of the sea shores to the mountains. And if you choose to say that the deluge afterwards rose with its waters above the mountains, the movement of the sea must have been so sluggish in its rise against the currents of the rivers, that it could not have carried, floating upon it, things heavier than itself; and even if it had supported them, in its receding it would have left them strewn about, in various spots. But how are we to account for the corals which are found every day towards Monte Ferrato in Lombardy, with the holes of the worms in them, sticking to rocks left uncovered by the currents of rivers? These rocks are all covered with stocks and families of oysters, which as we know, never move, but always remain with one of their halves stuck to a rock, and the other they open to feed themselves on the animalcles that swim in the water, which, hoping to find good feeding ground, become the food of these shells. We do not find that the sand mixed with seaweed has been petrified, because the weed which was mingled with it has shrunk away, and this the Po shows us every day in the debris of its banks.

Why do we find the bones of great fishes and oysters and corals and various other shells and sea-snails on the high summits of mountains by the sea, just as we find them in low seas?

You now have to prove that the shells cannot have originated if not in salt water, almost all being of that sort; and that the shells in Lombardy are at four levels,
4 liuelli, e così è per tutti, li quali sono fatti in piv tépi, e questi sono per tutte le valli che sboccano alli mari.

and thus it is everywhere, having been made at various times. And they all occur in valleys that open towards the seas.

Br. M. [564]

Per le 2 linie de' nicchi bisogna dire che la terra per sdegno s'attufasse sotto il mare, e fece il primo suolo, poi il diluvio fece il secondo.

From the two lines of shells we are forced to say that the earth indignantly submerged under the sea and so the first layer was made; and then the deluge made the second.

994. 1. nicch. 2. sattu fassi sotto il mare. 3. fe il sechondo.

994. This note is in the early writing of about 1470—1480. On the same sheet are the passages No. 1217 and 1219. Compare also No. 1339. All the foregoing chapters are from Manuscripts of about 1510. This explains the want of connection and the contradiction between this and the foregoing texts.
VII.

ON THE ATMOSPHERE.

Leic. 206]

Come la chiarezza dell' aria nasce dalla l'acqua che in quella s'è resoluta e fatti in isessibili granulici, li quali, preso il lume del sole dall' opposita parte, rerdono la chiarezza che in essa aria si dimostra, e l'azzurro, che in quella apparece, nascie dalla tenebre, che dopo essa aria si nascondono.

Leic. 226]

That the brightness of the air is occasioned by the water which has dissolved itself in it into imperceptible molecules. These, being lighted by the sun from the opposite side, reflect the brightness which is visible in the air; and the azure which is seen in it is caused by the darkness that is hidden beyond the air.[4]

Constituents of the atmosphere.

995.

That the return eddies of wind at the mouth of certain valleys strike upon the waters and scoop them out in a great hollow, whirl the water into the air in the form of a column, and of the colour of a cloud. And I saw this thing happen on a sand bank in the Arno, where the sand was hollowed out to a greater depth than the stature of a man; and with it the gravel was whirled round and flung about for a great space; it appeared in the air in the form of a great bell-tower; and the top spread like the branches of a pine tree, and then it bent at the contact of the direct wind, which passed over from the mountains.

996.

Come i retrosi de' uëti a certe boche di ualli percuiutino sopra delle acque e quelle concuaiuo có grà cauméto, e portino l'acqua in aria in forma circunnale in color of nugola, e il medesimo vid'io già fare sopra vn arenaio d' Arno, nel quale fu concuaiuto l'arena più d'una statura d'uomo, e di quella fu remossa la ghiaja e gittata in disparte per luogo spatio, e parea per l'aria in forma di gredissimo canpanile, e crescieva la sommità come i rami di gran pino, e si piegava poi nel contatto del retto uëto che passaua sopra li môti.

995. t. chiarezza. 2. scie . . . effattasi . . . presi. 3. rôdano la chiarezza . . . dimostra ell'azzurro . . . apparisce nascie . . . nascondono. 996. t. accerte. 2. percolino . . . ecquelle . . . chauaméto. 3. colunale . . . video cia. 4. duome he. 5. giara e gittata. 6. ecres- scieva la sommita . . . rami di girapino essi.

997.

L’onda dell’aria fa il me’desimo vïtio infrà l’ eleméto del fuoco ; che fa l’onda dell’acqua infrà l’aria, o l’onda dell’airena, cioè terra, infrà l’acqua, e sono i lor moti in tal proporzione qual è quella de’ lor mo’tori infrà loro.

S. K. M. II. 194]

DE MOTO.

Domàdo, se ‘l uero moto 2de’ nuvoli si può conoscere 2per lo moto delle sue ombre, 4e similèmete del moto 5del sole.

H.3 32a]

Per cognosciere 2meglio i věti.

999.

To know better the direction of the winds.

1000.

Nessuna cosa nasce in loco doue nò sia vita sensitiua, vegetatiua e rationale; nascono le penne sopra li uccelli, e si mv-tano ogni anno; nascono 2li peli sopra li animali, e ogni anno si mvtno, salvo alcuna parte, come li peli delle barbe de’ lioni e gatte e simì; nascono l’erbe sopra li prati e le foglie sopra li alberi, e ogni’ano in grà parte si rinovano; adunque potremo dire, 4la terra avere anima vegetatiua, e che la sua carne sia la terra, li sua ossi sieno li ordini delle collegationi de’ sasși,

Nothing originates in a spot where there is no sentient, vegetable and rational life; feathers grow upon birds and are changed every year; hairs grow upon animals and are changed every year, excepting some parts, like the hairs of the beard in lions, cats and their like. The grass grows in the fields, and the leaves on the trees, and every year they are, in great part, renewed. So that we might say that the earth has a spirit of growth; that its flesh is the soil, its bones the arrangement and connection of the rocks of

997. 2. infrallemeño . focho . cheffa. 3. coe . infrallacqua esoño . quele quella delor.
998. 2. nvoli spo. 3. obre. 4. esimete. 5.ete.
999. 2 R. 2. cognosciere. 2. e věti.
1000. 1. nasce . locho . vita “sensidiua [intelletiviu] vigiatiua e ra [canale] nasce le pene . essi . nasce. 2. aichuna . esimi. 3. nasce . elle . potren. 4. vigiatiua e chella . collegatione. 5. comogano. 6. occeano . cresscere e dis-

999. In connection with this text I may here mention a hygrometer, drawn and probably invented by Leonardo. A facsimile of this is given in Vol. I, p. 297 with the note: ‘Modi di pesare l’arie eddi in-
pere quando s’d arrompere il tìpo’ (Mode of weighing the air and of knowing when the weather will change); by the sponge “Spugna” is written.

1000. Compare No. 929.
which the mountains are composed, its cartilage the tufa, and its blood the springs of water. The pool of blood which lies round the heart is the ocean, and its breathing, and the increase and decrease of the blood in the pulses, is represented in the earth by the flow and ebb of the sea; and the heat of the spirit of the world is the fire which pervades the earth, and the seat of the vegetative soul is in the fires, which in many parts of the earth find vent in baths and mines of sulphur, and in volcanoes, as at Mount Ætna in Sicily, and in many other places.
XVII.

Topographical Notes.

A large part of the texts published in this section might perhaps have found their proper place in connection with the foregoing chapters on Physical Geography. But these observations on Physical Geography, of whatever kind they may be, as soon as they are localised acquire a special interest and importance and particularly as bearing on the question whether Leonardo himself made the observations recorded at the places mentioned or merely noted the statements from hearsay. In a few instances he himself tells us that he writes at second hand. In some cases again, although the style and expressions used make it seem highly probable that he has derived his information from others—though, as it seems to me, these cases are not very numerous—we find, on the other hand, among these topographical notes a great number of observations, about which it is extremely difficult to form a decided opinion. Of what the Master's life and travels may have been throughout his sixty-seven years of life we know comparatively little; for a long course of time, and particularly from about 1482 to 1486, we do not even know with certainty that he was living in Italy. Thus, from a biographical point of view a very great interest attaches to some of the topographical notes, and for this reason it seemed that it would add to their value to arrange them in a group by themselves. Leonardo's intimate knowledge with places, some of which were certainly remote from his native home, are of importance as contributing to decide the still open question as to the extent of Leonardo's travels. We shall find in these notes a confirmation of the view, that the MSS. in which the Topographical Notes occur are in only a very few instances such diaries as may have been in use during a journey. These notes are mostly found in the MSS. books of his later and quieter years, and it is certainly remarkable that Leonardo is very reticent as to the authorities from whom he quotes his facts and observations: For instance, as to the Straits of Gibraltar, the Nile, the Taurus Mountains and the Tigris and Euphrates. Is it likely that he, who declared that in all scientific research, his own experience should be the foundation of his statements (see XIX Philosophy No. 987—991) should here have made an exception to this rule without mentioning it?
As for instance in the discussion as to the equilibrium of the mass of water in the Mediterranea Sea—a subject which, it may be observed, had at that time attracted the interest and study of hardly any other observer. The acute remarks, in Nos. 985—993, on the presence of shells at the tops of mountains, suffice to prove—as it seems to me—that it was not in his nature to allow himself to be betrayed into wide generalisations, extending beyond the limits of his own investigations, even by such brilliant results of personal study.

Most of these Topographical Notes, though suggesting very careful and thorough research, do not however, as has been said, afford necessarily indisputable evidence that that research was Leonardo's own. But it must be granted that in more than one instance probability is in favour of this idea.

Among the passages which treat somewhat fully of the topography of Eastern places by far the most interesting is a description of the Taurus Mountains; but as this text is written in the style of a formal report and, in the original, is associated with certain letters which give us the history of its origin, I have thought it best not to sever it from that connection. It will be found under No. XXI (Letters).

That Florence, and its neighbourhood, where Leonardo spent his early years, should be nowhere mentioned except in connection with the projects for canals, which occupied his attention for some short time during the first ten years of the XVIth century, need not surprise us. The various passages relating to the construction of canals in Tuscany, which are put together at the beginning, are immediately followed by those which deal with schemes for canals in Lombardy; and after these come notes on the city and vicinity of Milan as well as on the lakes of North Italy.

The notes on some towns of Central Italy which Leonardo visited in 1502, when in the service of Cesare Borgia, are reproduced here in the same order as in the notebook used during these travels (MS. L., Institut de France). These notes have but little interest in themselves excepting as suggesting his itinerary. The maps of the districts drawn by Leonardo at the time are more valuable (see No. 1054 note). The names on these maps are not written from right to left, but in the usual manner, and we are permitted to infer that they were made in obedience to some command, possibly for the use of Cesare Borgia himself; the fact that they remained nevertheless in Leonardo's hands is not surprising when we remember the sudden political changes and warlike events of the period. There can be no doubt that these maps, which are here published for the first time, are original in the strictest sense of the word, that is to say drawn from observations of the places themselves; this is proved by the fact—among others—that we find among his manuscripts not only the finished maps themselves but the rough sketches and studies for them. And it would perhaps be difficult to point out among the abundant contributions to geographical knowledge published during the XVIth century, any maps at all approaching these in accuracy and finish.

The interesting map of the world, so far as it was then known, which is among the Leonardo MSS. at Windsor (published in the 'Archaeologia' Vol. XI) cannot be attributed to the Master, as the Marchese Girolamo d'Adda has sufficiently proved; it has not therefore been reproduced here.
Such of Leonardo's observations on places in Italy as were made before or after his official travels as military engineer to Cesare Borgia, have been arranged in alphabetical order, under Nos. 1034—1054. The most interesting are those which relate to the Alps and the Appenines, Nos. 1057—1068.

Most of the passages in which France is mentioned have hitherto remained unknown, as well as those which treat of the countries bordering on the Mediterranean, which come at the end of this section. Though these may be regarded as of a more questionable importance in their bearing on the biography of the Master than those which mention places in France, it must be allowed that they are interesting as showing the prominent place which the countries of the East held in his geographical studies. He never once alludes to the discovery of America.
I. ITALY.

CANALE DI FIRENZE.

"Facciarsi alle Chiane d'Arezzo - tali cateratte che, mächando acqua l'estate in Arno", il canale nò rimaga arido; e faccia esso canale largo in fondo braccia 20, e 30 in bocca, e braccia 2.8 per l'acqua o 4., perché dua d'esse braccia reca t'ali di nivini e li prati; questo bonificherà il paese, e Prato, Pistoia e Pisa insieme có Firenze, faranno l'anno di meglio duggiêto mila ducati, e porgieranno le mani e spesa a esso avitorio, e i Lucchesi il simile, perché il lago di Sesto fia navicable; fo lo faire la uia di Prato e Pistoia e tagliare Serravalle e uscire nel lago, perché nò bisogna conche o sostegni i qua'lli nò sono eterni, anzi senpre si sta in esercito a operarli e mantenerli.

"E sappi che se, cauâdo il canale, douc esso è profondo 4 braccia, si dà 4 dinari per braccio quadrato, in doppia profondità, si dà 6 dinari, se fai 4 braccia e' sono

1001. This passage is illustrated by a slightly sketched map, on which these places are indicated from West to East: Pisa, Luccha, Lago, Serravalle, Pistoja, Prato, Florence.

CANAL OF FLORENCE.

Sluices should be made in the valley of la Chiana at Arezzo, so that when, in the summer, the Arno lacks water, the canal may not remain dry: and let this canal be 20 braccia wide at the bottom, and at the top 30, and 2 braccia deep, or 4, so that two of these braccia may flow to the mills and the meadows, which will benefit the country; and Prato, Pistoia and Pisa, as well as Florence, will gain two hundred thousand ducats a year, and will lend a hand and money to this useful work; and the Lucchese the same, for the lake of Sesto will be navigable; I shall direct it to Prato and Pistoia, and cut through Serravalle and make an issue into the lake; for there will be no need of locks or supports, which are not lasting and so will always be giving trouble in working at them and keeping them up.

And know that in digging this canal where it is 4 braccia deep, it will cost 4 dinari the square braccio; for twice the depth 6 dinari, if you are making 4 braccia
Dal muro d'Arno della Giustizia al-l'argine d'Arno di Sardigna, dove sono 4i muri alle mulina, è braccia 5'7400, cioè miglia 2 e braccia 1400. *e* il di là d'Arno è braccia 5'500.

By guiding the Arno above and below a treasure will be found in each acre of ground by whomsoever will.

The wall of the old houses runs towards the gate of San Niccolò.

By this the Porta della Giustizia seems to be meant; from the XVth to the XVIth centuries it was also commonly known as Porta Gufa, Porta San Francesco del Reno, Porta Nuova, and Porta Reale. It was close to the Arno opposite to the Porta San Niccolò, which still exists.

By the side of this text there is an indistinct sketch, resembling that given under No. 973. On the bank is written the word Casacc. There then follows in the original a passage of 12 lines in which the consequences of the windings of the river are discussed. A larger but equally hasty diagram on the same page represents the shores of the Arno inside Florence as in two parallel lines. Four horizontal lines indicate the bridges. By the side these measures are stated in figures: 1. (at the Ponte alla Carraja): 230—larghe br. 12 e 2 di spôda e 14 di file e a 4 pilastri; 2. (at the Ponte S. Trinità): 188—larghe br. 15 e 2 di spôda ke 28 di pilastri for delle spôde e pilastri 2; 3. (at the Ponte vecchio); pôle lung br. 152 e largo; 4. (at the Ponte alle Grazie): 290 ellargo 12 e 2 di spôda e 6 di pil.
1005. The ruined wall is 640 braccia; 130 is the wall remaining with the mill; 300 braccia were broken in 4 years by Bisarno.

1006. They do not know why the Arno will never remain in a channel. It is because the rivers which flow into it deposit earth where they enter, and wear it away on the opposite side, bending the river in that direction. The Arno flows for 6 miles between La Caprona and Leghorn; and for 12 through the marshes, which extend 32 miles, and 16 from La Caprona up the river, which makes 48; by the Arno from Florence beyond 16 miles; to Vico 16 miles, and the canal is 5; from Florence to Fucechio it is 40 miles by the river Arno.

56 miles by the Arno from Florence to Vico; by the Pistoia canal it is 44 miles. Thus it is 12 miles shorter by the canal than by the Arno.

1007. The eddy made by the Mensola, when the Arno is low and the Mensola full.

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1005. 640 braccia = 600 feet. 2. muro. 1006. 3 non starà mai in ca-nale; perché i fiumi che vi mettono, nella loro entrata dopo sono terreno, e dalla oppo'sita parte leuano e piegavano il fiume; 96 miglia si fa per Arno dalla Caprona a Li^vorno, e 12 si fa per li stagioni che s'avanzano 53 miglia, e 16 dalla Caprona in su, che fa 48 per Arno da Firenze, avanzansi 16 miglia; a Vico miglia 16, 17 e il canale a 5; 18 da Firenze a Fucechio miglia 40 per acqua d'Arno.

20 Miglia 56 = 600 feet. 21 da Ficeze a Vico, 22 e pel canale di Pistoia 23 è miglia 44; e quante è piva corta 12 23 miglia per canale che per Arno.

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1006. This passage is written by the side of a map washed in Indian ink, of the course of the Arno; it is evidently a sketch for a complete map. These investigations may possibly be connected with the following documents. Francesco Guiducci alla Bal-1a di Firenze. Dal Campo contro Pisa 24 Luglio 1503 (Archivio di Stato, Firenze, Lettere alla Balilla; published by J. Gaye, Carteggi inedito d'Artisti, Firenze 1849, Tom. II, p. 62): Ex Castri, Franciscus Ghiudcicius, 24. Julii 1503. Appresso fu qui ierì con una di V. Signoria Alexandre degli Albizzi insieme con Leonardo da Vinci e corri altri, et veduto il disegno insieme con el governatore, doppo molto d'iscussione et dubbi concluse che l'opera fussi molto al proposito, o si veramente Arno volgersi qui, o restarvi con un canale, che almeno viste-rebbe che le colline da nemici non potrebbono essere offese; come tuto referivano loro a bocha V. S.

And, Archivio di Stato, Firenze, Libro d'Entrata e Unità di cassa de' Magnifici Signori di luglio e agosto 1503 a 51 T.: Andata di Leonardo al Campo sotto Pisa'. Spese extraordinary daino dare a di XXVI di luglio L. LVI sol. XIII per loro a Giovanni Piffero; e sono per tutti, asegnata avere spesi in vettura di ini chavalli a spese di vitto per andare cho Leonardo da Vinci a livellare Arno in quello di Pisa per levare del lito suo. (Published by Milanesi, Archivio Storico Italiano, Serie III, Tom. XVI.) Vasari asserts: (Le-0ardo) fu il primo ancora, che giovonetto discorresse sopra il fiume d'Arno per metterlo in canale da Pisa a Fi-rence (ed. Sansoni, IV, 20).

The passage above is in some degree illustrated by the map on Pl. CXII, where the course of the Arno westward from Empoli is shown.

1007. Mensola is a mountain stream which falls into the Arno about a mile and a half above Florence. A=M=Arno, I=Isola, M=Mvgone, P=Pisa, N=Mensola.
1008.

Come il fiume, che s'a à piegare d'uno in altro loco, debbe essere lusin'gato e nó con violenza aspreggia'to, e a questo fare si de' cauare infra'l fiume alquato 3 di pesc'caia, e poi di sotto gitarne vna pìv inà'ti, e così si faccia colla 3° 4° e 5°, in modo che'1 fiume inbocchi col canale'atoloi, o che per tal mezzo si scosti dal loco da lui danneggiato, come fu fatto in Fià'dra, dettoni da Niccolò di Forzore;

Come si de' vestire di riparo vn argine percusso 6dall'acqua, come sotto l'isola de'Cocomeri.

7 Pöte Rubaconte (Fig. 1); 8 sotto il Bist'cici 9 e Canigiani (Fig. 2); 10 sopra la pes'caia de'11la Givsititta (Fig. 3); 12 a b è vna secca 13 a riscòtro doue fi'tnisice l'isola de' Cocomeri in mezzo d'Arno 14 (Fig. 4).

C. A. 357 a; 1122 a

Navilio di san Cristoforo di Milano fatto a di 3 di maggio 1509.

1009.

The canal of San Cristofano at Milan made May 3rd 1509.

1010.

Del canale di Martesana.

2 Facèdò il canale di Martesana c'si diminuisce l'acqua all'Adda, la qual è destribuita in mol'ti paesi al servitio de'prati; Ecò vn rime'dio, e questo è di fare molti

1008. 1. chessa . . locho. 2. asspreggia e acquessto. 4. inbochi . . mezio si scosti dal locho dallui damegato. 5. nicholo . . percossa. 8. bisticci . . camigagni. 70. pescaia. 11. giosstita. 15. imero.

1009. cristofano . . facio addi . . magno.

1010. 1. martigiana . . diminuisce. 3. imol. 4. Eccl. 5. ecquesto . . checq. 6. beuta datta terra. 8. nessuno.

1008. The course of the river Arno is also discussed in Nos. 987 'and 988.

1009. This observation is written above a washed pen and ink drawing which has been published as Tav. VI in the „Saggi.“ The editors of that work explain the drawing as „uno Studio di boche per estrazione d'acqua.“

1010. „el navilio di Mortagano“ is also mentioned in a note written in red chalk, MS. H3 17a.

Leonardo has, as it seems, little to do with Lodovico il Moro's scheme to render this canal navigable. The canal had been made in 1460 by Bertinino da Novara. Il Moro issued his decree in 1493, but Leonardo's notes about this canal were, with the exception of one (No. 1343), written about sixteen years later.
fontanili, chè q'uell'acqua, chè è bevuta dalla terra nò fa ser'uitio a nessuno, nè ancora danno, perchè a nello nessuno è toita, e facèdeo tali fontanili, l'acqua, chè prima era perduta, ritorna di nouo a rifa're seruitio e vtile allì allì omi.

Leic. 18:o]

Nessuno canale, che esca fori de'fiumi, sarà durabile, se l'acqua del fiume, donde nascie, non è integralmente chiusa come il canal di Martisana e quel ch'esce de' Tesino.

C. A. 1396; 424.] Dal principio del navilio al molino.

3 Dal principio del navilio di Brivio al molino del Travaglia è trabochi 2794, cioè braccia 11176, che son più di 3 miglia e due terzi, e qui qui truovo più alto il navilio che la pelle dell'acqua di

C. A. 1396; 424.] From the beginning of the canal to the mill.

From the beginning of the canal of Brivio to the mill of Travaglia is 2794 trabochi, that is 11176 braccia, which is more than 3 miles and two thirds; and here the canal is 57 braccia higher than the surface.

1012. The following are written on the sketches:
at the place marked N: navilio da acqua (canal of running water); at M: molino del Travaglia (Mill of Travaglia); at R: roccia santa maria (small rock of Santa Maria); at A: Adda; at L: Lago di Leccho (lake of Travaglia).
If there ducats braccio, son comunitornar. The water of the Adda, giving a fall of two inches in every hundred trabochi; and at that spot we propose to take the opening of our canal.

If it be not reported there that this is to be a public canal, it will be necessary to pay for the land; and the king will pay it by remitting the taxes for a year.

The canal which may be 16 braccia wide at the bottom and 20 at the top, we may say is on the average 18 braccia wide, and if it is 4 braccia deep, at 4 dinari the square braccia; it will only cost 900 ducats, to excavate by the mile, if the square braccio is calculated in ordinary braccia; but if the braccia are those used in measuring land, of which every 4 are equal to 4 1/2, and if by the mile we understand three thousand ordinary braccia; turned into land braccia, these 3000 braccia will lack 1 1/2; there remain 2250 braccia, which at 4 dinari the braccio will amount to 675 ducats a mile. At 3 dinari the square braccio, the mile will amount to 506 1/4 ducats so that the excavation of 30 miles of the canal will amount to 15187 1/2 ducats.

of Lecco overflowing at Tre Corni, in Adda,—a permanent sluice). Near the second sketch, referring to the sluice near Q: qui la chiesa italica d'Ò pesa (here the chain is in one piece). At M in the lower sketch: mot de Tragavilla, nel casare la conchta il terreno ara chitrapo e casa d'aqua (Mill of Travaglia, in digging out the sluice the soil will have as a counterpoise a vessel of water).
Per fare il grà canale, fa prima il piccolo e dalla l’acqua, che colla rota farà il gràde. To make the great canal, first make the smaller one and conduct into it the waters which by a wheel will help to fill the great one.

Poni il uero mezzo di Milano. Indicate the centre of Milan.


Indicate the centre of Milan.

BAGNO.

Per iscaldare l’acqua della stufa della duchessa torrai 3 partì d’acqua calda da sopra 4 partì d’acqua fredda.

To heat the water for the stove of the Duchess take four parts of cold water to three parts of hot water.

1016. See Pl. CIX. The original sketch is here reduced to about half its size. The gates of the town are here named, beginning at the right hand and following the curved line. In the bird’s eye view of Milan below, the cathedral is plainly recognizable in the middle; to the right is the tower of San Gottardo. The square, above the number 9147, is the Lazzaretto, which was begun in 1488. On the left the group of buildings of the ‘Castello’ will be noticed. On the sketched Plan of Florence (see No. 1004 note) Leonardo has written on the margin the following names of gates of Milan: Verceilina—Ticinese—Ladovica—Romana—Orientale—Nova—Beatrice—Camana.—Compare too No. 1448, ll. 5, 12.

1018. Duchessa di Milano, Beatrice d’Este, wife of Ludovico il Moro to whom she was married, in 1491. She died in June 1497.
In domo alla carruca del chiodo della croce;

3 Item.

4 Da mettere il corpo \( v \) \( r \) \( 6 \) nello ...

In the Cathedral at the pulley of the nail of the cross.

Item.

To place the mass \( v \) \( r \) in the ...

\[ \text{E. 1.0} \]

DELLA POTENTIA DEL UACCU \( 2 \) GENERATO IN ISTATE.

3 Vidi a Milano \( v \) saetta percuoterre la \( 4 \) torre della Credenza da quella parte \( 5 \) che risguarda tramontana e disciese \( 6 \) con tardo moto per esso lato, e immediata \( 7 \) si divise da essa torre, \( 8 \) e si uscì d’esso \( 9 \) muro uno spazio\( 10 \) di 3 braccia per \( 0 \) ignivo e profondo, \( 11 \) di 4 braccia. \( 12 \) Ed era mura\( 13 \) di setti e 11 minuti mattoni\( 14 \) di antichi, \( 15 \) e questo fu \( 16 \) uscito dal uacchu, \( 17 \) che la\( 18 \) fiama della\( 19 \) saetta lasciò \( 20 \) di se ecc.

\[ \text{Leic. 28.0} \]

Io sono già stato a vedere tal multipli cazione (di arie) e già \( 8 \) sopra a Milano verso lago Maggiore vidi \( 21 \) nuvola in

\[ \text{1919.} \]

On this page Amoretti remarks (Memorie Storiche chap. IX): *Nell’anno stesso lo veggiam formare un congedo di carucole e di corde, con cui trasportare in più venerabile e più sicuro luogo, cioè nel luogo antico della nave di mezzo della metropolitana, la sacra reliquia del Santo Chiado, che ivi ancor si venera. Al fol. 15 del codice sinato Q. R. in 16, egli ci ha lasciata di tal congedo una doppia figura, cioè una di quattro carucole, e una di tre colle rispettive corde, sog ginnandosi: in Domus alla caruca del Chiodo della Croce.

Amoretti’s views as to the mark on the MS. and the date when it was written are, it may be observed, wholly unfounded. The MS. \( 1 \) in which it occurs, is of the year 1502, and it is very unlikely that Leonardo was in Milan at that time; this however would not prevent the remark, which is somewhat obscure, from applying to the Cathedral at Milan.

\[ \text{1920.} \]

With reference to buildings at Milan see also Nos. 751 and 756, and Pl. XCV, No. 2 (explained on p. 52), Pl. C (explained on pages 60–62). See also pages 25, 39 and 40.

\[ \text{di arie} \]

is wanting in the original but may safely be inserted in the context, as the formation of clouds is under discussion before this text.
forma di grandissima mòtagnia, piena di
scoglì strinfocati, perché li razzi del sole, che
già era all’orizzonte che rosseggia, la
tigneano del suo colore, e questa tal nugola
attraves a se tutti li nvgoli piccoli che in-
torno li stavano, e la nugola gráde nò sì
mouea di suo loco, anzi riseruò nella sua
summifà il lume del sole insino a una ora
mezzo di notte, tant'era la sua
immesa grádezza; e infra due ore di notte
gienerò si violento che fu cosa stupèda
e inavdita.

W. XXVIII]

A di 10 di dicembre a ore 15 fu
appicato il fuoco;
A di 18 di dicembre 1511 a ore 15
fu fatto questo secondo incendio da Suiz-
zeri a Milano al luogo detto DCXC.

Camini del castello di Pavia,
ànò 6 gradi di busi; è dall’uno
tall’altro uno braccio.

The chimneys of the castle of
Pavia have 6 rows of openings and
from each to the other is one
braccio.

The other notes relating to Pavia occur on
p. 43 and p. 53 (Pl. XCVIII, No. 3). Compare No.
1448, 26.

IO22. With these two texts (l. 1—2 and l. 3—5
are in the original side by side) there are sketches
of smoke wreaths in red chalk.

On the 2nd day of February 1494, At Sforzesca I drew twenty five steps, 1/3 braccio each, and 8 braccio wide.

1025. Vignie di Vigevano a di 20 di marzo 1494.

The vineyards of Vigevano on the 20th day of March 1494.

1026. Da serrare in chiave vno . . . icastro a Vigevano.

To lock up a butterbis at Vigevano.

1027. Ancora se la infima parte dell’argine trauersalmente opposto al corso delle acque sarà fatto in potenti e larghi gradi a uso di scala, l’acque che nell’abassamento del lor corso sogliono perpendicolarmente cadere dal termine di tale loco in infima sua bassezza e scalzare i fondamenti d’esso argine, non poderá più discendere con colpo di troppa valitudine; e lo esenpio dico fu a me quella scala, onde cadea l’acqua de’ pratì della Sforzesca di Vigevano, sulla quale ui cadea l’acqua correte in 50 braccia d’altezza.

Again if the lowest part of the bank which lies across the current of the waters is made in deep and wide steps, after the manner of stairs, the waters which, in their course usually fall perpendicularly from the top of such a place to the bottom, and wear away the foundations of this bank can no longer descend with a blow of too great a force; and I find the example of this in the stairs down which the water falls in the fields at Sforzesca at Vigevano over which the running water falls for a height of 50 braccia.

1028. Scala di Vigevano . . . sotto la Sforzesca di 130 scaglioni, altri 1/4 e larghi 1/4 braccio, per la qual cade l’acqua e non consuma niente nell’ultima percussione, e per tale scala è disceso tanto terreno che a sostecco vn padule, cio’è riemi, e se n’è fatto praterie da padu di grà profondità.

Stair of Vigevano below La Sforzesca, 130 steps, 1/4 braccio high and 1/4 braccio wide, down which the water falls, so as not to wear away anything at the end of its fall; by these steps so much soil has come down that it has dried up a pool; that is to say it has filled it up and a pool of great depth has been turned into meadows.

1024. See Pl. CX, No. 2. The rest of the notes on this page refer to the motion of water. On the lower sketch we read: 4 br. (four braccia) and giara (for ghiaia, sand, gravel).

1025. On one side there is an effaced sketch in red chalk.
Come in molti loci si trovano ve'ne d'acqua che sei ore crescono e sei ore calano, e io per me n'ò veduto vna in sul lago di Com, detta fonte Pliniana, la quale fa il predetto cresciere e diminuire in modo che, quando ursa, macina due mulini, e quado maça, è cala sì ch'ègli è come guardare l'acqua in vn profondo pozzo.

In many places there are streams of water which swell for six hours and ebb for six hours; and I, for my part, have seen one above the lake of Com called Fonte Pliniana, which increases and ebbs, as I have said, in such a way as to turn the stones of two mills; and when it fails it falls so low that it is like looking at water in a deep pit.

**Lake of Como. Valley of Chiavenna.**

Above the lake of Com towards Germany is the valley of Chiavenna where the river Mera flows into this lake. Here are barren and very high mountains, with huge rocks. Among these mountains are to be found the water-birds called gulls. Here grow fir trees, larches and pines. Deer, wildgoats, chamois, and terrible bears. It is impossible to climb them without using hands and feet. The peasants go there at the time of the snows with great snares to make the bears fall down these rocks. These mountains which very closely approach each other are parted by the river. They are to the right and left for the distance of 20 miles throughout of the same nature. From mile to mile there are good inns. Above on the said river there are waterfalls of 400 braccia in height, which are fine to see; and there is good living at 4 soldi the reckoning. This river brings down a great deal of timber.

**Val Sasina.**

Val Sasina runs down towards Italy; this is almost the same form and character. There grow here many mappello and there are great ruins and falls of water.

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1029. 2. 3. The fountain is known by this name to this day; it is near Torno, on the Eastern shore of Como. The waters still rise and fall with the flow and ebb of the tide as Pliny described it (Epist. IV, 30; Hist. Nat. II, 205).

1030. 2. 3. From the character of the handwriting we may conclude that these observations were made in Leonardo's youth; and I should infer from their contents, that they were notes made in anticipation of a visit to the places here described, and derived from some person (unknown to us) who had given him an account of them.

14. The meaning of mappello is unknown.
TOPOGRAPHICAL NOTES.

VALLE D’INTROZZO.

16 Questa valle produce assai abeti pini e larici, è doue Ambrogio Fereri fa venire il suo legname; in testa della Valtellina sono le mòtagnie di Bormio, terribili e picne sèpre di neve; qui nascono ermelini.

A BELLAGGIO.

20 A riscontro a Bellagio castello è il fume Latte, el quale cada da alto 21 piv che braccia 100 dalla vena, donde nascie, a piòbo nel lago cò inestimabile strepito 22 e romore; questa vena versa solamète agoosto e settèbre.

VALTELLINA.

23 Valtellina, com’è detto, valle circùdata d’alti e terribili möti, fa 25 vini potèti e assai, e fa tanto bestiame che da paesi è concluso nasceruì 25 piv latte che uino; questa è la valle dodue passa Adda, la quale prima corre 22 piv che 40 miglia per la Magnia; questo fume fa il pescie temolo, el quale 28 vive d’argìo, del quale se ne trova assai per la sua rena; 29j questo paese ognivno può vedere pane. E vino, e’l uino vale al piv uno soldo 30 il boccale e la libra del utila uno soldo, e’l sale 10 dinari, e’l simile il burro, 31 ed è la loro libbra 30 őcie e l’oua uno soldo la soldata.

A BORMIO.

2 A Bormio sono i bagni;—sopra Como otto miglia è la Pliniana, la quale cresce e discresce ogni 6 ore, e’l suo cresciere fa acqua per 2 mvlina e n’avanza, e’l suo calare fa asciugare la fonte; 5 più su 2 miglia è Nesso terrà, dove cade uno fume cò grade 6 enpito per una gradissima fessura di mòte; Queste gite só da 7 fare nel mese di maggio; E i maggior sassi scoperti che si trouano 8 in questi paesi sono le mòtagnie di Màdello, vicine alle mòtagnie di 9 Lecco e di Gravidona inverso Bellin-

ATHOME

1031. At Bormio.

At Bormio are the baths;—About eight miles above Como is the Pliniana, which increases and ebbs every six hours, and its swell supplies water for two mills; and its ebbing makes the spring dry up; two miles higher up there is Nesso, a place where a river falls with great violence into a vast rift in the mountain. These excursions are to be made in the month of May. And the largest bare rocks that are to be found in this part of the country are the mountains of Mandello near to those of Lecco, and

C. A. 2116; 0106
zon, a 30 miglia da Lecco, 10 e quelle di ualle di Chiavenna, ma la maggiore è quella di Madello, 11 la quale è nella sua basa una buca dietro il lago, la quale va sotto 12 200 scalini, e qui d'ogni tèpo è ghiaccio e vèto.

**In Valsasina.**

14 I Valsasina infra Vimogno et Introbbo, a man destra entrándo per uia di Lecco, si trova la Troggia fiume, che cade da uno sasso altissimo e caddeo entra sotto terra e li finisce il fiume... 3 miglia. Più si trovano li edifiti della veneta del rame e dello argento, presso a una terra detta Prato Santo Pietro, 18 e vene di ferro, e cose fantastiche; la Grigna è più alta, moltagnia ch'abbino questi paesi ed è pelata.

**G. 18.**

Il lago di Pusiano 2 versa in nel lago di Segrino e d'Annone e di Sala; 3 il lago d'Aòne ha 22 braccia più alta la pelle della sua acqua che la pelle dell'acqua del lago di Lecco, e 20 braccia è più alto il lago di Pusiano che l' lago d'Aòne, 9 le quali, giute colle braccia 22 dette, fan braccia 42, 19 e quest è la maggiore altezza che abbia la pe'ille del lago di Pusiano sopra la pelle del lago di Lecco.

**1032.**

The lake of Pusiano flows into the lake of Segrino (3) and of Annone and of Sala. The lake of Annone is 22 braccia higher at the surface of its water than the surface of the water of the lake of Lecco, and the lake of Pusiano is 20 braccia higher than the lake of Annone, which added to the afore said 22 braccia make 42 braccia and this is the greatest height of the surface of the lake of Pusiano above the surface of the lake of Lecco.

At Santa Maria in the Valley of Ravagnate in the mountains of Brianza are the rods of chestnuts of 9 braccia and one out of an average of 100 will be 14 braccia.

At Varallo di Ponbia near to Sesto on the Ticino the quinces are white, large and hard.

10. esche... edavena malla maggiore eschella. 11. busa. 12. schallini... diaggio. 14. valsasina ira... destra. 15. lecco... troso... chade... da l... chadeo. 16. eli finisse... pivìla si truova. 17. arsèto... prascio petro. 18. fero... chabbi. 19. edie.

1032. 1. lago di pusilà. 2. nive lagho. 3. di serio e danò. 4. tagho danò... br... alto. 6. chella. 7. lagho... br. eppiu. 8. be il lagho. 9. püìla... danò br. 20. 9. gue... br. 22. br. 42. 10. esche... la magore alcez... la pel... Pusl. 12. gho di lago. 1033. 1. maria... nella. 2. di ravagnati... britisia. 3. 9 br. e di 14 [et] 7 (?) lu. 4. re (? = no) in 100 di 9 br. 5. a ralò di pon- bieo presso asseto. 6. licasti. 7. odiari.

1032. This text has in the original a slight sketch to illustrate it.—3. The statement about the lake Segrino is incorrect; it is situated in the Valle Assina, above the lake of Pusiano.

1033. 2. Ravagnate (Leonardo writes Ravagni) in the Brianza is between Oggiono and Brivio, South of the lake of Como. M. Ravaisson avails himself of this note to prove his hypothesis.
Colôbaia a Urbino a di 30 di luglio 1502.

Fatta al mare di Piombino.

Acquapendente è a Orvieto.

Rocca di Cesena.

Siena  a b braccia 14,  a c braccia 510; Scale d'Urbino.

Campana di Siena, cioè il modo del suo moto e sito della dinodatura del battaglio suo.

Acquapendente is near Orvieto.

The rock of Cesena.

Siena, a b 4 braccia, a c 10 braccia. Steps at [the castle of] Urbino.

The bell of Siena, that is the manner of its movement, and the place of the attachment of the clapper.

that Leonardo paid two visits to France. See Gazette des Beaux Arts, 1881 pag. 528:

"Au recto du même feuillet, on lit encore une note relative à une vallée "nommée brigatia"; il me semble qu'il s'agit bien des monts de Briançon, le Brigantio dei Romani. Briançon est sur la route de Lyon en Italie. Ce fut par le mont Vio que passèrent, en août 1515, les troupes françaises qui allaient remporter la victoire de Marignan.

Leonard de Vinci, ingénieur de François 1er, comme il l'avait été de Louis XII, aurait-il été pour quelque chose dans le plan du célèbre passage des Alpes, qui eut lieu en août 1515, et à la suite duquel on le vit accompagner partout le châtelain vaingueur? Aurait-il été appelé par le jeune roi, de Rome où l'artiste était alors, dès son avènement au trône?"
1040. On St. Mary's day in the middle of August, at Cesena, 1502.

1041. Stairs of the [palace of the] Count of Urbino,—rough.

1042. At the fair of San Lorenzo at Cesena.

1043. Windows at Cesena.

1044. At Porto Cesenatico, on the 6th of September 1502 at 9 o'clock a.m. The way in which bastions ought to project beyond the walls of the towers to defend the outer talus; so that they may not be taken by artillery.

1045. The rock of the harbour of Cesena is four points towards the South West from Cesena.

1046. In Romagna, the realm of all stupidity, vehicles with four wheels are used, of which two in front are small and two high ones are behind; an arrangement which is very unfavourable to the motion, because on the fore wheels more weight is laid than on those behind, as I showed in the first of the 5th on "Elements".

1040. See Fl. CX, No. 4. The text is accompanied by a slight sketch.

1043. There are four more lines of text which refer to a slightly sketched diagram.

1044. An indistinct sketch, accompanies this passage.
Thus grapes are carried at Cesena.
The number of the diggers of the ditches is [arranged] pyramidically.

There might be a harmony of the different falls of water as you saw them at the fountain of Rimini on the 8th day of August, 1502.

The fortress at Urbino.

Imola as regards Bologna, is five points from the West, towards the North West, at a distance of 20 miles.

Castel San Piero is seen from Imola at four points from the West towards the North West, at a distance of 7 miles.

Faenza stands with regard to Imola between East and South East at a distance of ten miles. Forli stands with regard to Faenza between South East and East at a distance of 20 miles from Imola and ten from Faenza.

Forlimpopoli lies in the same direction at 25 miles from Imola.

Bertinoro, as regards Imola, is five points from the East towards the South East, at 27 miles.

A sketch, representing a hook to which two bunches of grapes are hanging, refers to these first two lines. Cesena is mentioned again Fol. 82a: Carro da Cesena (a cart from Cesena).

In the original the text is written inside the sketch in the place here marked x.
IMOLA.

1051.

Imola uede Bologna a 3/8 di po' nente • inuerso maestro con dist. • di miglia • 20; • Castel • San Piero • è veduto • da Imola in mezzo infra ponente e maestro • dis. • dist. • di miglia • 7.

Faenza • è veduto da Imola infra leuant e scircoco in mezzo apunto in distanza di miglia • 10, e 'l simile fa • Forli con Imola • con distanza di miglia • 20, e Forlimpopo • poli • fi il simile con Forli con distanza di • miglia • 25;

Bertinoro • si uede da Imola a 7/8 di leuant inuerso scircoco con distanza di 27 miglia.

1052.

Da Bon convento alla Casa Nova • miglia • 10; • dalla Casa Nova a Chiusi • miglia • 9.7; • da Chiusi a Perugia, da Perugia • a Santa Maria degli Angeli, e poi a Fuligno.

1053.

Di primo d'agosto 1502 in Pesaro la libreria.

At the beginning of October 1502 Cesare Borgia was shut up in Imola by a sudden revolt of the Condottieri, and it was some weeks before he could release himself from this state of siege (see Gregorovius, Geschichte der Stadt Rom im Mittelalter, Vol. VII, Book XIII, 5, 5).

Besides this incident Imola plays no important part in the history of the time. I therefore think myself fully justified in connecting this map, which is at Windsor, with the siege of 1502 and with Leonardo's engagements in the service of Cesare Borgia, because a comparison of these texts, Nos. 1050 and 1051, raise, I believe, the hypothesis to a certainty.

1052. Most of the places here described lie within the district shown in the maps on Pl. CXIII.
1054. Of Painting.

On the tops and sides of hills foreshorten the shape of the ground and its divisions, but give its proper shape to what is turned towards you.

1055. At Candia in Lombardy, near Alessandria della Paglia, in making a well for Messer Gualtieri of Candia, the skeleton of a very large boat was found about 10 braccia underground; and as the timber was black and fine, it seemed good to the said Messer Gualtieri to have the mouth of the well lengthened in such a way as that the ends of the boat should be uncovered.

1054. This passage evidently refers to the making of maps, such as Fl. CXII, CXIII, and CXIV. There is no mention of such works, it is true, excepting in this one passage of MS. L. But this can scarcely be taken as evidence against my view that Leonardo busied himself very extensively at that time in the construction of maps; and all the less since the foregoing chapters clearly prove that at a time so full of events Leonardo would only now and then commit his observations to paper, in the MS. L.

1055. Messer Gualtieri, the same probably as is mentioned in Nos. 672 and 1344.
At Alessandria della Paglia in Lombardy there are no stones for making lime of, but such as are mixed up with an infinite variety of things native to the sea, which is now more than 200 miles away.

At Monbracco, above Saluzzo,—a mile above the Certosa, at the foot of Monte Viso, there is a quarry of flakey stone, which is as white as Carrara marble, without a spot, and as hard as porphyry or even harder; of which my worthy gossip, Master Benedetto the sculptor, has promised to give me a small slab, for the colours, the second day of January 1511.

That there are springs which suddenly break forth in earthquakes or other convulsions and suddenly fail; and this happened in a mountain in Savoy where certain forests sank in and left a very deep gap, and about four miles from here the earth opened itself like a gulf in the mountain, and threw out a sudden and immense flood of water which scoured the whole of a little valley of the tilled soil, vineyards and houses, and did the greatest mischief, wherever it overlowered.

The river Arve, a quarter of a mile from Geneva in Savoy, where the fair is held on midsummerday in the village of Saint Gervais.

To this it may be objected that Benedetto da Majano had already lain in his grave fourteen years, in the year 1511, when he is supposed to have given the promise to Leonardo. The colours may have been given to the sculptor Benedetto and the stone may have been in payment for them. From the description of the stone here given we may conclude that it is repeated from hearsay of the sculptor's account of it. I do not understand how, from this observation, it is possible to conclude that Leonardo was on the spot.

An indistinct sketch is to be seen by the text.
1060.

And this may be seen, as I saw it, by any one going up[5] Monbroso, a peak of
the Alps which divide France from Italy. The base of this mountain gives birth to the
4 rivers which flow in four different directions through the whole of Europe. And no
mountain has its base at so great a height as this, which lifts itself above almost all the
clouds; and snow seldom falls there, but
only hail in the summer, when the clouds
are highest. And this hail lies [unmelted] there, so that if it were not for the absorp-
tion of the rising and falling clouds, which
does not happen more than twice in an age, an
enormous mass of ice would be piled up there
by the layers of hail, and in the middle of July
I found it very considerable; and I saw the
sky above me quite dark, and the sun as it
ten on the mountain was far brighter here
than in the plains below, because a smaller
extent of atmosphere lay between the summit
of the mountain and the sun.

1061.

In the mountains of Verona the red marble
is found all mixed with cockle shells turned
into stone; some of them have been filled
at the mouth with the cement which is the
substance of the stone; and in some parts
they have remained separate from the mass
of the rock which enclosed them, because
the outer covering of the shell had inter-
posed and had not allowed them to unite
with it; while in other places this cement had
petrified those which were old and almost strip-
pered the outer skin.

1062.

Bridge of Goertz—Wilbach (?)..

C. A. 2314; 6962

Ponte di Gorizia 2 Vilpago.

1060. I have mainly enquired of every available
authority for a solution of the mystery as to what
mountain is intended by the name Mom
boso (Comp. Vol. I Nos. 300 and 301). It seems most obvious
to refer it to Monte Rosa. Rosa is derived from the
Keltic Rav which survives in Breton and in Gaelic,
meaning, in its first sense, a mountain spur, but which
also—like Horn—means a very high peak; thus
Monte Rosa would mean literally the High Peak.

6. in una età. This is perhaps a slip of the pen
on Leonardo's part and should be read estate (summer).
1062. There is a slight sketch with this text,
Leonardo seems to have intended to suggest, with
a few pen-strokes, the course of the Isonzo and
of the Wipbach in the vicinity of Gorizia (Goerz).
He himself says in another place that he had been
in Friuli (see No. 1077 l. 19).
Leic. 1063

Quella parte della terra s'è pìv alienata dal centro d del modo, la qual s'è fatta pìv lieve; E quella parte della terra s'è fatta pìv lieve, per la quale s'è passato maggior concorso d'acque, E si è adìque fatta pìv lieue quelle parte, donde scol'a pìv numero di fiumi, come l'alpi, che diuidero la Magna e la Francia dalla Italia, delle quali s'èscie il Rodenio a mezzodi, e il Reno a tramòtana, il Danubio over Danoia a greco, e l'Po a leua6te con inumerabili fiumi che con loro s'accopagnano, i quali sempre corrono torbidi, dalla terra da loro portata, al mare;

Mouòsi al continvò i liti marittimi inverso il mezzo del mare e lo 8scaccià dal suo primo sito; Riseruerassì li pìv bassa parte del Mediterrano per letto e cor9so del Nilo, fume massimo, che versa in esso mare, E con lui s'accopagnieranno tutti li fiumi sua 10aderèti, che in esso mare le loro acque versar soleano, come far si uede al Po colli aderèt 11sua, li quali prima versaù nel mare che infra l'Appennino e le Germaniche alpi si era vnto 12col Mare Adriatico;

Come le alpi galliche son la pìv alta parte dell' Evropa.

E 1064.

E di questi 0 ri7trovato nelli 3sassi del l'alto 4Appenino e 5massime nel 6sasso della Vérna.

E 80a]

A Parma alla 3Càpana a di 25 3di settebre 1514.

1063. 2. lequella . . . seffatta. 3. magor choncorso . . . Easi adìque. 4. diuidano . . . ella franca . . . della qual. 5. attramòtiana . . . danubbio . . . tanoia a grecho . . . alleu. 5. chon . . . cholloro sacòpagnianno . . . corro. 7. dallo portata . . . movià . . . mero . . . ello. 8. scacciè del . . . mediterrano. 9. inseo . . . sachonpagniere. 10. solano . . . colli aderè . . . apenino elle . . . serràva. 12. chon . . . adriaticho . . . le alpe . . . pivola.

1064. 1. quessi. 2. trovadi. 7. naa.

1064. 6. Sasso della Vérna. Therowning rock between the sources of the Arno and the Tiber, as Dante describes this mountain, which is 1269 metres in height.

This note is written by the side of that given as No. 1020; but their connection does not make it clear what Leonardo's purpose was in writing it.

1065. 2. Càpana, an Inn.

A note on the petrifications, or fossils near Parma will be found under No. 989.
**C. A. 1374-1444**

1066. A method for drying the marsh of Piombino.

1067. The shepherds in the Romagna at the foot of the Apennines make peculiar large cavities in the mountains in the form of a horn, and on one side they fasten a horn. This little horn becomes one and the same with the said cavity and thus they produce by blowing into it a very loud noise.

1068. A spring may be seen to rise in Sicily which at certain times of the year throws out chestnut leaves in quantities; but in Sicily chestnuts do not grow, hence it is evident that that spring must issue from some abyss in Italy and then flow beneath the sea to break forth in Sicily.

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1066. There is a slight sketch with this text in the original. — Piombino is also mentioned in Nos. 609, l. 55—58 (compare Fl. XXXV, 3, below). Also in No. 1035.

1067. As to the Romagna see also No. 1046.

1046. The chestnut tree is very common in Sicily. In writing *cicilia* Leonardo meant, perhaps Cilicia.
## II. FRANCE.

### 1069.

<table>
<thead>
<tr>
<th>ALEMAGNIA</th>
<th>FRANCIA</th>
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<td>8b. Castiglia</td>
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<td>9c. Galitia</td>
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<td>10d. Portogallo</td>
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<td>11e. Tarragona</td>
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<td>12f. Granada</td>
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### 1070.

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<td>Holland</td>
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1069. In the original the three columns are parallel. 1. alamania franca — spagnia. 4. nolinberg — dalfinato. 5. flandra.
7. bincaglia. 8. castiglia. 11. tarragona. 12. granata.

1070. 3. lieffe.

1069. Two slightly sketched maps, one of Europe the other of Spain, are at the side of these notes. (Rodurnna) on the upper Loire, Lyonnais (Dép. du Loire). This town is now unimportant, but in Leonardo’s time was still a place of some consequence.

1070. Roana does not seem to mean here Rouen in Normandy, but is probably Roanne.
1071. 

Come in Borda presso a Guascogna alza il mare circa a 40 braccia pel suo refulso, e 'l suo fiume ringorga l'acque salze pivi di cento cinquanta miglia, e li nauili, che 3 si debbono calafatate, restano alti sopra vn alto collo sopra dello abassato mare.

At Bordeaux in Gascony the sea rises about 40 braccia before its ebb, and the river there is filled with salt water for more than a hundred and fifty miles; and the vessels which are repaired there rest high and dry on a high hill above the sea at low tide.

1072. 

El Rodano esce dal lago di Ginevra e corre prima 2 a ponente, e poi a mezzodi, con corso di 400 miglia, e versa le sue acque nel mare mediterrano.

The Rhone issues from the lake of Geneva and flows first to the West and then to the South, with a course of 400 miles and pours its waters into the Mediterranean.

1073. 

e d is the garden at Blois; a b is the conduit of Blois, made in France by Fra Gioncondo, b e is what is wanting in the height of that conduit, e d is the height of the garden at Blois, e f is the siphon of the conduit, b e, e f, f g is, where the siphon discharges into the river.

1071. 2. This is obviously an exaggeration founded on inaccurate information. Half of 150 miles would be nearer the mark.

1073. The tenor of this note (see lines 2 and 3) seems to me to indicate that this passage was not written in France, but was written from oral information. We have no evidence as to when this note may have been written beyond the circumstance that Fra Gioncondo the Veronese Architect left France not before the year 1505. The greater part of the magnificent Château of Blois has now disappeared. Whether this note was made for a special purpose is uncertain. The original form and extent of the Château is shown in Androvet, Les plus excellents Bastiments de France, Paris MDCVII, and it may be observed that there is in the middle of the garden a Pavilion somewhat similar to that shown on Pl. LXXXVIII No. 7.

See S. DE LA SAUSAYE, Histoire du Château de Blois 4ème Edition Blois et Paris p. 175; En mariant sa sile ablies à François, comte d'Angoulême, Louis XII lui avait constitué en dot les comtés de Blois, d'Asni, de Conac, de Monfor, d'Estampes et de Vertus. Une ordonnance de François I lui laissa en 1516 l'administration du comté de Blois.

Le roi fit commencer, dans la même année, les travaux de cette belle partie du château, commençant sous le nom d'aile de François I, et dont nous avons donné la description au commencement de ce livre. Nous trouvons en effet, dans les archives du Parlement de Tours, une pièce qui en fait parfaitement la date. On y lit: "Je, Bayeux Philippes, commis par le Roy à tenir le compte et faire le paiement des bâtiments, édifices et reparations que le dit seigneur fait faire en son chas de Blois, empeche avois en et reçus ... la somme de trois mille livres tournois ... le cinquantième jour de juillet, l'an mil cing cent et soixante. P. 24: Les jardins avaient été décorés avec beaucoup de luxe par les différents possesseurs du château. Il ne reste de tous les bâtiments qu'ils y élevèrent que ceux des officiers chargés de l'ad-
Loira fiume d'Amboise.

Il fiume è più alto dentro all'argine b d che fuori d'essa argine;
4Isola dove è 9va parte d'Amboisa.
2Il fiume Loira che passa per Ambosa passa per a b c d, e poiché è passato il pote, 12ritorna contro al suo avvenimento per il canale d e, b f in contatto dell'argine che si interpone infra li due moti contrari del predetto fiume a b, c d, e, b f; 14di poi si riunita in giù per il canale f l, g h, n m, e si ricongiugni col fiume dode prima si diuise, che passa per k n, che fa k m, r t; ma quando il fiume è grosso, allora e'lli corre tutto per uno solo verso, passando l'argine b d. 1074.

The river Loire at Amboise.
The river is higher within the bank b d than outside that bank.
The island where there is a part of Amboise.

This is the river that passes through Amboise; it passes at a b c d, and when it has passed the bridge it turns back, against the original current, by the channel d e, b f in contact with the bank which lies between the two contrary currents of the said river, a b, c d, and d e, b f. It then turns down again by the channel f l, g h, n m, and reunites with the river from which it was at first separated, which passes by k n, which makes k m, r t. But when the river is very full it flows all in one channel passing over the bank b d.

L'acque sieno risen'gorgate sopra il termine di Romorantino in t'atta altezza, c'ellè fac-cino poi nel l'oro disciess molite molina;
1075. 1. giardino. 4. altezza. 5. caiolitza del gar. 6. ella. 1074. 1. Loira. 2. di[en]sosa. 3. gocodo. 3. eppiu. 8. fiume era che. 13. chesi . infralli . controri . predetto. 14. ess richongiugnìa. 15. diuise [epua] che . chefil. 1075. 1. Lacsua sin rio. 2. gharhoata. 3. alteza. 7. 100 diessiosa. 9. uilla. 10. francha. 11. docto a romolo. 12. del ministrato et la cultura des jardins, et un pavillon carré en pierre et en brique flanqué de terrasses à chacun de ses angles. Quoique différent par des mesures élevées sur les terrasses, cet édifice est très-digne d'intérêt par l'originalité du plan, la décoration architecturale et le souvenor d'Anne de Bretagne qui le fit construire. Fèli-

The water may be dammed up above the level of Romorantin to such a height, that in its fall it may be used for numerous mills.

min des jardins, des carrières de pierre et de brique, et des terrasses. Les deux grands bassins de charpente se partagent toute la longueur et la largeur du jardin, et dans les quatre angles des allées, où ces bassins se croisent, il y avait 4 cabinets, de même charpente... Il y a pas longtemps qu'il y avait dans ce même jardin, à l'endroit où se croisent les allées du milieu, un édifice de figure octogone, de plus de 7 toises de diamètre et de plus de neuf toises de haut; avec 4 enfoncements en forme de niche dans les 4 angles des allées. Ce bâtiment... était de charpente mais d'un extrêmement bien travaillé. On y voyait parti-culièrement la cordillère qui regardait tout autour en forme de cordon. Car la Roine l'ordonna de la mettre non-tellement à ses armes et à ses chiffres mais de la faire représenter en divers manières dans tous les ouvrages qu'on lui faisait pour elle... le bâtiment était couvert en forme de domo qui dans son milieu avait encore un petit dôme, ou lanterne vivante au-dessus de laquelle était une figure dorée représentant Saint Michel. Les deux dômes étaient proprement couvert d'ardoise et de plomb doré par dehors; par dedans ils étaient lambrissés d'une menuiserie très délicate. Au milieu de ce Salon il y avait un grand bassin octogone de marbre blanc, dont toutes les faces étaient enrichies de différentes sculptures, avec les armes et les chiffres du Roy Louis XII et de la Reine Anne. Dans ce bassin il y en avait un autre post sur un pédestal lequel avait sept pieds de diamètre. Il était de figure ronde à godrons, avec des masques et d'autres ornements très squamalement taillés. Du milieu de ce deuxième bassin y levait un autre petit pédestal qui portait un troisième bassin de trois pieds de diamètre, assez parfaitement bien taillé; c'est de ce dernier bassin que j'allaisce l'eau qui se répandait en suite dans les deux autres bassins. Les beaux ouvrages faits d'un marbre également blanc et poli, furent bientôt par la pesanteur de tout l'édifice, que les injures de l'air renver-sèrent de fond en comble.

1074. See Pl. CXV. Lines 1—7 are above, lines 8—10 in the middle of the large island and the word folio is written above d in the smaller island; a is written on the margin on the bank of the river above l. 11; in the reproduction it is not visible. As may be seen from the last sentence, the observation was made after long study of the river's course, when Leonardo had resided for some time at, or near, Amboise.
Se il fiume m'era nato del fiume Lombarde, Lovere, teneva con i suoi acquai torbide, esso pigro nel canale di Romorantin, scende a sua volta alla sua riva tutta, o veramente in alto in una sola volta, o veramente in due.

Kapstadt ci era stato un'altra volta di imbatteringe, e ci era stato un'altra volta di salire per ben due volte.

E si era reso che l'acqua d'altra volta, o veramente in due.

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pagnie sopra le quali esso adauce'trà, e rederà il paese, fertile da nutrire li additori, e farà canale navigabile e mercatile. 

4 Modo che'l fiume 7 col suo corso 8 netti il fondo del 9 fiume.

10. Per la nona del 3°; 11 Quello ch'è più velo 12 cie, più còsuna il 13 suo fondo, e per la cò 14 versa: l'acqua ch'è più 15 tarda pium 16 la scia 17 di quel che la intorbi 17 da;

18 E facciasi il serraglio mobile, che io or 18' dinai nel Friuli, del quale, aperto vna catarata 19 ta, l'acqua che di quella vestiva cavò il fondo; 21 addunque nelle diluvi de' fiumi si debbono aprire le cate 22 rate del' mo 23 lin, acciocché tutto il corso del fiume si renda per e 24 terata in chiaro molino, sieno molte, acciocché . . . . 24 si faccia maggiore ipeto, e così netterà tutto il fiume; 26 e infra le due poste de' moli 26 ni sì vna delle dette catarata 27 te; sì vna d'esse poste di tal cate 27 rate infra l'uno e l'al 28 tro molino.

Vno trabocco è quattro braccia e vno miglio è tre mila d'esse braccia; E l'brac 29 cio si duide in 12 ocie; e l'acqua de' canali à di calo in ogni ceto trabocchi 2 delle dette onc; adìue 14 oncie 3 di calo son necessarie a due mila ottocento braccia di moto ne'detti canali; seguita che 15 oncie 4 di calo danno debito moto alli corsi del l'acque dei predetti canali, cioè uno braccio e 1/2 5 per miglio; E per questo concludersi che l'acqua che si toglie dal fiume di Villa

And let the sluice be movable like the one I arranged in Friuli [19], where when one sluice was opened the water which passed through it dug out the bottom. Therefore when the rivers are flooded, the sluices of the mills ought to be opened in order that the whole course of the river may pass through falls to each mill; there should be many in order to give a greater impetus, and so all the river will be scoured. And below the site of each of the two mills there may be one of the said sluice falls; one of them may be placed below each mill.

1078. A trabocco is four braccia, and one mile is three thousand of the said braccia. Each braccio is divided into 12 inches; and the water in the canals has a fall in every hundred trabocchi of two of these inches; therefore 14 inches of fall are necessary in two thousand eight hundred braccia of flow in these canals; it follows that 15 inches of fall give the required momentum to the currents of the waters in the said canals, that is one braccio and a half in the mile. And from this it may be concluded that the water taken from the river of Ville-

1077. 19. This passage reveals to us the fact that Leonardo had visited the country of Friuli and that he had stayed there for some time. Nothing whatever was known of this previously.
Franca e si 6 presta al fiume di Romorontino vuole ... Dove l'ù fiume mediante la sua bassezza nò 7 può entrare nell'altro, è necessario ringorzarlo in tale altezza che possa discidere 8 in quel che prima era piv alto.

Vigilia di Sco Anto 10 nio tornai da Romo 12 rotino in Abouasa, 12 c 1 l'è si parti due 13 di innanzi da Romoritätino.

Da Romorontino insinu al 16 pote a Sodro | sì chiama Soudro; 17 c da esso pote insino a Tours 18 sì chiama Schier.

Parai saggio del 20 luillo di quel ca- 21 nale che si à a codur 22 re dalla Loira a Romo 23 lontino con vn ca 24 nale largo vn braccio e 25 profondo vn bracco.

FRANCE.

1079.

STRADA D'ORSLENS.

2 Alla quarta di mezzodi verso scirocco;
3 alla terza di mezzodi verso scirocco;
4 alla quarta di mezzodi verso scirocco;
5 alla quinta di mezzodi verso scirocco;
6 tra libeccio e mezzodi; 7 a leuante partecipando di mezzodì; 8 tra mezzo giorno verso leuante 1/8; 9 Da poi verso ponente; 10 tra mezzodi e libeccio; 11 a mezzodi.

The Road to Orleans.

At 1/4 from the South to the South East.
At 1/3 from the South to the South East.
At 1/4 from the South to the South East.
At 1/5 from the South to the South East.
Between the South West and South, to the East bearing to the South; from the South towards the East 1/8; thence to the West, between the South and South West; at the South.

còclùderemo chellaqua chessi ... franca essi. 6. pressta ... remolontino vole ... mediante [la ba] la sua. 7. ringborgarlo ... altera ... discidere [§3].
12. el re [di fran] si. 13. innanzi ... Lines 15-18 are written from left to right. 15. Romorantino. 17. [po] e da. 20. cha. 21. chessa a chòdur. 22. re dallina remo. 23. cha. 24. largho va br. 25. va br.
1079. written from left to right: 1. doréons. 2. de mezo syroccho. 3. de mezo ... syroccho. 4. mezo ... syroccho. 5. mezo ... syroccho. 6. bybboce e merodi. 6. mezo. 7. mezo. 8. poné. 9. mezo ... bybboio. 10. mezo.

1079. The meaning is obscure; a more important passage referring to France is to be found under No. 744.
MODE COME I TEDESCHI INGARBUGLIANO E TESSANO, SÉRÒDOSI ISIME, 2 LE LORO TARGHE LUNGE CÔTO A NEMICI, ABASSANDOSI E METTÉDO 3 VNA DELLE TESTE A TERRA, TENÉDO IL RESTO IN MANO.

The way in which the Germans closing up together cross and interweave their broad leather shields against the enemy, stooping down and putting one of the ends on the ground while they hold the rest in their hand.

VSANO I GERMANI ANNEGARE CASTELLANI CO' FUMO DI PIVMA, SOLFO 2 E RISAGALLO, E Fanno durare detti fumi 7 E 8 ore; 4 c'acora la 3 pula del frumètò fa assai e durabil fumo; e letame secco ancor lui, 5ma fa sia mischiato colla sása, cioè vluie tratte nel' olio, o vuoi morchìa 5 'd'olio.

The Germans are wont to annoy a garrison with the smoke of feathers, sulphur and realgar, and they make this smoke last 7 or 8 hours. Likewise the husks of wheat make a great and lasting smoke; and also dry dung; but this must be mixed with olive husks, that is olives pressed for oil and from which the oil has been extracted.

COME LE UALLI FURÒ GIÀ GOPERTE IN GRÁ PARTE DA LHAGHI, INPEROCHÉ SEPRENPE IL SUO TERRENO FECE ARGINE A FUMI, E DA MARI, I QUALI POI COLLA PERSEVERATIONE DE' FUMI 3 SEGARONO LI MONTI, E LI FUMI COI LOR VAGABUNDI CORSI PORTARONO VIA LE ALTRE PIANVRE INCLUSE DALLI MÒTI, E LE SEGATURE DE'MÒTI SÓNO NOTE PER LE FALENDE DELLE PIETRE, CHE SI CORRISCONDONO NELLE LOR TAGLIATURE FATTE DALLI DÉTTI CORSI DE' FUMI; 4 IL MONTE EMUS CHE RIGA LA TRATIA E LA DARDARIA E SI CONGIUNGE COL MONTE SARIDONIUS, ELE QUEALE, SEGUENDO 5 A PONÈTE, MUTA IL NOME DI SARDUS IN 6 Rebì nel toccare la Dalmatia, poi seguendo a ponête riga li Illirici 6 oggi detta Schiavonia, e mvta nome di 7 Rebì in 8 Albanus, e seguendo pure a ponête si muta nel Mòte Ocra 7 a tramòtana, e a mezzodi sopra all'Istria si nomina 9 Caruancas e si congiunge a ponête sopra l'Italia col Mòte

1080. Above the text is a sketch of a few lines crossing each other and the words de ponderibus. The meaning of the passage is obscure.
Adula, 8doue nasie il Danubio, il quale s'astende a leuante con corso di 1500 miglia, e la sua linea breuiissima è circa 9mille miglia, e altrettanto o circa è'l ramo del Monte Adula mutato ne'predetti nomi di möti; sta a tramon10tana il monte Carpatus, il quale termina la larghezza della valle del Danubio, la qual, come dissi, s'astende 11a leuate cò lunghessa di circa mille miglia, ed è là da doce 200 e doce 300 miglia; questa si mette pel 12mezzo il Danubio, primo fiume d'Europa per magnitudine, il qual Danubio si lascia per mezzo di 13Austria e Albamia e per tramótana Bauaria, Polonia, Ungheria, Valachia e Bosnia; versaoua adunque il Danubio | over | Da14noia nel mare di Ponto, il quale s'astende insino vicino all'Austria e occupa tutta la pianvra che oggi 15discorre esso Danubio, e'l segno dico ne mostrano l'ostriche e li nichi e bovoli e cappe e ossa di grà pesci, che an16cora in molti loci si trovano nell'alte coste de'predetti möti; ed era tale mare fatto per la ringorgatione di' ra17mi dell'Austria e delle Alpe Augure, che s'astendeano a leuante e si congiugneano colli rami del Mòte Tauro, che s'astendono a po18nète, e circa alla Bitinian versaoua l'acque d'esso Mare di Pòto nel Propontico, cadendo nel Mare Egeo cioè 19Mar Mediterraneo, dove poi il lungo corso spiccò li rami del Mòte Adula dalle rami del Mòte Tauro; li Mare 20di Pòto s'abassò e scoperse la Val di Danubio colle prenomeinate provincie, e tutta l'Asia Minore di là dal monte Ta21tro per tramótana e la pianvra ch'è da Mòte Caucasso al mare di Ponto per ponète, e la pianvra del Ta22nai dentro alli monti Rifiè cioè a' piedi loro; Ecco che li mare di Ponto abbassò circa a braccia 1000 23nello scoprire di tanta pianura.

course of 1500 miles; its shortest line is about 1000 miles, and the same or about the same is that branch of the Adula mountains changed as to their name, as before mentioned. To the North are the Carpathians, closing in the breadth of the valley of the Danube, which, as I have said extends eastward, a length of about 1000 miles, and is sometimes 200 and in some places 300 miles wide; and in the midst flows the Danube, the principal river of Europe as to size. The said Danube runs through the middle of Austria and Albania and northwards through Bavaria, Poland, Hungary, Wallachia and Bosnia and then the Danube or Donau flows into the Black Sea, which formerly extended almost to Austria and occupied the plains through which the Danube now courses; and the evidence of this is in the oysters and cockle shells and scollops and bones of great fish which are still to be found in many places on the sides of those mountains; and this sea was formed by the filling up of the spurs of the Adula mountains which then extended to the East joining the spurs of the Taurus which extend to the West. And near Bithynia the waters of this Black Sea poured into the Propontis [Marmora] falling into the Egean Sea, that is the Mediterranean, where, after a long course, the spurs of the Adula mountains became separated from those of the Taurus. The Black Sea sank lower and laid bare the valley of the Danube with the above named countries, and the whole of Asia Minor beyond the Taurus range to the North, and the plains from mount Caucasus to the Black Sea to the West, and the plains of the Don this side—that is to say, at the foot of the Ural mountains. And thus the Black Sea must have sunk about 1000 braccia to uncover such vast plains.

8. Danubio, in the original Reno; evidently a mistake as we may infer from come dissi l. 10 &c.
III.

THE COUNTRIES OF THE WESTERN END OF THE MEDITERRANEAN.

\[1083.\]

1083. Why the sea makes a stronger current in the straits of Spain than elsewhere.

A river of equal depth runs with greater speed in a narrow space than in a wide one, in proportion to the difference between the wider and the narrower one.

This proposition is clearly proved by reason confirmed by experiment. Supposing that through a channel one mile wide there flows one mile in length of water; where the river is five miles wide each of the 5 square miles will require \( \frac{1}{5} \) of itself to be equal to the square mile of water required in the sea, and where the river is 3 miles wide each of these square miles will require the third of its volume to make up the amount of the square mile of the narrow part; as is demonstrated in \( fgh \) at the mile marked \( n \).

1083. In the place marked \( A \) in the diagram the original. And at \( B \), streto di Spagna (strait of Spain, i.e. Gibraltar). Compare No. 960.
1084.

Why the current of Gibraltar is always greater to the West than to the East.

The reason is that if you put together the mouths of the rivers which discharge into the Mediterranean sea, you would find the sum of water to be larger than that which this sea pours through the straits into the ocean. You see Africa discharging its rivers that run northwards into this sea, and among them the Nile which runs through 3000 miles of Africa; there is also the Bagrada river and the Schelif and others. Likewise Europe pours into it the Don and the Danube, the Po, the Rhone, the Arno, and the Tiber, so that evidently these rivers, with an infinite number of others of less fame, make its great breadth and depth and current; and the sea is not wider than 18 miles at the most westerly point of land where it divides Europe from Africa.

1085.

The gulf of the Mediterranean, as an inland sea, received the principal waters of Africa, Asia and Europe that flowed towards it; and its waters came up to the foot of the mountains that surrounded it and made its shores. And the summits of the Apennines stood up out of this sea like islands, surrounded by salt water. Africa again, behind its Atlas mountains, did not expose uncovered to the sky the surface of its vast plains about 3000 miles in length, and Memphis[6] was on the shores of this sea, and above the plains of Italy, where now birds fly in flocks, fish were wont to wander in large shoals.

1086.

The greatest ebb made anywhere by the Tunis. Mediterranean is above Tunis, being about two and a half braccia and at Venice it falls two braccia. In all the rest of the Mediterranean sea the fall is little or none.
TOPOGRAPHICAL NOTES.

1087. Describe the mountains of shifting deserts; that is to say the formation of waves of sand borne by the wind, and of its mountains and hills, such as occur in Libya. Examples may be seen on the wide sands of the Po and the Ticino, and other large rivers.

1088. Circumfulgore is a naval machine. It was an invention of the men of Majorca.

1089. Some at the Tyrhene sea employ this method; that is to say they fastened an anchor to one end of the yard, and to the other a cord, of which the lower end was fastened to an anchor; and in battle they flung this anchor on to the oars of the opponent’s boat and by the use of a capstan drew it to the side; and threw soft soap and tow, daubed with pitch and set ablaze, on to that side where the anchor hung; so that in order to escape that fire, the defenders of that ship had to fly to the opposite side; and in doing this they aided to the attack, because the galley was more easily drawn to the side by reason of the counterpoise.

1087. The machine is fully described in the MS. and shown in a sketch.

1088. This text is illustrated in the original by a pen and ink sketch.
On the shores of the Mediterranean 300 rivers flow, and 40, 200 ports. And this sea is 3000 miles long. Many times has the increase of its waters, heaped up by their backward flow and the blowing of the West winds, caused the overflow of the Nile and of the rivers which flow out through the Black Sea, and have so much raised the seas that they have spread with vast floods over many countries. And these floods take place at the time when the sun melts the snows on the high mountains of Ethiopia that rise up into the cold regions of the air; and in the same way the approach of the sun acts on the mountains of Sarmatia in Asia and on those in Europe; so that the gathering together of these three things are, and always have been, the cause of tremendous floods: that is, the return flow of the sea with the West wind and the melting of the snows. So every river will overflow in Syria, in Samaria, in Judea between Sinai and the Lebanon, and in the rest of Syria between the Lebanon and the Taurus mountains, and in Cilicia, in the Armenian mountains, and in Pamphilia and in Lycia within the hills,
To topographical notes. [1091. 1092.]

Tauro, e la Cilicia dentro alli moti Armeni e la Pamfilia e Licia dentro alli moticelli e l'Egitto insino al mòte Atlante; Il seno di Persia, che gia fu lago gràdissimo del Tigris e cadè[a] nel mare d'India, ora a consumato il mòte ch'è facea argine, e si è raggugliato coll'altezza delle Oceano Indico; E se 'l Mare Mediterrano se- quiva il moto suo nel se d'Arabia, aècor facieva il simile, cioè che si raggugliava l'altezza Mediterranea colla altezza d'esso Mare Indico.

Leic. 310]
The Red Sea. (1091. 1092.)

Versò l'acqua Mediterranea lungamente pel Mare Rosso, el quale è largo cento miglia e lungo mille cinque cento; è tutto pieno di scogli, e à consumato li lati del Mòte Sinai, la qual cosa testifica, nò da inodazione del Mar d'India, che in tali liti percuotesse, ma da una ruina d'acqua, la qual portaua con seco tutti li fumi che soprabbondauano al Mare Mediterrano, e oltre a questo il rifuesso del mare; e poi, essendo tagliato nel ponente, 3 mila miglia remoto da questo loco, il mòte Calpe è spiccatol dal Mòte Abila, e fu tal taglio fatto bassissimo nelle pianure che si trouauà infr. Abila e l'oceano a piè del monte in loco basso, aiutato dal concuamamento di qualche vallata fatta da alcun fiume che quiui passasse; venne Hercules ad aprire il mare nel ponente, e allora l'alque ma- rine cominciarono a uersare nell'oceano occidentale, e per la grà bassezza, il Mare Rosso rimase pivi alto, onde l'acque annò abbandonato il corso di quiui; senpre anno poi versato l'acque per lo Stretto di Spagna.

C. A. 321 a; 971d]
La superficie del Mare Rosso è in li- uello coll'oceano.

1091. For a long time the water of the Medi- terranean flowed out through the Red Sea, which is 100 miles wide and 1500 long, and full of reefs; and it has worn away the sides of Mount Sinai, a fact which testifies, not to an inundation from the Indian sea beating on these coasts, but to a deluge of water which carried with it all the rivers which abound round the Mediterranean, and besides this there is the reflux of the sea; and then, a cutting being made to the West 3000 miles away from this place, Gibraltar was separated from Ceuta, which had been joined to it. And this passage was cut very low down, in the plains between Gibraltar and the ocean at the foot of the mountain, in the low part, aided by the hollowing out of some valleys made by certain rivers, which might have flowed here. Hercules came to open the sea to the westward and then the sea waters began to pour into the Western Ocean; and in consequence of this great fall, the Red Sea remained the higher; whence the water, abandoning its course here, ever after poured away through the Straits of Spain.

1092. The surface of the Red Sea is on a level with the ocean.


1091. 1. mediterana lungamente. 2. largho . ellincho . cinquecento tutto. 3. de múti sinai . lii percho. 4. tessi . con- secho . soprabb. 5. dauno . mediterano e oltre adiqueso il refrusso. 6. chelle . chelli . ches. 7. picatto . abile eff. . chellis trovaua . abile. 8. iloceano . locho . chonchusa. 9. passas. . ercholo. 10. comiconoro . occsano . . perilla . bassae. 11. lache abbandonato.

1092. 1. mare [so] rosso e illuio. 2. chaduta . esessato [el] la bocha. 3. mediterano. 4. righorghato. 5. fralli . ghade-

1091. 9. Leonardo seems here to mention Hercules half jestingly and only in order to suggest to the reader an allusion to the legend of the pillars of Hercules.
Può esser caduta vna mòtagna e, serrato la bocca del Mare Rosso, e proibito l'esito al Mediterrano, e così rigorgato tal mare abbia per esito il tràsito fra li gioghi Gadetani, perché similmente abbia veduti alli nostri tèpi cadere il monte di sette miglia e serrare vna valle e farne lago, e così sö fatti la maggior parte de'laghi da mòti come Lago di 9 Garda di Como e Lugano, e l' lago Maggiore; 10 il Mediterrano poco s'abbassò per il taglio Gaditano ne' li còfini della Siria e assai in esso taglio, perché pri11ma che tal taglio si creasse, esso mare versava per scirocco, 12 e poi s'ebbe a fare la calata, che corresse a tal Gaditano.

In a cadea l'acqua del Mediterrano nel oce13ano.

Tutte le pianure che son dalla mari alli mòti, sono già state coperte dall'acque salse; 14

Ogni valle è fatta dal suo fiu15me e tal proportione è da valle a val17le, quale è da fiume a fiume; 15

Il massimo fiume del nostro modo è il Mediterrano fiume, 16

che si move dal principio del Nil oll'Oceano occidi18tale, 19

e la sua suprema altezza è nella Mavretania este19riore, e à di corso 10 mila miglia, prima che si ripatri 30 col suo Oceano, padre dell'11acque, 21 Cioè 3000 il Mediterrano, 3000 35 il Nilo scoperto, e 3000 il Nilo che corre a orie1te ecc.

A mountain may have fallen and closed the mouth of the Red Sea and prevented the outlet of the Mediterranean, and the Mediterranean Sea thus overfilled had for outlet the passage below the mountains of Gades; for, in our own times a similar thing has been seen; 6 a mountain fell seven miles across a valley and closed it up and made a lake. And thus most lakes have been made by mountains, as the lake of Garda, the lakes of Como and Lugano, and the Lago Maggiore. The Mediterranean fell but little on the confines of Syria, in consequence of the Gaditanean passage, but a great deal in this passage, because before this cutting was made the Mediterranean sea flowed to the South East, and then the fall had to be made by its run through the Straits of Gades.

At a the water of the Mediterranean fell into the ocean.

All the plains which lie between the sea and mountains were formerly covered with salt water.

Every valley has been made by its own river; and the proportion between valleys is the same as that between river and river.

The greatest river in our world is the Mediterranean river, which moves from the sources of the Nile to the Western ocean.

And its greatest height is in Outer Mauritania and it has a course of ten thousand miles before it reunites with its ocean, the father of the waters.

That is 3000 miles for the Mediterranean, 3000 for the Nile, as far as discovered and 3000 for the Nile which flows to the East, &c.
Adunque concluderemo quelle montagne essere di maggiore altura, sopra delle quali fiocando l'origine del Nilo dai nuvoli casca. Therefore we must conclude those mountains to be of the greatest height, above which the clouds falling in snow give rise to the Nile.

Gli Egiziani, gli Etiopi e gli Arabi nel passare il Nilo usano ai cameli 3appiccare ai lati del busto 2 baghe cioè otri i questa forma di sotto. 1094. In these four meshes of the net the camels for baggage place their feet.

Leic. 34 4]
Il Tigri passa per l'Asia Minore, il quale ne porta con seco l'acqua di 3 paduli, l'uno dopo l'altro di varie altezze, de quali il piv alto è Munace, e l mezzano è Pallas, e l'ulimo basso è Triton; ancora el Nilo diria di 3 altissimi paduli in Etiopia, il quale corre a tramontana e versa nel mare d'Egitto con corso di 4000 miglia, e la sua breuissima e diritta linea è 3000 miglia; di quel che s'apricca escie de' morti della luna con diversi e incogniti principi, e trovansi li detti laghi alti sopra la spera dell'acqua circa a 4000 braccia cioè vn miglio e 1/3, a dare 3 vn braccio di calduta al Nilo per ogni miglio. The Tigris passes through Asia Minor and brings with it the water of three lakes, one after the other of various elevations; the first being Munace and the middle Pallas and the lowest Triton. And the Nile again springs from three very high lakes in Ethiopia, and runs northwards towards the sea of Egypt with a course of 4000 miles, and by the shortest and straightest line it is 3000 miles. It is said that it issues from the Mountains of the Moon, and has various unknown sources. The said lakes are about 4000 braccia above the surface of the sphere of water, that is 1 mile and 1/3, giving to the Nile a fall of 1 braccia in every mile.

Leic. 22 4]
Moltissime volte il Nilo e gli altri fiumi di grà mag shuts seanco tutto l'elemento dell'acqua e reduto al mare. Very many times the Nile and other very large rivers have poured out their whole element of water and restored it to the sea.

1093. 1. adunque chòccluderemo quelle montagne essere di maggiore altura. 3. sopra delle quali l'origine del Nilo dai nuvoli fiochando cade. 3. sopra delle quali "fiocando del nilo dai nuvoli cade". 5. chòccluderano molto magiori. 5. fiochando...nuvoli casche.
1094. 1. egizi. 2. apiccare...baghe. 4. mettono...cariaggi.
1095. 1. come trigon il quale passa per la minorìa africa il quane ne. 2. conseco lacq"a"...altore...mezzano. 4. atramontana...ella sua...ediriti. 5. he 3000...quel chessa nozioni escie. 6. vasi...sopra lasspera dellacq"a" circa 4000 br. eoe. 7. va br. di.

1094. Unfortunately both the sketches which accompany this passage are too much effaced to be reproduced. The upper represents the two sacks joined by ropes, as here described, the other shows four camels with riders swimming through a river.

1095. 5. Incogniti principio. The alluents of the lakes are probably here intended. Compare, as to the Nile, Nos. 970, 1063 and 1084.
1097. Why does the inundation of the Nile occur in the summer, coming from torrid countries?

1098. It is not denied that the Nile is constantly muddy in entering the Egyptian sea and that its turbidity is caused by soil that this river is continually bringing from the places it passes; which soil never returns in the sea which receives it, unless it throws it on its shores. You see the sandy desert beyond Mount Atlas where formerly it was covered with salt water.

1099. The Assyrians and the people of Euboea accustom their horses to carry sacks which they can at pleasure fill with air, and which in case of need they carry instead of the girth of the saddle above and at the side, and they are well covered with plates of cuir bouilli, in order that they may not be perforated by flights of arrows. Thus they have not on their minds their security in flight, when the victory is uncertain; a horse thus equipped enables four or five men to cross over at need.

1100. Small boats.

The small boats used by the Assyrians were made of thin laths of willow plaited over rods also of willow, and bent into the form of a boat. They were daubed with fine mud soaked with oil or with turpentine, and reduced to a kind of mud which resisted the water and because pine would split; and always remained fresh; and they covered this sort of boats with the skins of oxen in safely crossing the river Sicuris of Spain, as is reported by Lucan[7].
TOPOGRAPHICAL NOTES.

[II01—II03.

The Spaniards, the Scythians and the Arabs, when they want to make a bridge in haste, fix hurdlework made of willows on bags of ox-hide, and so cross in safety.

II01.

In [fourteen hundred and] eighty nine there was an earthquake in the sea of Atalia near Rhodes, which opened the sea—that is its bottom—and into this opening such a torrent of water poured that for more than three hours the bottom of the sea was uncovered by reason of the water which was lost in it, and then it closed to the former level.

II02.

Rhodes has in it 5000 houses.

II03.

Site for [a temple of] Venus.

You must make steps on four sides, by which to mount to a meadow formed by nature at the top of a rock which may be hollowed out and supported in front by pilasters and open underneath in a large portico,

(An unpublished Arabic MS. in the possession of Prof. SCHEFER, Member of l'Institut, Paris) mention is made of a terrible earthquake in the year 867 of the Mohamedan Era corresponding to the year 1489, and it is there stated that a hundred persons were killed by it in the fortress of Kerak. There are three places of this name, Kerak on the sea of Tiberias, Kerak near Table on the Libanon, which I visited in the summer of 1876—but neither of these is the place alluded to. Possibly it may be the strongly fortified town of Kerak-Kir Mobb, to the West of the Dead Sea. There is no notice about this in ALEXIS PERCY, Mémoire sur les tremblements de terre ressentis dans le péninsule turco-hilàleen et en Syrie (Mémoires couronnés et mémoires des savants étrangers, Académie Royale de Belgique, Tome XXIII).

II03. See Pl. LXXXIII. Compare also p. 33 of this Vol. The standing male figure at the side is evidently suggested by Michael Angelo's David. On the same place a slight sketch of horses seems to have been drawn first; there is no reason for

Leic. 108]

Nello ottanta 9 fu vno terremoto nel mar di Atalia presso a Rodi, il quale aperse il mare cioè il fondo, "nella qual apertura si sommerse tanto diluuo d'acque, che per piv di 3' ore si scoprese il fondo del mare dall'acque, che di quiui si spogliarono, e poi si richiuse al primo grado.

W. XVIIa]

Pel sito di Venere.

2 Farai le scale da 4 faccie, per le quali si pervenga a un prato fatto dalla natura sopra vn sasso, "il quale sia fatto vuoto e sostenuto dinanzi con pilastri, e sotto travaglato con magno portico, nel quali uada ovroti ... pelle. Io. passa.

II01. 1. mare distalia preso ... aperse "il mare co' el fondo [del mare]. 2. somerse tane diluuo ... mare delle acqua.

II02. 2. lenscale ... pervena ... prato [for] fatto [sopra] dalla. 3. voto essoslenvia ... pilastri essetlo ... conmagnio porticho, ne.

II03. Nello ottanto 9. It is scarcely likely that Leonardo should here mean 89 A.D. Dr. H. MÜLLER STRAUBING writes to me as follows on this subject: "With reference to Rhodes Ross says (Reise auf den Griechischen Inseln, III 70 ff. 1840), that ancient history affords instances of severe earthquakes at Rhodes, among others one in the second year of the 138th Olympiad=270 B.C.; a remarkably violent one under Antoninus Pius (A. D. 138-161) and again under Constantine and later. But Leonardo expressly speaks of an earthquake "nel mar di Atalia preso a Rodi", which is singular. The town of Atalia, founded by Attalus, which is what he no doubt means, was in Pamphylia and more than 150 English miles East of Rhodes in a straight line. Leake and most other geographers identify it with the present town of Adalia. Atalia is rarely mentioned by the ancients, indeed only by Strabo and Pliny and no earthquake is spoken of. I think therefore you are justified in assuming that Leonardo means 1489". In the elaborate catalogue of earthquakes in the East by Selale Dabhelal eddin Sayouthy.
l'acqua in diversi vasi di granito porfido e serpentine, dentro a cnicili, e sparsa l'acqua in se medesimi, e dintorno a tal portico inverso tramontana sia un lago; con vna isola in mezzo, nella quale sia vn folto e obbroso bosco; l'acque in testa ai pilastri siè uersate in uasi ai pié de' suoi inbasamenti, de' quali si spargano piccoli riiuetti;

4 Partendosi dalla 5 riviera di Cilicia inverso meridio si scopro la bellezza dell'isola di Cipri.

From the shore of the Southern coast of the Caspian Sea Cilicia may be seen to the South the beautiful island of Cyprus, which was the realm of the goddess Venus, and many navigators being attracted by her beauty, had their ships and rigging broken amid the reefs, surrounded by the whirling waters. Here the beauty of delightful hills tempts wandering mariners to refresh themselves amidst their flowery verdure, where the winds are tempered and fill the island and the surrounding seas with fragrant odours. Ah! how many a ship has here been sunk. Ah! how many a vessel broken on these rocks. Here might be seen barks without number, some wrecked and half covered by the sand; others showing the poop and another the prow, here a keel and there the ribs; and it seems like a day of judgment when there should be a resurrection of dead ships, so great is the number of them covering all the Northern shore; and while the North gale makes various and fearful noises there.

C. A. 256 A.D. 773 A]

Sciri a Bartolomeo turco del flusso e rifuluoso del mar di Ponto, e che intenda, se tal flusso e rifuluoso è nel Mare Ircano over Mare Caspio.

Write to Bartolomeo the Turk as to the flow and ebb of the Black sea, and whether he is aware if there be such a flow and ebb in the Hyrcanean or Caspian sea.

assuming that the text and this sketch, which have no connection with each other, are of the same date.

Site di Venere. By this heading Leonardo appears to mean Cyprus, which was always considered by the ancients to be the home and birth place of Aphrodite (Kôpê in Homer).

1105. The handwriting of this note points to a late date.
**1106.**

**Why water is found at the top of mountains.**

From the straits of Gibraltar to the Don is 3500 miles, that is one mile and \( \frac{1}{6} \), giving a fall of one braccio in a mile to any water that moves gently. The Caspian sea is a great deal higher; and none of the mountains of Europe rise a mile above the surface of our seas; therefore it might be said that the water which is on the summits of our mountains might come from the height of those seas, and of the rivers which flow into them, and which are still higher.

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**1107.**

Hence it follows that the sea of Azov is the highest part of the Mediterranean sea, being at a distance of 3500 miles from the Straits of Gibraltar, as is shown by the map for navigation; and it has 3500 braccia of descent, that is, one mile and \( \frac{1}{6} \); therefore it is higher than any mountains which exist in the West.

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**1108.**

In the Bosphorus the Black Sea flows always into the Egean sea, and the Egean sea never flows into it. And this is because the Caspian, which is 400 miles to the East, with the rivers which pour into it, always flows through subterranean caves into this sea of Pontus; and the Don does the same as well as the Danube, so that the waters of Pontus are always higher than those of the Egean; for the higher always fall towards the lower, and never the lower towards the higher.

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The passage before this, in the original, treats of the exit of the waters from Lakes in general.
IIO9.

The bridge of Pera at Constantiopolis, 40 braccia wide, 70 braccia high above the water, 600 braccia long; that is 400 over the sea and 200 on the land, thus making its own abutments.

III0.

If the river will turn to the rift farther on it will never return to its bed, as the Euphrates does, and this may do at Bologna the one who is disappointed for his rivers.

IIII.

Mounts Caucasus, Comedorum, and Paropemisidae are joined together between Bactria and India, and give birth to the river Oxus which takes its rise in these mountains and flows 500 miles towards the North and as many towards the West, and discharges its waters into the Caspian sea; and is accompanied by the Oxus, Dargados, Arthamis, Xarisaspe, Dargamaim, Ocus, and Margus, all very large rivers. From the opposite side towards the South rises the great river Indus which sends its waters for 600 miles Southwards and receives as tributaries in this course the rivers Xaradrus, Hyphasis, Vadris, Vandalbal, Bislaspus, leuâte, Suastus, and Coe to the West, uniting with these rivers, and with their waters it flows 800 miles to the West; then, turning back by the Arbiti mountains makes an elbow and turns Southwards, where

1109. See Pl. CX No. 1. In 1453 by order of Sultan Mohamed II, the Golden Horn was crossed by a pontoon bridge laid on barrels (see Joh. Dukas' History of the Byzantine Empire XXXVI p. 279).

—The biographers of Michelangelo, Vasari as well as Condini, relate that at the time when Michelangelo suddenly left Rome, in 1506, he entertained some intention of going to Constantinople, to there serve the Sultan, who sought to engage him, by means of certain Franciscan Monks, for the purpose of constructing a bridge to connect Constantinople with Pera. See Vasari, Vita (ed. Sansoni VII, 168): Michelangelo, volendo questa fiera del papa, dubitando di lui, ebbe, secondo che si dice, voglia di andarsene in Costantinopoli a servire il Turco, per mezzo di certi frati di San Francesco, che desiderava averlo per fare un ponte che passassi da Costantinopoli a Pera. And Condini, Vita di M. Buonaroti chap. 39: Michelangelo allora volendosi condotto a questo, temendo dell’ira del papa, possò d’andarsene in Levante; massimamente essendo stato dal Turco ricercato con grandissime promesse per mezzo di certi frati di San Francesco, per volersene servire in fare un ponte da Costantinopoli a Pera ed in altri affari. Leonardo’s plan for this bridge was made in 1502. We may therefore conclude that at about that time the Sultan Bajazet II. had either announced a competition in this matter, or that through his agents Leonardo had first been called upon to carry out the scheme.
after a course of about 100 miles it finds the Indian Sea, in which it pours itself by seven branches. On the side of the same mountains rises the great Ganges, which river flows Southwards for 500 miles and to the South-west a thousand... and Sarabas, Diarnuna, Soas and Scilo, Condranunda are its tributaries. It flows into the Indian sea by many mouths.

Men born in hot countries love the night because it refreshes them and have a horror of light because it burns them; and therefore they are of the colour of night, that is black. And in cold countries it is just the contrary.

The sketch here inserted is in MS. H3 55 b.
XVIII.

Naval Warfare.—Mechanical Appliances.—Music.

Such theoretical questions, as have been laid before the reader in Sections XVI and XVII, though they were the chief subjects of Leonardo's studies of the sea, did not exclusively claim his attention. A few passages have been collected at the beginning of this section, which prove that he had turned his mind to the practical problems of navigation, and more especially of naval warfare. What we know for certain of his life gives us no data, it is true, as to when or where these matters came under his consideration; but the fact remains certain both from these notes in his manuscripts, and from the well known letter to Ludovico il Moro (No. 1340), in which he expressly states that he is as capable as any man, in this very department.

The numerous notes as to the laws and rationale of the flight of birds, are scattered through several note-books. An account of these is given in the Bibliography of the manuscripts at the end of this work. It seems, probable that the idea which led him to these investigations was his desire to construct a flying or aerial machine for man. At the same time it must be admitted that the notes on the two subjects are quite unconnected in the manuscripts, and that those on the flight of birds are by far the most numerous and extensive. The two most important passages that treat of the construction of a flying machine are those already published as Tav. XVI, No. 1 and Tav. XVIII in the "Saggio delle opere di Leonardo da Vinci" (Milan 1872). The passages—Nos. 1120—1125—here printed for the first time and hitherto unknown—refer to the same subject and, with the exception of one already published in the Saggio—No. 1126—they are, so far as I know, the only notes, among the numerous observations on the flight of birds, in which the phenomena are incidentally and expressly connected with the idea of a flying machine.

The notes on machines of war, the construction of fortifications, and similar matters which fall within the department of the Engineer, have not been included in this work, for the reasons given on page 26 of this Vol. An exception has been made in favour of the passages Nos. 1127 and 1128, because they have a more general interest, as bearing on
the important question: whence the Master derived his knowledge of these matters. Though it would be rash to assert that Leonardo was the first to introduce the science of mining into Italy, it may be confidently said that he is one of the earliest writers who can be proved to have known and understood it; while, on the other hand, it is almost beyond doubt that in the East at that time, the whole science of besieging towns and mining in particular, was far more advanced than in Europe. This gives a peculiar value to the expressions used in No. 1127.

I have been unable to find in the manuscripts any passage whatever which throws any light on Leonardo's great reputation as a musician. Nothing therein illustrates Vasari's well-known statement: Avvenne che morto Giovan Galeazzo duca di Milano, e creato Lodovico Sforza nel grado medesimo anno 1494, fu condotto a Milano con gran reputazione Lionardo al duca, il quale molto si dilettava del suono della lira, perchè sonasse; e Lionardo portò quello strumento ch'egli aveva di sua mano fabbricato d'argento gran parte, in forma d'un teschio di cavallo, cosa bizzarra e nuova, acciocchè l'armonia fosse con maggior tuba e più sonora di voce; laonde superò tutti i musici che qui vi erano concorsi a sonare.

The only notes on musical matters are those given as Nos. 1129 and 1130, which explain certain arrangements in instruments.
DEL MOTO DEL MOBILE,—THE COGNOSCERE QUÄTO IL NAVILIO SI MOVE PER ORA.

The ancients used various devices to ascertain the distance gone by a ship each hour, among which Vitruvius[6] gives one in his work on Architecture which is just as fallacious as all the others; and this is a mill wheel which touches the waves of the sea at one end and in each complete revolution describes a straight line which represents the circumference of the wheel extended to a straightness. But this invention is of no worth excepting on the smooth and motionless surface of lakes. But if the water moves together with the ship at an equal rate, then the wheel remains motionless; and if the motion of the water is more or less rapid than that of the ship, then neither has the wheel the same motion as the ship so that this invention is of but little use. There is another method tried by experiment with a known distance between one island and another; and this is done by a board or under the pressure of wind which strikes on it with more or less swiftness. This is in Battista Alberti[25].

III3. 6. See Vitruvius, De Architectura lib. X. C. 14 (p. 264 in the edition of Rose and Müller-Strübing). The German edition published at Bale in 1543 has, on fol. 596, an illustration of the contrivance, as described by Vitruvius.

25. LEON BATTISTA ALBERTI, De Architectura lib. V., c. 12 treats 'de le navi e parti loro', but there is no reference to the machine, mentioned by Leonardo. Alberti says here: 'Nel abbiamo trattato lungamente in altro luogo del modo de le navi, ma in questo luogo ne abbiamo dato quel tanto che si bisogna. To this the following note is added in the most recent Italian edition: Questo libro è tuttora inedito e porta il titolo, secondo Genere di 'Liber navis'.

MM
Come con otricoli l'esercito debbe passare i fiumi a noto; ... Del modo del notare de' pesci; del modo 3 del lor saltare fori delle acque, come far si uede a delfini, che par cosa maravigliosa forimare salto sopra la cosa che non aspetta, anzi si fugge; Del notare de' animali di lusgã figura, come anguille e simili; Del modo del notar contro alle coreti e grã cadute de' fiumi; Del modo come notino li pesci di retõda figura; Come li animali che non ânno lunga fessa non sà notare; Come tutti li altri animali naturalmente sãno notare, auendo li piedi colle dira dita, saluo che l'omo; In che modo l'omo debbe inparare a notare; Del modo del riposarsi sopra delle acque; Come l'omo si debbe difenedere dalle revertigini oover retorsi delle acque che lo tirano in fondo; Come l'omo tiirato in fondo abba a cercare del moto riflesso, che lo gitti fori della profonditã; Co'me si debe passeggiare colle braccia; come si debe notare riverso; Come, e come non sì si può star sotto l'acque, se non quando si può ritenere lo alitare; Come molti stie no con istrumeto alquãto sotto l'acque; Come e perão io non scrivo il mio modo d'istar sotto l'acqua, quàto io posso star sanza mangiare, e questo nò publico o diuolgo per le maãi le nature dell'omi, li quali ve rebbro lli assasiamêti ne' fondi de' mari

Battista Alberti's method which is made by experiment on a known distance between one island and another. But such an invention does not succeed excepting on a ship like the one on which the experiment was made, and it must be of the same burden and have the same sails, and the sails in the same places, and the size of the waves must be the same. But my method will serve for any ship, whether with ears or sails; and whether it be small or large, broad or long, or high or low, it always serves.[52].

How an army ought to cross rivers by swimming with air-bags... How fishes swim[21]; of the way in which they jump out of the water, as may be seen with dolphins; and it seems a wonderful thing to make a leap from a thing which does not resist but slips away. Of the swimming of animals of a long form, such as eels and the like. Of the mode of swimming against currents and in the rapid falls of rivers. Of the mode of swimming of fishes of a round form. How it is that animals which have not long hind quarters cannot swim. How it is that all other animals which have feet with toes, know by nature how to swim, excepting man. In what way man ought to learn to swim. Of the way in which man may rest on the water. How man may protect himself against whirlpools or eddies in the water, which drag him down. How a man dragged to the bottom must seek the reflux which will throw him up from the depths. How he ought to move his arms. How to swim on his back. How he can and how he cannot stay under water unless he can hold his breath[13]. How by means of a certain machine many people may stay some time under water. How and why I do not describe my method of remaining under water, or how long I can stay without eating; and I do not publish nor divulge these by reason of the evil nature of men who would use them as

32. Mattale. 33. rissece. 35. acquel. 36. effatto. 37. esperiênia. 38. chesia. 39. chol. 40. charicho. 45. dezie... M”a”. 47. a “og”gui. 48. cho. 49. essia. 50. c”j”colo ogrânade sûr. 51. do offugho. 52. obbasso.

52. Leonardo does not reveal the method invented by him.
NAVAL WARFARE.
I7

navili in fondo,

sommer-

e

2/5

no

means of destruction at the bottom of the. sea,
by sending ships to the bottom, and sinking
them together with the men in them. And

perche di sopra all'acqua
'S
la
bocca
della canna,
apparisce
alitano, posta sopra li otri o sughero.

although I will impart others, there is no
danger in them; because the mouth of the
tube, by which you breathe, is above the
water supported on bags or corks [19].

col

ronpere
gierli insieme

i

omini che

colli

l8

e beche io insegni

son

Ash.

delli

ui

son dentro,

altri,

quelli

di pericolo,

II.

4 6]

Se sara

in

2

gaggie,

le

de'

si

naui e galee
naui per le loro

pugnia

sendo vincitori

tirare

,

Supposing in a battle between ships and
galleys that the ships are victorious by reason
of the high of their tops, you must haul the yard

es-

alte

antena -per Isino

1'

alia
sommita
quasi
dell'albero, 3 e abbi
nella stremita di detta
atena, cioe quella ch' e

up almost

mattress full of cotton

6

sia offesa dalle bobardelle,

sara

.

fassciatta

.

.

ebece.

gagie.

.

.

daloposita.

.

2.

18.
si

aparissce la bocha.

de [mettere]

dltoruo dino.
io.

chontrapeso

6.
.

chol
.

.

tirare
.

19.
.

.

.

.

bombs;

site side will go up so high , that it will be far
above the round-top of the ship, and you will
easily drive out the men that are in it. But
is necessary that the men who are in the
galley should go to the opposite side of it so
as to afford a counterpoise to the weight of
it

men

the

placed inside the cage on the yard.

ossugero.

somita.

ella gagia.

charicho

injured by the

then, with the capstan, haul down the opposite end of this yard and the top on the oppo-

,

mergierli

may not be

so that 'it

poi tira

basso 1'opposita parte d'fessa
col'argano
antena, e la gaggia 7 O pposita andra tato
in alto
ch' ella di gra luga avazera la
8
gaggia de! la nave, e potrassi facilmete
cacciare li omini che detro ui sono; 9 ma
bisognia che gli omini che sono nella galea
vadino dall'opposita banda, I0 accio-faccino contrapeso al carico delli omini posti
detro alia gaggia "della antena.
1

i.

at

wrapped up below and
all round in a great

materasso
grosso
pieno di babagia, ac-

1115.

and

extremity of the
yard, that is the end
which is turned towT
ards the enemy, have
a small cage fastened,

5

no

the top

the

sporta sopra * il nemico, appiccato va gaggietta fasciata, e di
sotto e ditorno uno

cio

to

of the mast,

gagia.

7.

3.

abi

.

.

Itena

oposita andera

n. antena.

.

.

.

.

che [apichata] sporta.

gagia de.

8.

chaciare.

9.

4.

apichato va gagietta

chessono

.

.

ghalea

.

-

On
(

^

naval

arf
iii 6 )

Ir s


If you want to build an armada for the sea employ these ships to ram in the enemy's ships. That is, make ships 100 feet long and 8 feet wide, but arranged so that the left hand rowers may have their oars to the right side of the ship, and the right hand ones to the left side, as is shown at M, so that the leverage of the oars may be longer. And the

said ship may be one foot and a half thick, that is made with cross beams within and without,

with planks in contrary directions. And this ship must have attached to it, a foot below the

sotto l'acqua vn piede, appiccato vno sputone ferrato di peso e grossezza d'un
acquifero; e questo per forza di remi potrà, dato il primo colpo, tornare idirietro, e così furia ricacciai iniati e dare il colpo secondo, e poi il terzo, e tathi che röpa detto navilio.

**1117.**

**MODE DI SALUARSI IN VNA. TEPESTA E NAVFRAGIO MARITTIMO.**

Bisogna avere va veste 2 di corame ch'abbi doppio i labri del petto per spatio d'vno dito, e così sia doppio 3 dalla citura isino al ginocchio', e sia corame sicuro dallo - esalare.; E quando 4 bisognasse saltare i mare, soffia per li labri del petto le code del tuo vestito, 5 e salta in mare', e lasciati guidare all'onde.; quando nò vedi vicina riva, 6 ne abbi notitìa del mare', e ti ni sempre i bocca la canna dell'aria che va nel vestito, 7 e quando per una volta 2 ti bisognasse trare dell'aria comune, e la schiuma t'impedisce, 6 tira per bocca di quella del vestito.

**S. K. M. III. 254.**

Se l'mare si pesa sul suo fondo, 2 vn omo, che giacesse sopra esso 3 fondo e avesse 1000 braccia d'acqua 4 a dosso, n'avrebbe a scoppiare.

**1118.**

If the weight of the sea bears on its bottom, On the gravity of water.

**1119.**

Of walking under water.

D'andar sotto acqua; 2 modo di caminare 3 sopra l'acqua.

**1117.** AMORETTI, Memorie Storiche, Tav. II. B. Fig. 5, gives the same figure, somewhat altered.

6. **La canna dell'aria.** Compare Vol. I. No. 1. Note.

**1119.** The two sketches belonging to this passage are given by AMORETTI, Memorie Storiche. Tav. II, Fig. 3 and 4.
ON FLYING MACHINES.

II20. Siccome per lo fiume ghiacciato uno omo corre 2 sanza mvtazione di piedi, così vn carro fia 1 possibile fare che corra per se.

Just as on a frozen river a man may run without moving his feet, so a car might be made that would slide by itself.

II21. Definedione perché vno 2 che sdrucciola sopra il ghiaicco 3 no cade.

A definition as to why a man who slides on ice does not fall.

II22. L'uomo ne' volatili à a stare libero dalla cintura insù 1 per potersi bili-care, come fa in barca acció che 'l ce'tro della gravità di lui e dello strumèto si possa 'bilicare e trasmu-tarsi, dove necessità il dimàda 9 alla mutatione del centro della sua resi-stètía.

Man when flying must stand free from the waist upwards so as to be able to balance himself as he does in a boat so that the centre of gravity in himself and in the machine may counter-balance each other, and be shifted as necessity demands for the changes of its centre of resistance.

II23. Ricordati siccome 3l tuo vccello non debbe imitare 2 altro che 'l pipistrello per cavsa che i pannicoli fano 3 armadura over collegatione alle armadure, cioè ma' estre delle ali;

Remember that your flying machine must imitate no other than the bat, because the web is what by its union gives the armour, or strength to the wings.

5E se 7 tu imitassi l'alie dellì vccelli pen-nvi, esse 6 son di piv potète nervatura, per essere esse 7 traforate cioè che le lor penne sò disunite e passa'ete dall'aria; Ma che pipi-strello è aivtato dal pannèculo che lega il tutto, e non è traforato.

If you imitate the wings of feathered birds, you will find a much stronger structure, because they are pervious; that is, their feathers are separate and the air passes through them. But the bat is aided by the web that connects the whole and is not pervious.

II20. The drawings of carts by the side of this text have no direct connection with the problem as stated in words.—Compare No. 1448, l. 17.

II21. An indistinct sketch accompanies the passage, in the original.
ON FLYING MACHINES.

II24.

To escape the peril of destruction.

Destruction to such a machine may occur in two ways; of which the first is the breaking of the machine. The second would be when the machineshould turn on its edge or nearly on its edge, because it ought always to descend in a highly oblique direction, and almost exactly balanced on its centre. As regards the first—the breaking of the machine—that may be prevented by making it as strong as possible; and in whichever direction it may tend to turn over, one centre must be very far from the other; that is, in a machine 30 braccia long the centres must be 4 braccia one from the other.

II25.

Bags by which a man falling from a height of 6 braccia may avoid hurting himself, by a fall whether into water or on the ground; and these bags, strung together like a rosary, are to be fixed on one's back.

C. A. 3726; 11586]

An object offers as much resistance to the air as the air does to the object. You may see that the beating of its wings against the air supports a heavy eagle in the highest and rarest atmosphere, close to the sphere of elemental fire. Again you may see the air in motion over the sea, fill the swelling sails and drive heavily laden ships. From these instances, and the reasons given, a man with wings large enough and duly connected might learn to overcome the resistance of the air, and by conquering it, succeed in subjugating it and rising above it.

Se tu vuoi sapere dove una cava faccia suo corso, metti un tamburo in tutti quelli lochi, dove tu sospetti che la cava, e sopra detto tamburo metti un pajo di dadi, e quiado sarai presso al loco dove si cava, i dadi risaliranno alquanto sopra del tamburo per lo colpo che si da sotto terra nel cavare.

If you want to know where a mine runs, place a drum over all the places where you suspect that it is being made, and upon this drum put a couple of dice, and when you are over the spot where they are mining, the dice will jump a little on the drum at every blow which is given underground in the mining.

There are persons who, having the convenience of a river or a lake in their lands, have made, close to the place where they suspect that a mine is being made, a great reservoir of water, and have countermined the enemy, and having found them, have turned the water upon them and destroyed a great number in the mine.

There are persons who, having the convenience of a river or a lake in their lands, have made, close to the place where they suspect that a mine is being made, a great reservoir of water, and have countermined the enemy, and having found them, have turned the water upon them and destroyed a great number in the mine.

**Greek Fire.**

Take charcoal of willow, and saltpetre, and sulphuric acid, and sulphur, and pitch, with frankincense and camphor, and Ethiopian wool, and boil them all together. This
ON GREEK FIRE.

fire is so ready to burn that it clings to the timbers even under water. And add to this composition liquid varnish, and bituminous oil, and turpentine and strong vinegar, and mix all together and dry it in the sun, or in an oven when the bread is taken out; and then stick it round hempen or other tow, moulding it into a round form, and studding it all over with very sharp nails. You must leave in this ball an opening to serve as a fusee, and cover it with resin and sulphur.

Again, this fire, stuck at the top of a long plank which has one braccio length of the end pointed with iron that it may not be burnt by the said fire, is good for avoiding and keeping off the ships, so as not to be overwhelmed by their onset.

Again throw vessels of glass full of pitch on to the enemy’s ships when the men in them are intent on the battle; and then by throwing similar burning balls upon them you have it in your power to burn all their ships.

A drum with cogs working by wheels with springs[2].


1129.

Tanburo di tacche, fregate ² da rote di molle;

II. 28. Venturi has given another short text about the Greek fire in a French translation (Essai § XIV). He adds that the original text is to be found in MS. B. 30 (7). Libri speaks of it in a note as follows (Histoire des sciences mathématiques en Italie Vol. II, p. 129): La composition du feu grégorien est une des choses qui ont été les plus cherchées et qui sont encore les plus douteuses. On dit qu’il fut inventé au septième siècle de l’ère chrétienne par l’architecte Callinique (Constantini Porphyrigenetæ opera, Lugd. Batav. 1617, in-8°; p. 172, de admin. imper. exp. 48), and it is to be noted that the historian Byzantins. Tout on the lancet, des machines, comme on lançait une bouche, toutent on le soufflait avec de longs tubes, comme on soufflait un gaz ou un liquide inflammable (Annae Comenianæ Alexæ, p. 335, lib. XI. Adianæ et Leonis, imperatoris tactica, Lugd.-Bat. 1613, in-4. part. 2, p. 322, Leonis tact. cap. 19.—Jouville, histoire du Saint Louis collect. Petit tom. II, p. 235). Le livres contemporains disent que l’eau ne pouvait les éteindre ce feu, mais qu’avec du vinaigre et du sucre on y parvenait.

1129. This chapter consists of explanations of the sketches shown on Pl. CXXI. Lines 1 and 2 of the text are to be seen at the top at the left hand side of the first sketch of a drum. Lines 3—5 refer to the NN
ON MUSIC.

II30. II31.

A square drum of which the parchment may be drawn tight or slackened by the lever a b [5].

A drum for harmony [6].

[7] A clapper for harmony; that is, three clappers together.

g. Just as one and the same drum makes a deep or acute sound according as the parchments are more or less tightened, so these parchments variously tightened on one and the same drum will make various sounds [16].

Keys narrow and close together; (bicchi) far apart; these will be right for the trumpet shown above.

a must enter in the place of the ordinary keys which have the . . . . in the openings of a flute.

II30.

Tymbals to be played like the monochord, or the soft flute.

[6] Here there is to be a cylinder of cane after the manner of clappers with a musical round called a Canon, which is sung in four parts; each singer singing the whole round.

Therefore I here make a wheel with 4 teeth so that each tooth takes by itself the part of a singer.

II31.

White and sky-blue cloths, woven in checks to make a decoration.

Cloths with the threads drawn at a b c d e f g h i k, to go round the decoration.

sketch immediately below this. Line 6 is written as the side of the seventh sketch, and lines 7 and 8 at the side of the eighth. Lines 9—16 are at the bottom in the middle. The remainder of the text is at the side of the drawing at the bottom.

II30. In the original there are some more sketches, to which the text, from line 6, refers. They are studies for a contrivance exactly like the cylinder in our musical boxes.
XIX.


Vasari indulges in severe strictures on Leonardo's religious views. He speaks, among other things, of his "capricci nel filosofar delle cose naturali" and says on this point: "Per il che fece nell'animo un concetto si eretico che e' non si accostava a qualsi voglia religione, stimando per avventura assai più lo esser filosofo che cristiano" (see the first edition of 'Le Vite'). But this accusation on the part of a writer in the days of the Inquisition is not a very serious one—and the less so, since, throughout the manuscripts, we find nothing to support it.

Under the heading of "Philosophical Maxims" I have collected all the passages which can give us a clear comprehension of Leonardo's ideas of the world at large. It is scarcely necessary to observe that there is absolutely nothing in them to lead to the inference that he was an atheist. His views of nature and its laws are no doubt very unlike those of his contemporaries, and have a much closer affinity to those which find general acceptance at the present day. On the other hand, it is obvious from Leonardo's will (see No. 1566) that, in the year before his death, he had professed to adhere to the fundamental doctrines of the Roman Catholic faith, and this evidently from his own personal desire and impulse.

The incredible and demonstrably fictitious legend of Leonardo's death in the arms of Francis the First, is given, with others, by Vasari and further embellished by this odious comment: "Mostrava tuttavia quanto avea offeso Dio e gli uomini del mondo, non avendo operato nell'arte come si conveniva." This last accusation, it may be remarked, is above all evidence of the superficial character of the information which Vasari was in a position to give about Leonardo. It seems to imply that Leonardo was disdainful of diligent labour. With regard to the second, referring to Leonardo's morality and dealings with his fellow men, Vasari himself nullifies it by asserting the very contrary in several passages. A further refutation may be found in the following sentence from
the letter in which Melzi, the young Milanese nobleman, announces the Master's death to Leonardo's brothers: Credo state certificati della morte di Maestro Lionardo fratello vostro, e mio quanto optimo padre, per la cui morte sarebbe impossibile che io potesse esprimere il dolore che io ho preso; e in mentre che queste mia membra si sosterranno insieme, io possedero una perpetua infelicità, e meritamente perché sviscerato et ardentissimo amore mi portava giornalmente. È dolto ad ognuno la perdita di tal uomo, quale non è più in podestà della natura, ecc.

It is true that, in April 1476, we find the names of Leonardo and Verrocchio entered in the "Libro degli Ufficiali di notte e de' Monasteri" as breaking the laws; but we immediately after find the note "Absoluti cum condizione ut retamburentur" (Tambrunini was the name given to the warrant cases of the night police). The acquittal therefore did not exclude the possibility of a repetition of the charge. It was in fact repeated, two months later, and on this occasion the Master and his pupil were again fully acquitted. Verrocchio was at this time forty and Leonardo four-and-twenty. The documents referring to this affair are in the State Archives of Florence; they have been withheld from publication, but it seemed to me desirable to give the reader this brief account of the leading facts of the story, as the vague hints of it, which have recently been made public, may have given to the incident an aspect which it had not in reality, and which it does not deserve.

The passages here classed under the head "Morals" reveal Leonardo to us as a man whose life and conduct were unfailingly governed by lofty principles and aims. He could scarcely have recorded his stern reprobation and unmeasured contempt for men who do nothing useful and strive only for riches, if his own life and ambitions had been such as they have so often been misrepresented.

At a period like that, when superstition still exercised unlimited dominion over the minds not merely of the illiterate crowd, but of the cultivated and learned classes, it was very natural that Leonardo's views as to Alchemy, Ghosts, Magicians, and the like should be met with stern reprobation whenever and wherever he may have expressed them; this accounts for the argumentative tone of all his utterances on such subjects which I have collected in Subdivision III of this section. To these I have added some passages which throw light on Leonardo's personal views on the Universe. They are, without exception, characterised by a broad spirit of naturalism of which the principles are more strictly applied in his essays on Astronomy, and still more on Physical Geography.

To avoid repetition, only such notes on Philosophy, Morals and Polemics, have been included in this section as occur as independent texts in the original MSS. Several moral reflections have already been given in Vol. I, in section "Allegorical representations, Mottoes and Emblems". Others will be found in the following section. Nos. 9 to 12, Vol. I, are also passages of an argumentative character. It did not seem requisite to repeat here these and similar passages, since their direct connection with the context is far closer in places where they have appeared already, than it would be here.
I.

PHILOSOPHICAL MAXIMS.

II32.

I obey Thee Lord, first for the love I pray to God, ought, in all reason to bear Thee; secondly (1132. 1133), for that Thou canst shorten or prolong the lives of men.

W. An. IV. 1720]

II33.

| Oratio. |

Thou, O God, dost sell us all good things at the price of labour.

A. 24[a]

II34.

O admirable impartiality of Thine, Thou the first Mover; Thou hast not permitted that any force should fail of the order or quality of its necessary results.

S. K. M. III. 49[a]

II35.

La necissitá è maestra e tutrice della natura;

La necissitá è tema e inventrice della natura e freno e regola eterna.

Necessity is the mistress and guide of nature.

Necessity is the theme and the inventress, the eternal curb and law of nature.

1132. 3. sechondaris. 4. breviere. 1133. 2. "tu" | o idio [che] ci vende. 3. per pre. 4. faticha.
1134. 1. màcchare a nessuna [creata chosa]. 2. "equalità" de sua.
1135. 1. he maestra. 2. etutrice. 3. etema. 5. efrne.
1136. In many cases one and the same thing is attracted by two strong forces, namely Necessity and Potency. Water falls in rain; the earth absorbs it from the necessity for moisture; and the sun evaporates it, not from necessity, but by its power.

1137. Weight, force and casual impulse, together with resistance, are the four external powers in which all the visible actions of mortals have their being and their end.

1138. Our body is dependant on heaven and heaven on the Spirit.

1139. The motive power is the cause of all life.

1140. And you, O Man, who will discern in this work of mine the wonderful works of Nature, if you think it would be a criminal thing to destroy it, reflect how much more criminal it is to take the life of a man; and if this, his external form, appears to thee marvellously constructed, remember that it is nothing as compared with the soul that dwells in that structure; for that indeed, be it what it may, is a thing divine. Leave it then to dwell in His work at His good will and pleasure, and let not your rage or malice destroy a life—for indeed, he who does not value it, does not himself deserve it[19].

19. In MS. I' 15o is the note: chi non stima la vita, non la merita.
II41. The soul can never be corrupted with the corruption of the body, but is in the body as it were the air which causes the sound of the organ, where when a pipe bursts, the wind would cease to have any good effect.

II42. The part always has a tendency to reunite with its whole in order to escape from its imperfection.

II43. If any one wishes to see how the soul dwells in its body, let him observe how this body uses its daily habitation; that is to say, if this is devoid of order and confused, the body will be kept in disorder and confusion by its soul.

II44. Why does the eye see a thing more clearly in dreams than with the imagination being awake?

II45. The senses are of the earth; Reason, stands apart in contemplation.

II46. Every action needs to be prompted by a motive.

---

1141. Compare No. 845.
1145. Compare No. 842.
Ogni nostra cognizione pricipia da sentimëti.

All our knowledge has its origin in our preceptions.

Science is the observation of things possible, whether present or past; prescience is the knowledge of things which may come to pass, though but slowly.

La sperieza, interprete infra 3'artifi-
tiosa natura e la umana spe'tie, ne insegnia científico 6 che essa natura infra 7 mortali ado-
pera, 38 da necissità co' stretta non altri-
10 meti operarsi pot'essa · che la ragiò, suo
Timone, 12 operare le asse13gini.

Experience, the interpreter between formati-
tive nature and the human race, teaches how
that nature acts among mortals; and being
constrained by necessity cannot act otherwise
than as reason, which is its helm, requires
her to act.

La sperietia è figliola della 2 sperietia.

Wisdom is the daughter of experience.

La natura è piena d'infinite ragioni 2'che
no furò mai in isperietia.

Nature is full of infinite causes that have
never occured in experience.

La sperieza nò falla mai, ma sol fallano
i vostri giuditi, promettessi di quella
1'efetti · tali che ne' vostri esperimëti
causati nò sono;

Experience never errs; it is only your
judgments that err by promising themselves
effects such as are not caused by your
experiments.

Experience does not err; only your
judgments err by expecting from her what
is not in her power. Men wrongly com-
plain of Experience; with great abuse they
accuse her of leading them astray but they set
Experience aside, turning from it with complaints as to our ignorance causing us to be carried away by vain and foolish desires to promise ourselves, in her name, things that are not in her power; saying that she is fallacious. Men are unjust in complaining of innocent Experience, constantly accusing her of error and of false evidence.

Instrumental or mechanical science is of all the noblest and the most useful, seeing that by means of this all animated bodies that have movement perform all their actions; and these movements are based on the centre of gravity which is placed in the middle deviding unequal weights, and it has dearth and wealth of muscles and also lever and counter-lever.

Mechanics are the Paradise of mathematical science, because here we come to the fruits of mathematics.

Every instrument requires to be made by experience.

The man who blames the supreme certainty of mathematics feeds on confusion, and can never silence the contradictions of sophistical sciences which lead to an eternal quackery.

There is no certainty in sciences where one of the mathematical sciences cannot be applied, or which are not in relation with these mathematics.
1159.

Any one who in discussion relies upon authority uses, not his understanding, but rather his memory. Good culture is born of a good disposition; and since the cause is more to be praised than the effect, I will rather praise a good disposition without culture, than good culture without the disposition.

1160.

Science is the captain, and practice the soldiers.

1161.

Those who fall in love with practice without science are like a sailor who enters a ship without a helm or a compass, and who never can be certain whither he is going.

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1159. 1. iaturita. 2. longiegno. 3. sonate. 4. laldare la cagio chelle fatto. 5. lauderia vn bo. 6. literato.
1160. 1. ella pratica.
1161. 1—6 R. 1. errore. 2. praticha. 3. chessinnamora di praticha. 4. nochieri. 5. ebussola. 6. cierteza.
II.

MORALS.

II62.

Or vedi la speranza e l' desiderio del ripatriarsi e ritornare nel primo caso fa a similitudine della farfalla al lume, e l'uomo che có coticini desideri scpre có festa aspetta la nuova primavera, sempre la nuova state, sempre e nuovi mesi, e nuovi anni, parèdologi che le desiderate cose, venèdo, sieno troppe tarde, E' non s'avede che desidera la sua disfazione; ma questo desiderio è la quitesenza, spirito degli elementi, che trovàdosi richivsa per l'anima dello vmano corpo desidera sempre ritornare al suo mandatario; E' uo'che sappi che questo medesimo desiderio è quella quitesenza, còpagnia della natura, e l'uomo è modello dello mòdo.

II63.

Now you see that the hope and the desire What is life? of returning home and to one's former state (II62. II63), of returning home and to one's former state (II62. II63),

O temp, consumatore delle cose, e o invidiosa antichità, tu distruggi tutte le cose, e consumi tutte le cose da duri dèti della vecchiezza a poco a poco có lèta morte! Elena quando si specchiaua, vedèdo le vizze grinze del suo viso, fatte per la vecchiezza, piagne e pèsa seco, perchè fu rapita due volte.

O Time! consumer of all things; O envious age! thou dost destroy all things and devour all things with the relentless teeth of years, little by little in a slow death. Helen, when she looked in her mirror, seeing the withered wrinkles made in her face by old age, wept and wondered why she had twice been carried away.

C. A. 704; 207 a]

II62. 1. on the margia: pro, meaning probably proposizione. 2. l'aspe[za [del suo] el desidero 2. chas'co' ... assimilitudine 'della farfalla alume' dell'uomo. 3. chè chòsi avi ... chè festa aspetta. 5. cose. 6. disfazi. 7. Desidero e ne i [a] la quile essenza. 8. peranima dello ... chorpux. 10. chespapi ... quila esèsa. 11. còpagnia ... etuomou.

II63. 1. chonsumatore ... chose. 2. diastriui ... chose. 3. chonsumate ... chose. 4. vecchieza appocho appocho chò. 5. elena ... sispecchiaua. 6. leuzze grinze. 7. appèsa secho. 8. da vo[te]. 9. chonsumatore ... chose. 10. leono chonsumate.
MORALS.

O time! consumer of all things, and O envious age! by which all things are all devour'd.

II 64.

Ogni danno lascia dispiacere n ella ricordazione, salut 3 che'l sommo dano, cioè la morte, che 4 uccide essa ricordazione 5 colla vita.

II 65.

O dormiête, che cosa è sonno? 6 il sonno à similitudine colla morte; O perchè non poi adunque tale opera, che dopo la morte 7 tu abbi similitudine di perfetto vivo, che uiuendo farsi col sonno simile ai tristi morti?

II 66.

L'un caccia l'altro.

Per questi quadretti 8 s'intendeva la uita 9 e li studi umani.

II 67.

La cognitio del tépo preterito 10 e del sito della terra è ornamento e cibo delle mèti vmane.

II 68.

È di tato vilipédio la bugia, che s'ella dicesse bene già 11 cose di Dio, ella toglie gratia a sua detta, ed è di tata eccell'èlia la urità, che s'ella laudasse cose minime elle si faño nobili;

Sanza dubbio tal proporzione è dalla verità alla bugia, qual è 5 dalla luce alle tenebre, ed è essa verità in se di tanta eccell'èlia che, ancora ch'ella s'estenda sopra 12 mili e basse materie, 7 sanza comparazione ella eccede le incertezze e bugie.

To lie is so vile, that even if it were in speaking well of godly things it would take off something from God's grace; and Truth is so excellent, that if it praises but small things they become noble.

Beyond a doubt truth bears the same relation to falsehood as light to darkness; and this truth is in itself so excellent that, even when it dwells on humble and lowly matters, it is still infinitely above uncertainty and lies, disguised in high and noble terms.

1164. 1. dàv lascia disspiacere. 3. sonno. 4. viede.
1165. 1. chosa. 2. assimilitudine cholla. 2. abì. 3. chol sono.
1167. 1. chognituò. 3. ecibo. 4. vmane.
1168. 1. ede di. 2. chessella dicessi. 2. dio ello di gratia assuna. 3. chessella laldassi. 5. verita "in se" di. 6. anchora sastende. 7. comparatione ellaccede. 8. essa. 8. pra [la altissime] li. 6. disconi. 9. nostra anchora. 10. no resta.

estese sopra li magni e altissimi discorsi, perché la mente nostra, ancora ch'ell'abba la bugia pel quito eletmo, 15 non resta però che la verità delle cose nò sia di sommo
nuo^trimento dell'intelletti fini, ma non di uga^bundi ingegni;

Ma tu che tuvi di sogni, 15 ti pia-ciono più le ragioni sofistiche 17 e barerie
di^pallaji nelle 19cose gradi 28 e incerte, che 21 le certe 22 naturali e 23 nò di tata al-
tura.

S. K. M. III. 368]

...Fuggi quello studio del quale la risultante opera more insieme coll' operante
d'essa.

C. A. 75a; 219a]

...A torto si laméthi di omni della fuga
del tempo, 4incolpando quello di troppa velocità, nò s'accorgiédì quello essere di
bastevole trasito, ma bona memòria; di che la natura ci à dotati, ci fa che 5ogni cosa
lungaméte passata ci pare essere presente.

C. A. 311a; 345a]

Acquista cosa nella tua gioveù 2arresta
il danno della tua vecchìezza; — 4è se tu in-
tèdi 5la vecchìezza aver per suo cibo la sa-
pìctia; adoperati in tal modo in giovètù
che tal vecchìezza nò mâchi il nuo^triméto.

C. A. 223a; 671a]

...L'acquisto di quáluche cognizione 2è
scère utile allo intelletto, perché potrà
scacciare da se le cose inutili e riserva-
ere le buone; 7
5 perché nessuna cosa si può amare ne
odiare, 6se prima nò si à cognitio di quella. 8

Tr. 52]

...Siccome vna giornata bene spesa dà
lieto dormire, così vna vita bene vsata dà
lieto morire.
II74.

L'acqua che tochi de' fiumi, è l'ultima di quella che adò, e la prima di quella che viene; così il tepo presète;
5 La vita bene spesa lunga è.

The water you touch in a river is the last of that which has passed, and the first of that which is coming. Thus it is with time present. Life if well spent, is long.

II75.

Siccome magiare · sanza voglia si cóuerte
3 i fastidioso · notrimento , così lo studio sà pera desiderio · guasta la · memoria, col non ritenere cosa · ch'ella pigli.

Just as food eaten without caring for it is turned into loathsome nourishment, so study without a taste for it spoils memory, by retaining nothing which it has taken in.

II76.

Siccome il mangiare · sanza · voglia fia dañoso · alla salute, · cosi lo studio sanza · desiderio guasta · la memoria, e nò ritiè cosa · ch'ella pigli.

Just as eating against one's will is injurious to health, so study without a liking for it spoils the memory, and it retains nothing it takes in.

II77.

C. A. 284 6; 805 6

Ti ghiacciano le parole · in bocca, e fa· resti gietlatina i Mògibello;
3 Siccome il ferro s'arruginisce sanza · esercizio, e l'acqua si putrefa e nel freddo · s'agghiaaccia , così l'ingiegnio sanza · esercitio si guasta;
7 Mal fai se lodi · , e peggio se tu riprèdi
8 la cosa , quádo bene · tu nò la intècdi;
9 Quàdo fortuna viè, prèdi l'a mà · salua · Dinàti, perchè retro · è · calua.

On Mount Etna the words freeze in your mouth and you may make ice of them[2].

Just as iron rusts unless it is used, and water putrefies or, in cold, turns to ice, so our intellect spoils unless it is kept in use.

You do ill if you praise, and still worse if you reprove in a matter you do not understand.

When Fortune comes, seize her in front with a sure hand, because behind she is bald.

II78.

It seems to me that men of coarse and clumsy habits and of small knowledge do not deserve such fine instruments nor so great a variety of natural mechanism as men of speculation and of great knowledge; but merely a

1177. 1. 2. There is no clue to explain this strange sentence.
ceua il cibo, e donde esso esa, chè in vero altro che un transito di cibo non sò da essere giudicati, perché niente mi pare che essi participino di spetie vmana altro, che la voce e la figvrna, e tutto il resto è assai manco che bestia.

S. K. M. III. 178]

Ecco alcuni che non altramente che trâsito di cibo e avmètatori di sterico e rienpitori di destri chiamarsi debono, perché per loro non altro nel modo o pure alcuna virtù in opera si mette, perché di loro altro che pieni destri non resta.

C. A. 155d; 455d]

Il massimo ingâno deli omni è nelle loro oppinioni.

Tr. 56]

La stoltitia è scudo della vergogna, come la imprôtitudine della povertà glorificata.

Tur. 174]

La cieca igniorâza cosi ci côduce cò effetto de' lasciv solazzi
3 per nò conoscere la uera luce.
4 per nò conoscere qual sia la uera luce.
5 E' l' uno splendor ci toglie l'esser 6...; ved i che per lo splendor nel fuoco andiamo, 8 come cieca ignorâza ci côduce.
9 O miseri mortali aprite li occhi.

Ash. I. 1a]

Nò si dimâda . richezza . quello . che si può perdere; 2 la virtù è vero nostro bene ed è vero premio del suo possessore .; lei nò si può perdere ., lei nò ci abbandona , sack in which their food may be stowed and whence it may issue, since they cannot be judged to be any thing else than vehicles for food; for it seems to me they have nothing about them of the human species but the voice and the figure, and for all the rest are much below beasts.

II79.

Some there are who are nothing else than a passage for food and augmentors of excrement and fillers of privies, because through them no other things in the world, nor any good effects are produced, since nothing but full privies results from them.

II80.

The greatest deception men suffer is On foolishness and ignorance (1180—1182).

II81.

Folly is the shield of shame, as un-readiness is that of poverty glorified.

II82.

Blind ignorance misleads us thus and delights with the results of lascivious joys.

Because it does not know the true light.

Because it does not know what is the true light.

Vain splendour takes from us the power of being . behold! for its vain splendour we go into the fire, thus blind ignorance does mislead us. That is, blind ignorance so mis-leads us that .

O! wretched mortals, open your eyes.

II83.

That is not riches, which may be lost; On riches virtue is our true good and the true reward of its possessor. That cannot be lost; that never deserts us, but when life leaves us ....

5. sachò [da cibo] douse. 6. esa . . giudicati. 7. chella voce. 18. ella . . tututto ereso . manco che bestia.

1179. 1. ecci . . che altro chenri. 3. cho |“e rienpitori di destri” chiamarsi. 4. loro |“altrono nel modo o pure” alcuma. 6. pieni e òcensor.

1180. 2. he nelloro oppennione.

1181. 1. esschudo . . chome. 2. grorificato.

1182. 1. ciecha . . chosi ci côduce. 2. e chô . . lasciv solazzi. 3. chonossiere. 4. chonossiere. 6. b || | vedi fucho an-diano. 7. ciecha igniorâza . . intal modo chôduce. 8. coe côme ciecha igniorâza ci côduce. 9. che.

1183. 1. richeza . . chessi. 4. lascia. 5. elle esterne. 6. inesperto lascianno choniscorno. 7. essbeffato iloro.
se prima la uita nò ci lascia; s'è robe e le esterne diuitt. sempre le tiien 6'è timore; spesso lasciano con scorno 7'è beffato il loro possessore perde' loro possessione.

1184.

Ogni omo desidera far capitale per dare a medici distruttori di uite, adunque debono essere richi;
1 L'omo à grande discorso, del quale la più parte è vana e falsa, li animali l'anno piccolo, ma à vistle e vero, e meglio è la piccola certezza che la grà bugia.

1185.

Chi piu possiede piu deve 2 temere di nò perdere.

He who possesses most must be most afraid of loss.

1186.

Chi uole essere richo in 3 di 2 e impic- catto in vn anno.

He who wishes to be rich in a day will be hanged in a year.

1187.

E questo uomo à vna somma 2 pazzia cioè che sèpre sòta per 1 non stëtere, e la uita à lui 4 fugie sotto speranza di gode're i beni con somma fatica acquisitati.

That man is of supreme folly who always wants for fear of wanting; and his life flies away while he is still hoping to enjoy the good things which he has with extreme labour acquired.

1188.

Se tu avessi il corpo secôdo la virtù, tu nò carpesti 3 in questo mòdo;
3 Tu crescì i reputatione como il pane i mano a' putti.

If you governed your body by the rules of virtue you would not walk on all fours in this world.

You grow in reputation like bread in the hands of a child.

1189.

Saluatico è quel che si salua.  
Savage he is who saves himself.
E. 31]

Non si debbe desiderare lo impossibile.

II90.

We ought not to desire the impossible.

H.3 70]

Dimàda côsiglio a chi bë si corregge;
²Givstitia vuol potëtia, intelligëtia e volontà, e si assomi^glia al rè delle api;
⁵Chi nò punisce il male, co'màda che si facci;
⁷Chi piglia la biscia per la coda quella poi lo morde;
⁹Chi cava la fossa, quella gli ruina adosso.

II91.

Ask counsel of him who rules himself well.
*Justice requires power, insight, and will;
and it resembles the queen-bee.

He who does not punish evil commands it to be done.

He who takes the snake by the tail will presently be bitten by it.

The grave will fall in upon him who digs it.

H.3 71]

¹Chi nò rafigna la uolullta, colle bestie
²s'acopagni;
³Nò si può avere maggior nè minor signioria che quella di se medesimo;
⁵Chi poco pása, molto erra;
⁶Più facilmente si còtesta al pricipio,
⁷che al fine;
⁸Nessuno côsiglio è pìv leale che quello che si da alle navi che sono in pericolo;
¹¹Aspetti danno quel che si regie per gio-vane sconsigliato.

II92.

The man who does not restrain wantonness, allies himself with beasts.

You can have no dominion greater or less than that over yourself.

He who thinks little, errs much.

It is easier to contend with evil at the first than at the last.

No counsel is more loyal than that given on ships which are in peril: He may expect loss who acts on the advice of an inexperienced youth.

Tr. 39]

Dov'è pìv sentimëto, lì è pìv martirio;
grà martire.

II93.

Where there is most feeling, there is the greatest martyrdom;—a great martyr.

H.1 166]

La memoria de' benìsitj apresì so l'igra-titudine è fragile;
³Repréndi l'amico i segreotto, e laudalo i paleso;
⁵Non essere bugiardo del preterito.

II94.

The memory of benefits is a frail de-fence against ingratitude.

Reprove your friend in secret and praise him openly.

Be not false about the past.

II90. The writing of this note, which is exceedingly minute, is reproduced in facsimile on Pl. XLI No. 5 above the first diagram.

VOL. II.

PP
COPERATI0NE DELLA PATIETISA.

La patieta fa cotra alle ingiurie non altramenti che se i fattino i panni contra del freddo, inperoché se ti multiplicherai li pani secondo la multipiicazione del freddo, esso freddo nocere no potra; similemente alle gradi ingivrie cresci la patieta, e esse ingiurie offendere no ti potranno la tua mente.

A SIMILE FOR PATIENCE.

Patience serves us against insults precisely as clothes do against the cold. For if you multiply your garments as the cold increases, that cold cannot hurt you; in the same way increase your patience under great offences, and they cannot hurt your feelings.

S. K. M. II. 2 24a]

Tanto è a dire be d'ũ tristo, quanto a dire male d'ũ bono.

To speak well of a base man is much the same as speaking ill of a good man.

L. 01]

Decipimur votis et tempore fallimur et mos deridet curas; anxia vita nihil.

We are deceived by promises and time disappoints us[2].

L. 90a]

La pavra nascie piv tosto che altra cosa.

Fear arises sooner than any thing else.

C. A. 75b; 219b]

Siccome l'animosita è pericolo di uita.

Just as courage imperils life, fear protects it.

Le minaccie sol sono armi dello minaccia;

Threats alone are the weapons of the threatened man.

Dov'entra la uetura, la invidia vi pone lo assedio e lo chabatte, e don'della si parte, vi lascia il dolore e pettimeto;

Wherever good fortune enters, envy lays siege to the place and attacks it; and when it departs, sorrow and repentance remain behind.

Raro cade chi ben camina;

He who walks straight rarely falls.

1195. 2. allingerie: altremči . chessi. 3. fredo Jasper chessett . sechondo. 4. esso fredo. 5. grade . crescti . essa ingiuria. 1196. 1. tristo.

1197. 1-3 R. 1. lanvidia . cholla. 2. chol. 3. spavete.

1198. 1. et mos. 2. nihil.

1199. 1-2 R. 1. nasscele. 2. chosa.

1200. 1. sichome . pericholo . chos . sicurita. 3. iminaccia. 4. lanvidia . essedio ello chébatte E . lascia il "dolore be" pettimeto. 5. chade . chamina. 6. laldi e pegio . chosa dicho . tu nolla. 7. laldi e pegio is tu . tu nollassidi.

1198. 2. The rest of this passage may be rendered in various ways, but none of them give a satisfactory meaning.
It is bad if you praise, and worse if you reprove a thing, I mean, if you do not understand the matter well.

It is ill to praise, and worse to reprimand in matters that you do not understand.

The lover is moved by the beloved object as the senses are by sensible objects; and they unite and become one and the same thing. The work is the first thing born of this union; if the thing loved is base the lover becomes base.

When the thing taken into union is perfectly adapted to that which receives it, the result is delight and pleasure and satisfaction.

When that which loves is united to the thing beloved it can rest there; when the burden is laid down it finds rest there.

There will be eternal fame also for the inhabitants of that town, constructed and enlarged by him.
Tutti i popoli obbediscono e sò mossi da lor magniati, e essi magniati si colle-gano e costringono coi signori 4 per 2 vie: o per sanguinità, o per roba: sanguini-
ità, quàdo i lor figlioli sono a similitudine
di statichi; sicurtà è pegno della lor dubi-
tata fede; roba, quàdo tu farai a ciascù
d'essi 5 murare vna casa o 2 dentro alla tua
città, della quale lui ne tragga qual ch'en-
trate e trarrà... 10 città cinque mila
case, cò trenta 6 mila abitatori, e digregerai tanta cßregatione di popolo che a simili-
tudine di capre l'ù 9 adosso all' altro stanno,
èpiédo ogni parte di fetore e si fanno se-
meza di pestilète 10 morte;
11 E la città si fà di bellezza cópagnia
del suo nome e a te vtile di dati e fama
eterna del suo crescimèto.

Ash. II. 13a]

Per màtenere il dono pricipal 2 di natura
ciò libertà, trovo modo 3 da offedere e
difèdere stàte assediati 4 dali àbitosi tirañì,
e prima dirò del siëto mvrale, e àcòra
per che i popoli possìno 6 màtenere i loro
boni et giusti signiori.

1204. All communities obey and are led by their
magnates, and these magnates ally themselves
with the lords and subjugate them in two ways:
either by consanguinity, or by fortune; by con-
sanguinity, when their children are, as it were,
hostages, and a security and pledge of their
suspected fidelity; by property, when you make
each of these build a house or two inside your
city which may yield some revenue and
he shall have...; 10 towns, five thousand
houses with thirty thousand inhabitants, and
you will disperse this great congregation of
people which stand like goats one behind
the other, filling every place with fetid smells
and sowing seeds of pestilence and death;
And the city will gain beauty worthy of
its name and to you it will be useful by
its revenues, and the eternal fame of its
aggrandizement.

To preserve Nature's chiepest boon, that
is freedom, I can find means of offence and
defence, when it is assailed by ambitious
tyrants, and first I will speak of the situation of
the walls, and also I shall show how commu-
nities can maintain their good and just Lords.

1204. Compare No. 1266.
III.

POLEMICS.—SPECULATION.

1205.

Oh! speculators on things, boast not of knowing the things that nature ordinarily brings about; but rejoice if you know the end of those things which you yourself devise.

1206.

Oh! speculators on perpetual motion how many vain projects of the like character you have created! Go and be the companions of the searchers for gold.

1207.

The false interpreters of nature declare that quicksilver is the common seed of every metal, not remembering that nature varies the seed according to the variety of the things she desires to produce in the world.

1206. Another short passage in MS. I, referring also to speculators, is given by LINNI (Hist, des Sciences math. III, 228): Sicché voi speculatori non vi fidate delli autori che sono sol col immaginazione voluto farsi interpreti tra la natura e l'omo, ma sol di quelli che non coi cenni della natura, ma cogli effetti delle sue esperienze hanno esercitati i loro ingegni.
And many have made a trade of delusions and false miracles, deceiving the stupid multitude.

Abbreviators do harm to knowledge and to love, seeing that the love of any thing is the offspring of this knowledge, the love being the more fervent in proportion as the knowledge is more certain. And this certainty is born of a complete knowledge of all the parts, which, when combined, compose the totality of the thing which ought to be loved. Of what use then is he who abridges the details of those matters of which he professes to give thorough information, while he leaves behind the chief part of the things of which the whole is composed? It is true that impatience, the mother of stupidity, praises brevity, as if such persons had not life long enough to serve them to acquire a complete knowledge of one single subject, such as the human body; and then they want to comprehend the mind of God in which the universe is included, weighing it minutely and mincing it into infinite parts, as if they had to dissect it!

Oh human stupidity, do you not perceive that, though you have been with yourself all your life, you are not yet aware of the thing you possess most of, that is of your folly? and then, with the crowd of sophists, you deceive yourselves and others, despising the mathematical sciences, in which truth dwells and the knowledge of the things included in them. And then you occupy yourself with miracles, and write that you possess information of those things of which the human mind is incapable and which cannot be proved by any instance from nature. And you fancy you have wrought miracles when you spoil a work of some
[48] O mathematicians shed light on this error. **On spirits**

The spirit has no voice, because where there is a voice there is a body, and where there is a body space is occupied, and this prevents the eye from seeing what is placed behind that space; hence the surrounding air is filled by the body, that is by its image.

There can be no voice where there is no motion or percussion of the air; there can be no percussion of the air where there is no instrument, there can be no instrument without a body; and this being so, a spirit can have neither voice, nor form, nor strength. And if it were to assume a body it could not penetrate nor enter where the passages are closed. And if any one should say that by air, compressed and compacted

speculative mind, and do not perceive that you are falling into the same error as that of a man who strips a tree of the ornament of its branches covered with leaves mingled with the scented blossoms or fruit.

[48] as Justinus did, in abridging the histories written by Trogus Pompeius, who had written in an ornate style all the worthy deeds of his forefathers, full of the most admirable and ornamental passages; and so composed a bald work worthy only of those impatient spirits, who fancy they are losing as much time as that which they employ usefully in studying the works of nature and the deeds of men. But these may remain in company of beasts; among their associates should be dogs and other animals full of rapine and they may hunt with them after..., and then follow helpless beasts, which in time of great snows come near to your houses 'asking' alms as from their master...
per quello strumeto parla 12e move cò forza, a questa parte dico, 11che dove non sono nerui e ossa, non può esse22re forza· operata in nessuno moviméto 13fatto dagli' imaginati spiriti;
4fuggi i precetti · di quelli · speculatori, chè le loro 15ragioni · nò son · confermate · dalla · speriéza.

W. An. II. 212 d (N)]

Delli discorsi vmani stoltissimo è da essere riputato quello, il qual s'astède allà credulità della negromàtia, sorella della alchemia, partoritrice delle cose senplici e naturali; Ma è tanto più degmia di riprensione che l'alchemia, quàto ella non partorisce alcuna cosa se nò simile a se, 5cioè bugia; il che non interviene nella alchemia, la quale è ministratricie de'senplici prodotti della natura, il quale vítio fatto esser nò può 7da essa natura, perchè in lei non sono strumèti organismi colli quali essa possa operare quel 8che adopera l'uomo mediante le mani, che in tale vítio 9à fatti i maggiori ecc.; ma essa negromàtia, stendardo ovvero bandiera 10volante, mossa dal letó, è guida·trice della stolta moltitudine, la quale 11al continuo testimonia collo abbaiaaméto d'in·finiti effetti di tale 12arte; e uano épiuti i libri, affermando che l'incáti e spiriti adop·erino 13e senza lingua parlino, e senza struméti organismi, sàza i quali 14parlar nò si può, parlino, e portino gravissimi pesi, facino tépestare 15e piovere, e che li omími si cóvertino il gatte, lupi e altre bestie, 16benchè in bestia prima ét quelli che tal cosa affermano;

17È cierto, se tale negromàtia fusse in essere, come dalli bassi ingiegni è creduto, 18nessuna cosa è sopra la terra che al danno e seruitio dell'omo fusse di tanta valitudine, perché se fusse22ve vero, che in tale arte si avesse potétia di far turbare la trá·quilla serenità dell'ari22a, convertendo quella in notturn aspetto, e far le corruscations o venti con spavétevoli toni e folgorí scorrotí infra le tenebre, e con ipetuosi venti ruinare
together, a spirit may take bodies of various forms and by this means speak and move with strength—to him I reply that when there are neither nerves nor bones there can be no force exercised in any kind of movement made by such imaginary spirits.

Beware of the teaching of these specu·lators, because their reasoning is not confirmed by experience.

Of all human opinions that is to be reputed the most foolish which deals with the belief in Necromancy, the sister of Alchemy, which gives birth to simple and natural things. But it is all the more worthy of reprehension than alchemy, because it brings forth nothing but what is like itself, that is, lies; this does not happen in Alchemy which deals with simple products of nature and whose function cannot be exercised by nature itself, because it has no organic instruments with which it can work, as men do by means of their hands, who have produced, for instance, glass &c. but this Necromancy the flag and flying banner, blown by the winds, is the guide of the stupid crowd which is constantly witness to the dazzling and endless effects of this art; and there are books full, declaring that enchantments and spirits can work and speak without tongues and without organic instruments — without which it is impossible to speak — and can carry heaviest weights and raise storms and rain; and that men can be turned into cats and wolves and other beasts, although indeed it is those who affirm these things who first became beasts.

And surely if this Necromancy did exist, as is believed by small wits, there is nothing on the earth that would be of so much importance alike for the detriment and service of men, if it were true that there were in such an art a power to disturb the calm serenity of the air, converting it into darkness and making coruscations or winds, with terrific thunder and lightnings rushing through the darkness, and with violent
214. DELLI SPIRITI.

2. Abiàno insin qui direto a questa faccia detto, come la diinfinito dello spirito è vna potenzia congiunta al corpo, perché per se dichiar le piante “selue” e chon . perchotere . acquelli. 23. otradiquesto . tempestes . chialtori. 24. gluvrro po . chon. 25. nemicho aver potestas . richolte . ba. 26. po . chessti . acquella dicho . chomhidà. 27. efa . essomergririti. 28. chomüda attali. 29. resistere . ocholdi. 30. giome . chorno . achoestu . essentu. 31. fortezz [chef] inesegabili . chesssalvar. 32. chuno. 33. hioriente . opositi aspperi. 34. mi volo più oltre asstendendo . chosa che pera. 36. choncuo “in parte” il ella. 37. chostiene. 38. choncuo . ina e ressta inacralli . chotta desid. 38. chessti chosa ischiporepor . chorno e vchuo . vchuo. 1214. 2. acquesta . detto. 3. chome . spirito [e vn ome nSch]. 4. chonquinta. 5. alchuna . lochale. 6. essettu . reggha

POLEMICS.

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storms overthrowing high buildings and rooting up forests; and thus to oppose armies, crushing and annihilating them; and, besides these frightful storms may deprive the peasants of the reward of their labours. — Now what kind of warfare is there to hurt the enemy so much as to deprive him of the harvest? What naval warfare could be compared with this? I say, the man who has power to command the winds and to make ruinous gales by which any fleet may be submerged,—surely a man who could command such violent forces would be lord of the nations, and no human ingenuity could resist his crushing force. The hidden treasures and gems reposing in the body of the earth would all be made manifest to him. No lock nor fortress, though impregnable, would be able to save any one against the will of the necromancer. He would have himself carried through the air from East to West and through all the opposite sides of the universe. But why should I enlarge further upon this? What is there that could not be done by such a craftsman? Almost nothing, except to escape death. Hereby I have explained in part the mischief and the usefulness, contained in this art, if it is real; and if it is real why has it not remained among men who desire it so much, having nothing to do with any deity? For I know that there are numberless people who would, to satisfy a whim, destroy God and all the universe; and if this necromancy, being, as it were, so necessary to men, has not been left among them, it can never have existed, nor will it ever exist according to the definition of the spirit, which is invisible in substance; for within the elements there are no incorporeal things, because where there is no body, there is a vacuum; and no vacuum can exist in the elements because it would be immediately filled up. Turn over.
medesimo reggire no si puo, nè pigliare alcuna sorti di moto locale, e se tu dirai che per se si regga, questo essere non può ^dentro alli eleméti, perché se lo spirito è quitàt incorporea, questa tal quantità è detta vacuo, e l'ua'ecuo non si da in natura; e dato che si desse, subito sa^rebbe riempito dalla ruina di quello ele-
meno nel ^qual l'ucuo si gínerasse; adunque per la division del pe^so che dice, la gravità è una potècia accidentale creat^ d'alciuno elemento tirato o sospinto nell'altro, seguita, che ^nessuno eleméto, non pesando nel medesimo eleméto, c' pe^sa nell'eleméto superiore ch'è più lieve di lui; come si uede ^la parte dell'acqua non à gravità o leuità più che l'altra ^acqua, ma se tu la tirerai nell'aria, allora ella acqui^sterà gravézza, e se tu tirerai l'aria ^sotto l'acqua, allora l'acqua, che si trova sopra tale ^aria, acquista gravézza, la qual gravézza per se sostener ^non si può, onde li è necessario la ruina, e così cade infra ^l'acqua in quel loco ch'è va-
cuo d'essa acqua; tale ac^caderebbe nello spirito, stando infra li eleméti, chè al ^continuó gínererebbe vacuo in quel tale eleméto, dove ^lui si trovasse, per la qual cosa li sarebbe necessario la con^tinua fuga in-
verso il cielo, insinche vscito fusse di tali ^eleméti.

SE LO SPIRITO TIENE CORPO INFRA LI 39 ELEMENTI.

^Abbià provato, come lo spirito non può per se stare infra li ^elementi sanza corpo, nè per se si può mouere per moto vo^lontario, se non è allo in sù; Ma al presente diremo co^me, pigliando corpo d'aria tale spirito, è neci^sario che s'in-
fonda infra essa aria, perché, s'elli stesse vnito, ^e' sarebbe separato e caderebbe alla gíneratió del uacuo, ^come di sopra è 
detto; addunque è necessario che, a volere ^restare infra l'aria, che esso s'in-
fonda in una quitàt d'aria; e ^se si mista coll'aria, elli seguita due inconvenienti, cioè ^che elli leuifica quella quitàt del-
I'aria dove esso si mista, e ^per la qual cosa l'aria leuificata per se uola in alto,

AS TO WHETHER A SPIRIT HAS A BODY AMID THE ELEMENTS.

We have proved that a spirit cannot exist of itself amid the elements without a body, nor can it move of itself by voluntary motion unless it be to rise upwards. But now we will say how such a spirit taking an aerial body would be inevitably melt into air; because if it remained united, it would be separated and fall to form a vacuum, as is said above; therefore it is inevitable, if it is to be able to remain suspended in the air, that it should absorb a certain quantity of air; and if it were mingled with the air, two difficulties arise; that is to say: It must rarely that portion of the air with which it mingle; and for this cause the rarefied air must fly up of itself and will not

move of its own accord, nor can it have any kind of motion in space; and if you were to say that it moves itself, this cannot be within the elements. For, if the spirit is an incorporeal quantity, this quantity is called a vacuum, and a vacuum does not exist in nature; and granting that one were formed, it would be immediately filled up by the rushing in of the element in which the vacuum had been generated. Therefore, from the definition of weight, which is this—Gravity is an accidental power, created by one element being drawn to or suspended in another—it follows that an element, not weighing anything compared with itself, has weight in the element above it and lighter than it; as we see that the parts of water have no gravity or levity compared with other water, but if you draw it up into the air, then it would acquire weight, and if you were to draw the air beneath the water then the water which remains above this air would acquire weight, which weight could not sustain itself by itself, whence collapse is inevitable. And this happens in water; wherever the vacuum may be in this water it will fall in; and this would happen with a spirit amid the elements, where it would continuously generate a vacuum in whatever element it might find itself, whence it would be inevitable that it should be constantly flying towards the sky until it had quitted these elements.
e non resta 44 infra l'aria più grossa di lei; e oltre a questo tal virtù 45 spirituali sparsa si disunisce e altera sua natura, per la qual 46 cosa esso mācā della prima virtù addolcijesi vn 3° inco4⁴veniente; e questo è, che tal corpo d'aria, preso dallo spirito, è 4⁵ sottoposto alla penetratior de' venti, li quali al continuo disi4⁶niscono e stracciano le parti vnite dell'aria, quelle rivolgìe7do e raggiando infra l'altra aria; adunque lo spirito, in tale

 aria infuso, sarebbe smembrato ovvero sbrannato e rotto insieme collo sbranamento dell'aria, nella qual s'infuse.

**Se lo spirito, avèdo preso corpo 4 d'aria, si può per se move re o no.**

5 Inimpossibile è che lo spirito, infuso a una qualità d'aria, 6 possa move re essa aria; e questo si manifesta per la passa'ta dove dice 7 lo spirito leuifica quella qualità del'aria, 8 nella quale esso s'infondo; adunque tale aria 9 si leuerà in alto sopra l'altra aria, e sarà moto fatto dell'aria per la sua leuità e nò per moto volontario dello spirito, e 11 se tale aria si scontra nel ueto per la 3° di questo, essa 12 aria sarà messa dal ueto e nò dallo spirito in lei infuso.

**Se lo spirito può parlare o no.**

10 Volendo mostrare, se lo spirito può parlare o no, è necies8 9 sario in prima definire che cosa e uocie, e come si giene9 10; e diremo in questo modo: la vocie è mo11 vimento d'aria confrigata in corpo denso, e l' corpo denso 12 confrigato nell'aria che è il medesimo, la qual co9 13 fricatione di denso con raro condensa il raro e fassi resis14 tia, e ancora il uelocie raro nel tardo raro si condensa12 non l'uno e l'altro ne' contatti, e fano suono e grandissimo strepito; è il suono ovo ver mormorio fatto dal raro 15 che si move nel raro có medi

remain among the air that is heavier than itself; and besides this the subtle spiritual essence disunites itself, and its nature is modified, by which that nature loses some of its first virtue. Added to these there is a third difficulty, and this is that such a body formed of air assumed by the spirits is exposed to the penetrating winds, which are incessantly sundering and dispersing the united portions of the air, revolving and whirling amidst the rest of the atmosphere; therefore the spirit which is infused in this

**As to whether the spirit, having taken this body of air, can move of itself or not.**

It is impossible that the spirit infused into a certain quantity of air, should move this air; and this is proved by the above passage where it is said: the spirit rarefies that portion of the air in which it incorporates itself; therefore this air will rise high above the other air and there will be a motion of the air by its lightness and not by a voluntary movement of the spirit, and if this air is encountered by the wind, according to the 3rd of this, the air will be moved by the wind and not by the spirit incorporated in it.

**As to whether the spirit can speak or not.**

In order to prove whether the spirit can speak or not, it is necessary in the first place to define what a voice is and how it is generated; and we will say that the voice is, as it were, the movement of air in friction against a dense body, or a dense body in friction against the air,—which is the same thing. And this friction of the density and the rare condenses the rare and causes resistance; again, the rare, when in swift motion, and the rare in slow motion condense each other when they come in contact and make a noise and very great uproar;

43. chosa ... màcha ... aggiunescisi. 44. ecuesto he chattal. 45. sottoposto ... venetriatì ... chostinuò. 46. nissano
43. estracce le parte. 47. raginando infrallaira ... l' spirito in tale 7.
Ogni qualità continua intellettualmente e divisibile in infinito;

[Amid the vastness of the things among which we live, the existence of nothingness holds the first place; its function extends over all things that have no existence, and]

and the sound or murmur made by the rare moving through the rare with only moderate swiftness, like a great flame generating noises in the air; and the tremendous uproar made by the rare mingling with the rare, and when that air which is both swift and rare rushes into that which is itself rare and in motion, it is like the flame of fire which issues from a big gun and striking against the air; and again when a flame issues from the cloud, there is a concussion in the air as the bolt is generated. Therefore we may say that the spirit cannot produce a voice without movement of the air, and air in it there is none, nor can it emit what it has not; and if desires to move that air in which it is incorporated, it is necessary that the spirit should multiply itself, and that cannot multiply which has no quantity. And in the 4th place it is said that no rare body can move, if it has not a stable spot, whence it may take its motion; much more is it so when an element has to move within its own element, which does not move of itself, excepting by uniform evaporation at the centre of the thing evaporated; as occurs in a sponge squeezed in the hand held under water; the water escapes in every direction with equal movement through the openings between the fingers of the hand in which it is squeezed.

As to whether the spirit has an articulate voice, and whether the spirit can be heard, and what hearing is, and seeing; the wave of the voice passes through the air as the images of objects pass to the eye.

1216. Compare No. 916.
6. 

6. essential risiede presso del tempo infra 'l preterito 7 e l futuro, e nulla possiede del presente; Questo nulla 8 a la sua parte equale al tutto, e l tutto alla parte, e 'l diuissibile allo indivisibile; e tal somma produce nella 10 sua partizione come nella 
multiplicazione, 11 e nel suo sommare, quanto nel sottrare, come si dimostra 12 presso dell'aritmetici dello suo 10 carattere che rap13 pressa esso nullo; E la podestà 
sua non si stende infra le cose di natura. 15 [Quello che è detto niente, si ritrova 
solo nel tempo e nelle parole; nel tempo si trova infra 'l preterito e l futuro, 17 e nulla ri tiene del presente, e così infra le parole delle coe 18 che si dicono che non sono o che sono impossibili.] 
19 Presso del tempo e nulla risiede infra 'l preterito e l futuro, 20 e niente possiede del presente, e presso di natura e' s'accompagna infra le cose impossibili, onde per quel ch'è detto e' non a l essere; 21 Imperocchè doue fusse il nullo, sarebbe dato il vacuo.

ESEMPO DELLA SEATTA FRA NUVOLI.

[O potente e già animato strumento dell'artificiosa natura, 3 a te non valéde le tue grà forze ci tóuine abbadonare la tráquilla vita e obbedire alla legie, 4 che Iddio e l tépo diele alla gienitrice natura.] 
2 O quáte volte furono vedute le ipavrite 

ciare 8 de' delfini e de' grà tonni fugire dal inpià tua furia, 9 e tu, che .10 fulminando gneriastì nel mare subita tèpesta con grà busse e sommersione di navili co grà 11 de' odamèto, çipèdo gli scoperti liti degli ipavriti e sbigo 12 tititi pesci, toglièdosi a te per lasciato mare rimasi in loco diveniano soperchia e 13 abbondante preda de' vecini popoli;

1217. EXAMPLE OF THE LIGHTNING IN CLOUDS.

[O mighty and once living instrument of formative nature. Incapable of availing thy self of thy vast strength thou hast to abandon a life of stillness and to obey the law which God and time gave to procreative nature.] 
Ah! how many a time the shoals of terri 
edolphins and the huge tinny-fish were 
seen to flee before thy cruel fury, to escape; whilst thy fulminations raised in the sea a sudden tempest with buffeting and submer 
sion of ships in the great waves; and filling the uncovered shores with the terrified and desperate 
fishes which fled from thee, and left by the sea, 
remained in spots where they became the abun 
dant prey of the people in the neighbourhood.


1217. ESEMPO DELLA SEATTA FRA NUVOLI.

[O potente e già animato strumento dell'artificiosa natura, 3 a te no valède le tue grà forze ci tòuine abbadonare la tráquilla vita e obbedire alla legie, 4 che Iddio e l tépo diele alla gienitrice natura.]
7 O quàte volte furono vedute le ipavrite 

schiere 8 de' delfini e de' grà tonni fugire dal inpià tua furia, 9 e tu, che .10 fulminando gneriastì nel mare subita tèpesta con grà busse e sommersione di navili co grà 11 de' odamèto, çipèdo gli scoperti liti degli ipavriti e sbigo 12 tititi pesci, toglièdosi a te per lasciato mare rimasi in loco diveniano soperchia e 13 abbondante preda de' vecini popoli;

1217-1219. The character of the handwriting 
points to an early period of Leonardo's life. It has become very indistinct, and is at present exceedingly difficult to decipher. Some passages remain doubtful.

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points to an early period of Leonardo's life. It has become very indistinct, and is at present exceedingly difficult to decipher. Some passages remain doubtful.
1218. Rimase lo elemeto dell’acqua richiuso ifra li crescivti argini de’ fiumi, e si vede l’mare ifra la cresciuta terra e la circunadatrice aria, avédo a fasciare e circon-scrivere la moltificata machina della terra, e la sua grossesse, che staua fra l’acqua e lo elemeto del fuoco, rimaggi molto stretta e privata dalla bisogniosa acqua; i fivni rimarrano senza le loro acque, la fertile terra no maider pìv leggieri fröde, nó fieno pìv i capi adornati dalle ricascati piate; tutti li animali nó trovado da pasciere le fresche erbe, morranno, e ma’cherà il cibo ai rapaci lioni e lupi e altri animali che vivono di ratto, e agli omini dopo molti ripari còverà abàdonare la loro vita, e macherà la generazione vmana; a questo modo la fertile e fruttuosa terra abbandonata rimarrà arida e sterile e per richivso omotre della acqua, richivsa nel suo ventre, e per la vivace natura osserve’rà alquàto dello suo accrescimento, tato che passata la fredda e so’tile aria fia costretta a terminare collo elemeto del fuoco; allora la sua superficie rimarrà in riarsa cienere, e questo fia l termine della terrestre natura.


1218. The watery element was left enclosed between the raised banks of the rivers, and the sea was seen between the uplifted earth and the surrounding air which has to envelope and enclose the complicated machine of the earth, and whose mass, standing between the water and the element of fire, remained much restricted and deprived of its indispensable moisture; the rivers will be deprived of their waters, the fruitful earth will put forth no more her light verdure; the fields will no more be decked with waving corn; all the animals, finding no fresh grass for pasture, will die and food will then be lacking to the lions and wolves and other beasts of prey, and to men who after many efforts will be compelled to abandon their life, and the human race will die out. In this way the fertile and fruitful earth will remain deserted, arid and sterile from the water being shut up in its interior, and from the activity of nature it will continue a little time to increase until the cold and subtle air being gone, it will be forced to end with the element of fire; and then its surface will be left burnt up to cinder and this will be the end of all terrestrial nature.

1219. Why did nature not ordain that one animal should not live by the death of another? Nature, being inconstant and...
taking pleasure in creating and making constantly new lives and forms, because she knows that her terrestrial materials become thereby augmented, is more ready and more swift in her creating, than time in his destruction; and so she has ordained that many animals shall be food for others. Nay, this not satisfying her desire, to the same end she frequently sends forth certain poisonous and pestilential vapours upon the vast increase and congregation of animals; and most of all upon men, who increase vastly because other animals do not feed upon them; and, the causes being removed, the effects would not follow. This earth therefore seeks to lose its life, desiring only continual reproduction; and as, by the argument you bring forward and demonstrate, like effects always follow like causes, animals are the image of the world.
XX.

Humorous Writings.

Just as Michaelangelo's occasional poems reflect his private life as well as the general disposition of his mind, we may find in the writings collected in this section, the transcript of Leonardo's fanciful nature, and we should probably not be far wrong in assuming, that he himself had recited these fables in the company of his friends or at the court festivals of princes and patrons. Era tanto piacevole nella conversazione — so relates Vasari — che tirava a sé gli animi delle genti. And Paulus Jovius says in his short biography of the artist: Fuit ingenio valde comi, nitido, liberal!, vultu autem longe venustissimo, et cum elegantiae omnis deliciarumque maxime theatralium mirificus inventor ac arbiter esset, ad lyramque scito caneret, cunctis per omnem aetatem principibus mire placuit. There can be no doubt that the fables are the original offspring of Leonardo's brain, and not borrowed from any foreign source; indeed the schemes and plans for the composition of fables collected in division V seem to afford an external proof of this, if the fables themselves did not render it self-evident. Several of them—for instance No. 1279—are so strikingly characteristic of Leonardo's views of natural science that we cannot do them justice till we are acquainted with his theories on such subjects; and this is equally true of the 'Prophecies'.

I have prefixed to these quaint writings the 'Studies on the life and habits of animals' which are singular from their peculiar aphoristic style, and I have transcribed them in exactly the order in which they are written in MS. H. This is one of the very rare instances in which one subject is treated in a consecutive series of notes, all in one MS., and Leonardo has also departed from his ordinary habits, by occasionally not completing the text on the page it is begun. These brief notes of a somewhat mysterious bearing have been placed here, simply because they may possibly have been intended to serve as hints for fables or allegories. They can scarcely be regarded as preparatory for a natural history; rather they would seem to be extracts. On the one hand the names
of some of the animals seem to prove that Leonardo could not here be recording observations of his own; on the other hand the notes on their habits and life appear to me to dwell precisely on what must have interested him most—so far as it is possible to form any complete estimate of his nature and tastes.

In No. 1293 lines 1—10, we have a sketch of a scheme for grouping the Prophecies. I have not however availed myself of it as a clue to their arrangement here because, in the first place, the texts are not so numerous as to render the suggested classification useful to the reader, and, also, because in reading the long series, as they occur in the original, we may follow the author's mind; and here and there it is not difficult to see how one theme suggested another. I have however regarded Leonardo's scheme for the classification of the Prophecies as available for that of the Fables and Fests, and have adhered to it as far as possible.

Among the humorous writings I might perhaps have included the 'Rebusses', of which there are several in the collection of Leonardo's drawings at Windsor; it seems to me not likely that many or all of them could be solved at the present day and the MSS. throw no light on them. Nor should I be justified if I intended to include in the literary works the well-known caricatures of human faces attributed to Leonardo—of which, however, it may be incidentally observed, the greater number are in my opinion undoubtedly spurious. Two only have necessarily been given owing to their presence in text, which it was desired to reproduce: Vol. I page 326, and Pl. CXXII. It can scarcely be doubted that some satirical intention is conveyed by the drawing on Pl. LXIV (text No. 688).

My reason for not presenting Leonardo to the reader as a poet is the fact that the maxims and morals in verse which have been ascribed to him, are not to be found in the manuscripts, and Prof. Uzielli has already proved that they cannot be by him. Hence it would seem that only a few short verses can be attributed to him with any certainty.
I.

STUDIES ON THE LIFE AND HABITS OF ANIMALS.

1220.

THE LOVE OF VIRTUE.

The gold-finch is a bird of which it is related that, when it is carried into the presence of a sick person, if the sick man is going to die, the bird turns away its head and never looks at him; but if the sick man is to be saved the bird never loses sight of him but is the cause of curing him of all his sickness.

Like unto this is the love of virtue. It never looks at any vile or base thing, but rather clings always to pure and virtuous things and takes up its abode in a noble heart; as the birds do in green woods on flowery branches. And this Love shows itself more in adversity than in prosperity; as light does, which shines most where the place is darkest.

1221.

ENVY.

We read of the kite that, when it sees its young ones growing too big in the nest, out of envy it pecks their sides, and keeps them without food.
Allegrezza.

7 L'allegrezza è appropriata al gallo che d'ogni piccola cosa si rallegra e cata con vari e scherzati mouimenti.

Tristezza.

11 La tristezza s'assomiglia al corbo, il quale, quando uede in sua nati figlioli esser biati, che per lo grande dolore si parte có tristo ramarichio, gli'abàdona e nò gli pasce sino che non gli vede alquàte poche pène enere.

Ira.

10 Dell'orso si dice che quando va alle case delle api per torre loro il mele, esse api cominciando a pügierlo, che lui lascia il mele e corre alla vendetta, e volè dosi có tutte quelle che lo mordono vè dicare, có nessuna si uèdica, in modo che la sua ira si cóuerte in rabbia, e gittatosi in terra colle mani e col piedi inasprádo indarno da quelle si difende.

Gratitudine.

2 La virtù della gratitudine si dice essere piv nelli uccieli detti upupa, i quali, conosciédo il benificio della ricievuta vita e nvidia dal padre e dalla loro madre, quando li uedo nó vechi fanno loro vno nido e li covano e li nutriscono, e cavà loro col becco le vecchie e triste penne, e có ciete erbe li rédano la uista, in modo che ritornano in prosperità.

Cheerfulness.

Cheerfulness is proper to the cock, which rejoices over every little thing, and crows with varied and lively movements.

Sadness.

Sadness resembles the raven, which, when it sees its young ones born white, departs in great grief, and abandons them with doleful lamentations, and does not feed them until it sees in them some few black feathers.

Peace.

We read of the beaver that when it is pursued, knowing that it is for the virtue [contained] in its medicinal testicles and not being able to escape, it stops; and to be at peace with its pursuers, it bites off its testicles with its sharp teeth, and leaves them to its enemies.

Rage.

It is said of the bear that when it goes to the haunts of bees to take their honey, the bees having begun to sting him he leaves the honey and rushes to revenge himself. And as he seeks to be revenged on all those that sting him, he is revenged on none; in such wise that his rage is turned to madness, and he flings himself on the ground, vainly exasperating, by his hands and feet, the foes against which he is defending himself.

Gratitude.

The virtue of gratitude is said to be more [developed] in the birds called hoopoes which, knowing the benefits of life and food, they have received from their father and their mother, when they see them grow old, make a nest for them and brood over them and feed them, and with their beaks pull out their old and shabby feathers; and then, with a certain herb restore their sight so that they return to a prosperous state.

1222. 2. he. 3. conosciédo. 5. fugire. 7. sisspicha.. . elli lascia assiua. 11. ave. 12. ave lo coñiciato a pügier o di lui lasci. 13. core. 14. chello mordano. 15. imodo chella. 17. tero cholle mani eco.. . inasprádo. 18. dacquelle.
1223. 1. [miscericordia] over gratitudine. 3. detti upica. 4. conosciédo.. . nvidia. 6. ueda. 7. fano.. . elli. 8. elli nòtrisscano. 9. becho.. . triste. 10. chò.. . rédano. 11. imodo. 13. rosspo si passcie.. . essempre.
Avaritia.

13 Il rospo si pascie di terra e sempre sta macro, perché no si satia; tant'è il timore che essa terra no li manchi.

1224.

Ingratitudine.

2 I colonbi sono assimiliati alla ingratitudine, imperoché quâdo sono in età che non abbino pivi bisognio d'essere cibati, cominciano a cóbattere col padre; e no finisce, essë pugnia insino a tato che caçia il padre e togli la mogli façiendo la sua.

Crueltà.

11 Il basilisco è di tanta crudeltà che, quâdo colia sua venenosa vista no può occidere li animali, si volta all'erbe e le piâte, e fermâdo in quelle la sua vista le fa seccare.

Liberalità.

2 Dell'aquila si dice che non à mai si grâ fame, che non lasci parte della sua preda a quelli vciacchi che gli son distintorno; i quali, no potèdosi per se pasciere, è necessario che sieno correggiatori d'essa aquila, perché in tal modo si cibano.

Corettione.

10 Quêdo il lupo va asentito intorno a qualche stallo di bestiame, e che per caso esso poga il piede in fallo in modo facci strepito, egli si morde il piê per corréggiere se da tale errore.

Lusingehe over sirene.

2 La sirena si dolcemête càta che adormëta i marinari, e essa ònita sopra i navili e occide li adormëtati marinarì.

Avarice.

The toad feeds on earth and always remains lean; because it never eats enough:—it is so afraid lest it should want for earth.

1224.

Ingratitude.

Pigeons are a symbol of ingratitude; for when they are old enough no longer to need to be fed, they begin to fight with their father, and this struggle does not end until the young one drives the father out and takes the hen and makes her his own.

Cruelty.

The basilisk is so utterly cruel that when it cannot kill animals by its baleful gaze, it turns upon herbs and plants, and fixing its gaze on them withers them up.

Generosity.

It is said of the eagle that it is never so hungry but that it will leave a part of its prey for the birds that are round it, which, being unable to provide their own food, are necessarily dependent on the eagle, since it is thus that they obtain food.

Discipline.

When the wolf goes cunningly round some stable of cattle, and by accident puts his foot in a trap, so that he makes a noise, he bites his foot off to punish himself for his folly.

Flatterers or Syrens.

The syren sings so sweetly that she lulls the mariners to sleep; then she climbs upon the ships and kills the sleeping mariners.
Prudètia.

7 La formica per naturale consiglio 8 pro-
vede la state per lo uerno, uccide7do le
racolte semèze, perché nò ri7nascino, e di
quelle al tenpo si pascono.

Pazzia.

12 Il bo salutatico avèdo in odio il co-
lore rosso, i cacciatori vestono di rosso
il pedal d'una piàta, e esso bo corre a
quella e cò gran furia v'inchioda le corti-
ne, òde i cacciatori l'uccidono.

Prudentia.

We may liken the virtue of Justice to
the king of the bees which orders and
arranges every thing with judgment. For
some bees are ordered to go to the flowers,
others are ordered to labour, others to fight
with the wasps, others to clear away all dirt,
others to accompany and escort the king;
and when he is old and has no wings they
carry him. And if one of them falls in his
duty, he is punished without reprieve.

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duty, he is punished without reprieve.

Follia.

The wild bull having a horror of a red
colour, the hunters dress up the trunk of a
tree with red and the bull runs at this with
great frenzy, thus fixing his horns, and forth-
with the hunters kill him there.

Verità.

Benchè le perecìi rubino l'oua l'una
all'al1sra, nòdimeno i figlioli nati d'esse
ova 16 senpre ritornano alla lor uera madre.

Verità.

Although partridges steal each other's eggs,
evertheless the young born of these eggs
always return to their true mother.

Fidelità, or Loyalty.

The cranes are so faithful and loyal to
their king, that at night, when he is sleeping,
some of them go round the field to keep
watch at a distance; others remain near,
each holding a stone in his foot, so that if
sleep should overcome them, this stone
would fall and make so much noise that
they would wake up again. And there are
others which sleep together round the king;
and this they do every night, changing in
turn so that their king may never find them
wanting.

16. i acciatirìi locidanò.

1227. 2. delagasti. 3. ave. 4. chosa . ipero. 5. alcunna ave. 6. allavora. 7. chibottere cholle vespe, 8. spurcísti. 9. acò-
pagnare e cortegiare loree. 10. essìa. 11. esse . màcìa. 14. benschelle.

1228. 1. lialta. 2. allorerò. 3. chella. 5. ettaganò. 6. sasso [per] ciascuna . cheesselò. 7. vinciessi . chaderèbe effs. 8. rebe . ridesterèbbono. 9. chensieme . are. 10. mano . fano. 11. acio chollorore nò uègli a màchare. 13. torma disga.
Falsehood.

The fox when it sees a flock of herons or magpies or birds of that kind, suddenly flings himself on the ground with his mouth open to look as if he were dead; and these birds want to peck at his tongue, and he bites off their heads.

Lies.

The mole has very small eyes and it always lives under ground; and it lives as long as it is in the dark but when it comes into the light it dies immediately, because it becomes known;—and so it is with lies.

Valour.

The lion is never afraid, but rather fights with a bold spirit and savage onslaught against a multitude of hunters, always seeking to injure the first that injures him.

Fear or Cowardice.

The hare is always frightened; and the leaves that fall from the trees in autumn always keep him in terror and generally put him to flight.

Magnanimity.

The falcon never preys but on large birds; and it will let itself die rather than feed on little ones, or eat stinking meat.

Vain Glory.

As regards this vice, we read that the peacock is more guilty of it than any other animal. For it is always contemplating the beauty of its tail, which it spreads in the form of a wheel, and by its cries attracts to itself the gaze of the creatures that surround it. And this is the last vice to be conquered.

13. In questo vitto si legge del pavone esser più che altro animale sottoposto, perché sempre contempla in quella bellezza la sua coda, quella allargàdo in forza di rota e col suo grido trae a se la uista di circustatì animali; e questo è l'ultimo vitto che si possa vincere.

14. Gli uccelli e sibilo...
CONSTANTIA.

2 Alla costantia s’assimiglia la fenice, la quale intéddeo per natura la sua rinnovatrice, è costante a sostenere le cuo- centi fiamme le quali la còsumo, e poi di novo rinascie.

INCOSTANTIA.

8 Il rondone si mette per la incostantia, il quale sempre sta in moto per nò sopporta’ alcun minimo disaggio.

TÉPERAZA.

12 Il camello è il piv lussurioso animale che sia, e andrebbe mille miglia direito a vna camella, e se vsasse cotivno co la madre o sofre, mai le tocca; tåto si sa be téperare.

INTÉPERANZA.

8 Il liocorno overo vicorno per la sua intéperanza e nò sapersi uiçiere per lo di- letto che a delle donzelle dimética la sua ferocità e salutichèzza; ponèdo da câto ogni sospetto va alla sedente donzella e se le adormèta in grëbo, e i cacciatori in tal modo lo pigliano.

VMILITÀ.

10 Dell’umiltà si uede somma sperìetà nello agnello, il quale si sottomette a ogni ani’male; e quådo per cibo son dati ai incarcerati leoni, a quelli si sottomettono come alla propria madre, in modo che spesse volte si è visto i lioni non li volere occidere.

SUPERBIA.

8 Il falcone per la sua alterigia e superbìa vole signioreggiare e soprafare tutti li altri vccieli che sono di rapina, e sempre desidera essere solo, e spesse volte si è veduto il falcone assaltare l’aquila, regina delli vccieli.

CONSTANCY.

Constancy may be symbolised by the phoenix which, knowing that by nature it must be resuscitated, has the constancy to endure the burning flames which consume it, and then it rises anew.

INCONSTANCY.

The swallow may serve for Inconstancy, for it is always in movement, since it cannot endure the smallest discomfort.

CONTINENCE.

The camel is the most lustful animal there is, and will follow the female for a thousand miles. But if you keep it constantly with its mother or sister it will leave them alone, so temperate is its nature.

HUMILITY.

We see the most striking example of humility in the lamb which will submit to any animal; and when they are given for food to imprisoned lions they are as gentle to them as to their own mother, so that very often it has been seen that the lions forbear to kill them.

PRIDE.

The falcon, by reason of its haughtiness and pride, is fain to lord it and rule over all the other birds of prey, and longs to be sole and supreme; and very often the falcon has been seen to assail the eagle, the Queen of birds.
ASTINENTIA.


GOLA.

15. Il vultore - è tanto sottoposto alla gola 16. che andrebbe mille miglia per māgiare 17. d'una carogna, e per questo seguita li eserciti.

H. 1 124]

CASTITÀ.

5. La tortora no fa mai fallo al suo có-pagenio, 16 se l'uno more, l'altro osserua perpetua castità e non si posa mai su ramo verde e no 5. beve mai acqua chiara.

LUSURIA.

7. Il pipistrello per la sua sfrenata lussu-ria non osserua alcuno universale modo di lussuria, anzi maschio có maschio, 10. femina có femina, siccome a caso si trovano insieme, vsano il lor coito.

MODERANZA.

13. L'ermellino per la sua moderātia no māgia 14. se non vnā sola volta il di, e prima si lascia piēgliare dai cacciatori che volere fugire 16. nella infangata tana, 17. per no máculare la sua giēčilezza.

H. 1 125]

AQUILA.

2. L'aquila, quādo è vechia, vola tāto 3. in alto, che abbrūcic le sue penne, e nātura cósente che si rinoui in giovetē, 3. cadendo nella poca acqua;

6. E se i suoi nati no possono tenere la uista 7. nel sole - ; no li pasce di nessuno uc-ccello, che no uole morire; non s'accostano

trueva. 11. non ara . . sede. 12. aspetti . . acqua. 13. sirisciar. 15. la volore ettanto sotto possto. 16. andrebe mile.

Abstinence.

The wild ass, when it goes to the well to drink, and finds the water troubled, is never so thirsty but that it will abstain from drinking, and wait till the water is clear again.

GLUTTONY.

The vulture is so addicted to gluttony that it will go a thousand miles to eat a carrion [carcase]; therefore is it that it follows armies.

CHASTITY.

The turtle dove is never false to its mate; and if one dies the other preserves perpetual chastity, and never again sits on a green bough, nor ever again drinks of clear water.

UNCCHASTITY.

The bat, owing to unbridled lust, observes no universal rule in pairing, but males with males and females with females pair promiscuously, as it may happen.

MODERATION.

The ermine out of moderation never eats but once in the day; it will rather let itself be taken by the hunters than take refuge in a dirty lair, in order not to stain its purity.

THE EAGLE.

The eagle when it is old flies so high that it scorchers its feathers, and Nature allowing that it should renew its youth, it falls into shallow water [5]. And if its young ones cannot bear to gaze on the sun [6] - ; it does not feed them with any bird, that does not wish to die. Animals which much fear

1235. 5. 6. The meaning is obscure.
al suo "nido gli animali che forte la tema nono, ma essa a lor no nece, sempre lascia rimanete della sua preda.

LUMERPA,—FAMA.

1) Questa nace in Asia Maggiore, e splè de si forte che toglie le sue obre, e morendo no per esso lume, e mai li cadono giù le penne, e la penn di che si spicca piv no luce.

H.1 13a]

Pelicano.

2) Questo porta gràde amore a sua nati, e troitìo quelli nel nido morti dal serpente, si pügje a riscòtro al core e, col suo piovente sangue bagnadoli, li tora in vita.

SALAMADRA.

8) Questo non à mebra passive, e no si cura d’altro cibo che di foco, e spesso in quello rinova la sua scorza.

11) La salamàdra nel foco rinova la sua scorza; per la virtù.

CAMELEO.

16) Questo viue d’aria, e è quella sta subiutto a tutti li uccelli, e per stare piv salvo vela sopra le nnvole; e truova aria tòto sottile, che no può sostenere vucciello che lo seguiti.

22) A questa altezza no va, se no a chi da cieli è dato, cioè dove vela il cameleon.

H.1 13b]

ALEPO PESCIE.

2) Alepo no viue fori dell’acqua.

STRUZZO.

4) Questo cóuerte il ferro in suo nutrimo; cova l’uova colla vista; per l’arme de’ capitanii.

1236. 1237.

THE PELICAN.

This bird has a great love for its young; and when it finds them in its nest dead from a serpent’s bite, it pierces itself to the heart, and with its blood it bathes them till they return to life.

THE SALAMANDER.

This has no digestive organs, and gets no food but from the fire, in which it constantly renews its scaly skin.

THE CAMELEON.

This lives on air, and there it is the prey of all the birds; so in order to be safer it flies above the clouds and finds an air so rarefied that it cannot support the bird that follows it.

At that height nothing can go unless it has a gift from Heaven, and that is where the chameleon flies.

H.1 13a]

THE ALEPO, A FISH.

The fish alepo does not live out of water.

THE OSTRICH.

This bird converts iron into nourishment, and hatches its eggs by its gaze;—Armies under commanders.


1237: 1. alep[0] poss. 14. suo "nutrimeto". 5. cova lava. Lines 6 and 7 are written on the margin near the title-line.
THE LIFE AND HABITS OF ANIMALS.

CIGNO.

Gignio è candido senza alcuna macchia, e dolcemète canta nel more, il qual câto termina la uita.

1238.

CICOGNA.

Questa, beuèdo la salsa acqua, caccia da se il male; se truova la còspagna in fallo, l'abandona; e quâdo è vechia, i suoi figlioli la covano e païscono, inçché more.

CICALA.

Questa col suo canto fa tacere il cucco, more nell'olio, e resucita nello aceto, câta per li ardëti caldi.

PIPISTRELLO.

Questo dov'è pìu luce pîv si fa orbo, e come pîv guarda il sole più s'acciecca; pel utio che nô può stare dov'è la virtù.

PERNICE.

Questa si trasmuta di femina i maschio, e dimética il primo sesso, e fura per iudia l'oua al'altre, e le coua, ma i nati seguîtano la uera madre.

RÔDINE.

Questa colla celandonia lumina i sua ciecchi nati.

1239.

OSTRIGA.—PEL TRADIMÊTO.

Questa, quãdo la lua è piena, s'apre tutta, e quãdo il grâcio la vede, dëtro le gietta qualche sasso o festuca, e questa nô si può riserrare, oîe è cibo d'esso grâchio; così fa, chi apre la bocca a dire il suo segreto, chè si fa preda dello indiscreto auditori.

THE SWAN.

The swan is white without any spot, and it sings sweetly as it dies, its life ending with that song.

THE STORK.

This bird, by drinking saltwater purges itself of distempers. If the male finds his mate unfaithful, he abandons her; and when it grows old its young ones brood over it, and feed it till it dies.

THE GRASSHOPPER.

This silences the cuckoo with its song. It dies in oil and revives in vinegar. It sings in the greatest heats.

THE BAT.

The more light there is the blinder this creature becomes; as those who gaze most at the sun become most dazzled.—For Vice, that cannot remain where Virtue appears.

THE PARTRIDGE.

This bird changes from the female into the male and forgets its former sex; and out of envy it steals the eggs from others and hatches them, but the young ones follow the true mother.

THE SWALLOW.

This bird gives sight to its blind young ones by means of celandine.

THE OYSTER.—FOR TREACHERY.

This creature, when the moon is full opens itself wide, and when the crab looks in he throws in a piece of rock or seaweed and the oyster cannot close again, whereby it serves for food to that crab. This is what happens to him who opens his mouth to tell his secret. He becomes the prey of the treacherous hearer.

8. ciugno. 10. cântig. 11. caca diasse. 12. ecquàdo. 15. issua. 17. scano.

1238. 1. cichala. 3. cucco. 5. palipistrello. 8. sacieca. 9. po. 14. trasmuta . massicio. 15. iprimo. 16. elle cova. 19. cel-laccedidonia. 20. cieci.

1239. 1. hosstriga. 2. quastra. 3. ecquàdo. 4. qualechessesso ostituca ecuesta. 5. po riserrare. 6. faciapipla bocha. 9. sigreto.

7. chessi . 6. widitore. 8. bavaliseco. 9. effugito detutti . la do. 10. mexo. 11. essi. 12. † rua per la virtù †.
**BASILISCO.—CRUELTY.**

1240. All snakes lie from this creature; but the weasel attacks it by means of rue and kills it.

**THE DRAGON.**

1241. This creature entangles itself in the legs of the elephant which falls upon it, and so both die, and in its death it is avenged.

**THE VIPER.**

She, in pairing opens her mouth and at last clenches her teeth and kills her husband. Then the young ones, growing within her body rend her open and kill their mother.

**THE SCORPION.**

Saliva, spit out when fasting will kill a scorpion. This may be likened to abstinence from greediness, which removes and heals the ills which result from that gluttony, and opens the path of virtue.

**COCODRILLO. HYPOCRISY.**

1241. This animal catches a man and straightforwardly kills him; after he is dead, it weeps for him with a lamentable voice and many tears. Then, having done lamenting, it cruelly devours him. It is thus with the hypocrite, who, for the smallest matter, has his face bathed with tears, but shows the heart of a tiger and rejoices in his heart at the woes of others, while wearing a pitiful face.

**THE TOAD.**

The toad flies from the light of the sun, and if it is held there by force it puffets itself out to much as to hide its head below and shield itself from the rays. Thus does the foe of clear and radiant virtue, who can only be constrainedly brought to face it with puffed up courage.
THE CATERPILLAR.—FOR VIRTUE IN GENERAL.

The caterpillar, which by means of assiduous care is able to weave round itself a new dwelling place with marvellous artifice and fine workmanship, comes out of it afterwards with painted and lovely wings, with which it rises towards Heaven.

THE SPIDER.

The spider brings forth out of herself the delicate and ingenious web, which makes her a return by the prey it takes.

THE LION.

This animal, with his thundering roar, rouses his young the third day after they are born, teaching them the use of all their dormant senses and all the wild things which are in the wood flee away.

This may be compared to the children of Virtue who are roused by the sound of praise and grow up in honourable studies, by which they are more and more elevated; while all that is base flies at the sound, shunning those who are virtuous.

Again, the lion covers over its foot tracks, so that the way it has gone may not be known to its enemies. Thus it beseems a captain to conceal the secrets of his mind so that the enemy may not know his purpose.

THE TARANTULA.

The bite of the tarantula fixes a man's mind on one idea; that is on the thing he was thinking of when he was bitten.

THE SCREECH-OWL AND THE OWL.

These punish those who are scoffing at them by pecking out their eyes; for nature has so ordered it, that they may thus be fed.
HUMOROUS WRITINGS.

1245.

**LEOFANTE.**

Il grâde elefante à per natura quel che raro negli omini si truova, cioè *probità, prudètìa, equità e osservàïtà e religione, inperòchê, quâdo la luna si rinovalo, questi vanno ai f'vni e quivi purgadosì solennemété *si lauano, e così salutatò il pianeta *ritornano alle selue; E quâdo 10 sono ammalati, stando supìni, gittâ'no l'erbe verso il cielo, quasi com'esse *sacriçare volessino; *sotterrano li dèti quâdo per vecchiezza gli cadono; *de' 11 sua due dèti l'uno adopera a causare 15 le radici per ci-barsi; all'altro còserà 16 la pûta per có-battere; quâdo sono 17 superati da caccia-tori, e chê la stâchezza 18 gli uïcie per cotali dèti l'elefante, quelle traitesi, con esse si ricomprano.

1246.

Sono di leni menti e conoscono i peri-colì; *se se esso truova l'omo solo e smarìto, 3piacevolmête lo rimette nella perduta *strada, se truova le pedate dell'omo 5prima che veda l'omo; 6* esso teme tradimeto, òde si ferma 7 e soffia, mostraâlodo ali altri elefanti, e 8 fanno schiera e vanno assentita-mête.

*Questi vanno senpre a schiere, e l'ì più 10vechio va inàizi, e l'ì secódo d'età resta 11l'ultimo, e così chiudono la schiera; 12te-mono vergoscìa, non vano il co*što se nò di notte di nascosto, e nò tor*4nano dopo il coito alli armêti, se prima 15nò si lauano nel fiume; nò còbattono 16le femine, come gli altri animalî; 17 ed è tâto elemête, che mal uolùtìeri per na*19tura nò noce ai no ti potenti di se, e scò19tradosì nella sua via e greggi delle pecore

1247.

colla sua mano le pone da parte 3per non le pestare, coi piedi, nè mai noce 3se nò gli sono provocati; quâdo son ca'duti nella fossa, gli altri có rami, 5tèrra e sassi rie-piono la fossa, 6in modo che alzano il fondo, it puts them aside with its trunk, so as not to trample them under foot; and it never hurts any thing unless when provoked. When one has fallen into a pit the others fill up the pit with branches, earth and stones, thus

**THE ELEPHANT.**

The huge elephant has by nature what is rarely found in man; that is Honesty, Prudence, Justice, and the Observance of Religion; inasmuch as when the moon is new, these beasts go down to the rivers, and there, solemnly cleansing themselves, they bathe, and so, having saluted the planet, return to the woods. And when they are ill, being laid down, they fling up plants towards Heaven as though they would offer sacrifice.—They bury their tusks when they fall out from old age.—Of these two tusks they use one to dig up roots for food; but they save the point of the other for fighting with; when they are taken by hunters and when worn out by fatigue, they dig up these buried tusks and ransom themselves.

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THE LIFE AND HABITS OF ANIMALS.

1248. When they cross rivers they send their young ones up against the stream of the water; thus, being set towards the fall, they break the united current of the water so that the current does not carry them away. The dragon flings itself under the elephant's body, and with its tail it ties its legs; with its wings and with its arms it also clings round its ribs and cuts its throat with its teeth, and the elephant falls upon it and the dragon is burst. Thus, in its death it is revenged on its foe.

1249. The serpent would be drowned, therefore they combine.

THE DRAGON.

When they cross rivers they send their young ones up against the stream of the water; thus, being set towards the fall, they break the united current of the water so that the current does not carry them away. The dragon flings itself under the elephant's body, and with its tail it ties its legs; with its wings and with its arms it also clings round its ribs and cuts its throat with its teeth, and the elephant falls upon it and the dragon is burst. Thus, in its death it is revenged on its foe.

THE SERPENT.

The serpent is a very large animal. When it sees a bird in the air it draws in its breath so strongly that it draws the birds into its mouth too. Marcus Regulus, the consul of the Roman army was attacked, with his army, by such an animal and almost defeated. And this animal, being killed by a catapult, measured 123 feet, that is 64½ braccia and its head was high above all the trees in a wood.
Boile.

12 Questa è grà biscia, la quale có se medesima si aggruppa alle gane del beracca in módo nó si mova, poi la tetta in modo che quasi la disseca; di questa specie a tépo di Claudio operatorre nel môte Vaticano ne fu morta.

\[1250. \ 1251.\]

BONASO NOCE COLLA FUGA.

12 Questo bestìa in Peonia; à collo có crini simile al cauallo, in tutte l'altre parti è simile al toro, salvo che le sue corna sono in modo piegate indietro, che nó può cozzare, e per questo non à altro scampo che la fuga, nella quale getta sterco per spatio di 400 braccia del suo corso, il quale, dove tocca, abbruzza come foco.

LEONI, PARDI, PÁTERE, TIGRI.

12 Questi tégono l'ugie nella guaina, e mai le sfoderanno, se non è adosso alla preda o ne o mico.

H. 216]

vna che avea vno putto intero in corpo il quale avea traghitiottito

MACLI. 7 Pel sonno è giùto.

4 Questa bestià in Scàdìnavia isola; à forma di grà cavallo, se nó che la grà lughezza dello collo e dellori lo variamano; pascie l'erba allo indietro, perchè à si lìgo il labro di sopra che pascieò inàrozi coprirebbe l'erba; à le gâbe d'ù pezzo; per questo, quàdo vuol dormire s'apppog gia a vno albero, e ì cacciatori, ativedéò il loco vsato a dormire, segà quasi tutta la piàta, e quàdo questo poi vi s'apppog gia nel dormire, per lo sonno cade, e ì cacciatori cosi lo piglano, e ogni altro modi di pi' girlo è vano, perchè è d'incredibile velocità nel correre.

H. 226]

THE BISON WHICH DOES INJURY IN ITS FLIGHT.

This beast is a native of Peonia and has a neck with a mane like a horse. In all its other parts it is like a bull, excepting that its horns are in a way bent inwards so that it cannot butt; hence it has no safety but in flight, in which it flings out its excrement to a distance of 400 braccia in its course, and this burns like fire wherever it touches.

LIONS, PARDS, PANTHERS, TIGERS.

These keep their claws in the sheath, and never put them out unless they are on the back of their prey or their enemy.
THE LIFE AND HABITS OF ANIMALS.

Leonessa.

16 Quando la leonessa difende i figlioli dalle ma de' cacciatori, per no si spaute' di stare dalli spiedi, abbassa li occhi a terra accioche, per la sua fuga li figli no sieno prigionieri.

H. 22 6]

Leone.

2 Questo si terribile animale nièete teme che lo strepido delle vuote carrette e simile il catio de' galli; e teme a'ssai nel uederli e con pauroso aspetto riguarda la sua crest; e forte invilisce, quado a coper to il uolto.

PATERE IN AFRICA.

10 Questo a forma di leonessa, ma è puv alta di gâte, e puv sottile, e làg; e la tua biacha e punteggiata di ma chè nere a modo di rosette, e di que' sta si dilettano tutti li animali di vedere, e sempre le starebbero dintorno, se no fusse la terribilità del suo viso.

H. 21 10]

ondè essa, questo conosciédo, asco de il uiso, e li animali circustàti s'assicurano e fannosi vicini per meglio potere fruire tata bellezza, o de questa subito piglia il puv uici no e subito lo diuora.

CAMELLI.

1 Quegli Battiani ànno 2 gobbi, 9 gli Arabi uno solo; sono veloci in battagla e vitilissimi a portare le some; questo animale à regoli e misura oseràtissima, perche no si move sé a puv carico che l'usato, e se fa puv uaggero fa il simile, subito si ferma, ò de li bisogna a mercatàti allog giare.

H. 21 6]

Tigro.

2 Questa nascie in Ircania, la quale è simile alquàta alla pàtera per le diuere machie della sua pelle, ed è animale di

1252.

THE LIONESS.

When the lioness defends her young from the hand of the hunter, in order not to be frightened by the spears she keeps her eyes on the ground, to the end that she may not by her flight leave her young ones prisoners.

1253.

THE LION.

This animal, which is so terrible, fears nothing more than the noise of empty carts, and likewise the crowing of cocks. And it is much terrified at the sight of one, and looks at its comb with a frightened aspect, and is strangely alarmed when its face is covered.

1254.

THE TIGER.

This beast is a native of Hyrcania, and it is something like the panther from the various spots on its skin. It is an animal

1252. 1254.]
spauòtevole velocità; il caccia^torre quâdo trouva i sua figli, 7li rapisçie subito, ponédo specchi nel 8loco donde li leua, e subito sopra 9veloce cauallo si fugie; la pantera tor^mândo trouva li specchi fermi in terra, ne 11quali vedédsoci, li pare vedere li sua fi^glioli, e raspâdo colle zâpe scuopre 13l'in-ganno, òde medîate l'odore de'figli 14se-guita il cacciatore, e quâdo esso caccia^torre vede la tigra, lascia vno de'figlioli, 16e questa lo piglia, e portalo al nido; 17subito rigivgne esso cacciatore, e fa

H. 24[u] il simile insino a tâto ch'esso mòta 2in barca.

Catoplea.

4Questa nascie : in Ethiopia 5vicino al fonte Nigricapò; è animale nó troppo .grande, è 6pigra 7in tutte le mébra, e al capo di tâta grâ-dezza, che malagievomète 8lo por-ta, ìn modo che 8senpre .sta chinato in-verso 9la terra, altri-menti sárebbe di soñà.peste .alli omini, 10perché qualunque è veduta da sua .ochi 11subito .more.

Basilisco.

13Questo nascie .nella provincia 12Gire-naica 12e nó è maggiori che 12.dita e à 12.capo 15vna machia bianca a similitudine di diadema; 16col fischo .caccia ogni ser-pête. a simili-tudìne di serpe, ma nó si move có torture, anzi 18manritto dal mezzo innâzi.; diciesi che vno di questi, essendo morto con vn aste da vno che 2era a cavallo, che 'l suo ve-neno discorrer 1 super l'aste, e nó che l'omo ma il cavallo mori: 4usta le piâte e nó solamète quelle 'che tocca, ma quelle doue .sofia .; secca l'er^be, spezza .i sassi.

H. 24[u] di questi, essendo morto con vn aste da vno che era a cavallo, che 'l suo veneno discorrer 1 super l'aste, e nó che l'omo ma il cavallo morì: 'gusta le piête e nó solamête quelle 'che tocca, ma quelle 'doue 'soffia ; secca l'erbe, spezza 'i sassi.

Catoblepas.

It is found in Ethiopia near to the source Nigricapò. It is not a very large animal, is sluggish in all its parts, and its head is so large that it carries it with difficulty, in such wise that it always droops towards the ground; otherwise it would be a great pest to man, for any one on whom it fixes its eyes dies immediately.

The Basilisk.

This is found in the province of Cyrenaica and is not more than 12 fingers long. It has on its head a white spot after the fashion of a diadem. It scares all serpents with its whistling. It resembles a snake, but does not move by wriggling but from the centre forwards to the right. It is said that one of these, being killed with a spear by one who was on horse-back, and its venom flowing on the spear, not only the man but the horse also died. It spoils the wheat and not only that which it touches, but where it breathes the grass dries and the stones are split.

1255. Leonardo undoubtedly derived these remarks as to the Catoblepas from Pliny, Hist. Nat. VIII. 21 (al. 32): Apud Herpetios Aethiopas fons et Niger (different readings), ut plerique existimaverunt, Nil caput — — — Juxta hunc fera appellatur catoblepas, medica alioquin, tertieque membris iners, caput tamen prope grave aeste ferens; alias internazio humani generis, omnibus qui oculos ejus videre, confestim morientibus. Aelian, Hist. An. gives a far more minute description of the creature (ţo catoblepas), but he says that it poisons beasts not by its gaze, but by its venomous breath. Athenaeus 221 B, mentions both. If Leonardo had known of these two passages, he would scarcely have omitted the poisonous breath. (H. Möller-Strübing.)
THE LIFE AND HABITS OF ANIMALS.

DONNOLA OVER BELLULA.

This beast finding the lair of the basilisk kills it with the smell of its urine, and this smell, indeed, often kills the weasel itself.

THE AMPHISBOENA.

This has two heads, one in its proper place the other at the tail; as if one place were not enough from which to fling its venom.

THE ICNEUMON.

This animal is the mortal enemy of the asp. It is a native of Egypt and when it sees an asp near its place, it runs at once to the bed or mud of the Nile and with this makes itself muddy all over, then it dries
HUMOROUS WRITINGS.

[1259. 1260.]

sole, di non vo di fango s'inbratta; e così se- 
guittando l'ai dop po l'altro si fa tre o 4 veste 
i similitudine 9 di corazz?, e dipoi assalta 
lassipio, e bò còs testa có quello in modo 
che, tolto il tépop, 11 se li caccia in gola e 
Crocodilo.

Questo nasce nel Nilo, a 4 piedi, vii4ve 
H. 264]
terra e in acqua, né altro terrestre 15ani- 
male si trova senza lingua che questo; 
13. lassipio. 10. tasta... imodo chetolto. 11. caccia... ella riesga. 12. massee... piedi nvc vi. 14. ce in terra e in acq"a" 
e solo morde movèdo la mascella di 
[1259. 1260.]
16 e sopra; 17 cresce insino in 40 pedi, è un- 
gliato, 18 armato di corane, atto a ogni colpo; 
e il 19 stà la, e vedo la notte in acqua; 
estesso della colà, ella 2. si cibato di pesci, s'adormèta sulla 
rio del 21 Nilo colla bocca aperta e l'uc- 
ciello detto 
THE Crocodile.

This is found in the Nile, it has four feet 
trochilus, a very small bird, runs at once 
to its mouth and hops among its teeth, 
and goes pecking out the remains of the 
food, and so inciting it with voluptuous 
delight tempts it to open the whole of its 
mouth, and so it sleeps. This being observed 
by the ichneumon it flings itself into its 
mouth and perforates its stomach and 
bowels, and finally kills it.

Delfini.

La natura à dato tal cognizione alli- 
11La natura à dato tal cognizione alli- 
animali; che, oltre allo conoscere la lor co- 
13modità, conoscono la incomodità del ni- 
14mico... donde intènde il delfino quanto va- 
glia... il taglio delle sue penne, posteli sulla 
16sulla schiena, e quanto sia tenera la pàcia 17 del 
cocodrillo... e nel lor còbbattere se li 
caccia sotto e tagliati la pàcia, e così 
19 l'uccide.

Il cocodrillo è terribile a chi fuggie, e 
vilissimo a chi lo caccia.

1260.

THE Hippopotamus.

This beast when it feels itself over-full 
Ipopotamo.

2 Questo- quando si sente aggravato- va 
ciercando le spine, o dove sià i riman- 
2. trocchio...!!! 2. bocca... ecosi stuzicadolo. 3. lomita... 
21 accolo.

bocca. 7. daleleumone... si fina in bocca. 8. ele. 
13. cognioscancio. 15. pene. 16. sula sci... pàcia. 17. nello... 18. ettagliai. 20. deste... aci faggie e vili 
15. pene. 16. sula sci... pàcia. 17. nello... 18. ettagliai. 20. esteribile aci faggie e vili 
21. accolo.

bocca... ecosi stuzicadolo. 3. lomita... 

This beast when it feels itself over-full 
goes about seeking thorns, or where there 
may be the remains of canes that have been 
H. 264] 

1260. 1. hippopotamo. 2. agravato. 3. ciercando... sia. 4. canedi ellì. 5. chamato... chelli... cola lita. 6. rialdolà. 7. liglia. 8. ciglare
ve'na che la taglia, e causato il sangue, che li 6bisognia, colla litta s'infianga, e risalta alla 7piaggia; a forma quasi come cavallo; l'ughia, 8fessa, coda torta, e denti di cighiale; collo cò 9crini la pelle; nò si può passare., se nò si barga; pasciesi di piâte ne'capì, entralì 11allo dirieto, acciocché pare ne sia uscito.

Ibis.

*Questo à similitudine colla cicognia, e quant'è si sente ammalato, èpie il gozzo d'acqua, 12e col becco si fa vn clistero.

Cierul.

*Questo quando si sente morso dal ragno 13detto falangio-màgia de' gràchi, e si libera 19di tale veneno.

11. 137th

Lucerte.

*Questa quàdo còbatte colle serpi 3man-gia la cicierbita; e sò libere.

Rondine.

*Questa rende il uedere alli orbiti 6fi-glioli col sugo della celidonia.

Bellula.

*Questa quando caccia ai ratti, màgia 9prima della ruta.

Cinghiale.

*Questo medica i sua mali mangiàdo 11della edera.

Serpe.

*Questa quàd si uol renovare, gitta il 15vecchio scoglio, comìciàdosi dalla testa; 19mvtsi in vn di e vna notte.

Partera.

*Questa, poichè le sono uscite l'interiora, 19ancora combatte coi cani e cacciatori.

THE LIZARD.

This, when fighting with serpents eats the sow-thistle and is free.

THE SWALLOW.

This [bird] gives sight to its blind young ones, with the juice of the celandine.

THE WEASEL.

This, when chasing rats first eats of rue.

THE WILD BOAR.

This beast cures its sickness by eating of ivy.

THE SNAKE.

This creature when it wants to renew itself casts its old skin, beginning with the head, and changing in one day and one night.

THE PANTHER.

This beast after its bowels have fallen out will still fight with the dogs and hunters.
HUMOROUS WRITINGS.

1262.

THE CHAMELEON.

This creature always takes the colour of the thing on which it is resting, whence it is often devoured together with the leaves on which the elephant feeds.

THE RAVEN.

When it has killed the Chameleon it takes laurel as a purge.

1263.

Moderation checks all the vices.

The ermine will die rather than besmirch itself.

OF FORESIGHT.

The cock does not crow till it has thrice flapped its wings; the parrot in moving among boughs never puts its feet excepting where it has first put its beak. Vows are not made till Hope is dead.

Motion tends towards the centre of gravity.

1264.

MAGNANIMITY.

The falcon never seizes any but large birds and will sooner die than eat [tainted] meat of bad savour.

H.1 17.6]

CAMELEONTE.

2 Questo piglia senpre il colore della cosa 3 dove si posa; onde insieme colle frödi 4 dove si posano, spesso dali elefanti sô diuorati.

CORBO.

6 Questo quando à ucciso el cameleonte 7 si purga coll’alloro.

DELL’ANTIUEDERE.

5 Il gallo nó câta, se prima 3 volte nó batte 6 l’alie; il papagalo nel mutarsi pe’rami 7 nó mette i piè, doue non à prima 8 messo il becco; 9 il uoto nascie quado la speraña more.

10 Il moto seguita il ciëtro del peso.

1262. 6. questo . cameleon. 7. pugra choll alloro.

1263. 2. cheebra. 8. becho. 9. nasscie. 10. mot seguita.

MAGNANIMITA.

Il falcone nó piiglia se nó vccelli grossi, e prima 3 more che màgiare carne di nó bona odore.

1264. 2. vcelli. 3. chare.
II.

FABLES.

1265.

FAVOLA.

5 Sendo l’ostrica insieme colli altri peschi in casa del pescatore scaricata vicino al mare, priega il ratto, 6 che al mare la còduca; il ratto fatto disegno di mangiarla la fa aprire, 7 e mordèdola questa li serra la testa 8 e si lo ferma; viene la gatta e l’uccide.

A FABLE.

An oyster being turned out together with other fish in the house of a fisherman near the sea, he entreated a rat to take him to the sea. The rat purposing to eat him bid him open; but as he bit him the oyster squeezed his head and closed; and the cat came and killed him.

1266.

FAVOLA.

2 I tordi si rallegraron forte, vedédo che l’omo prese la ciuettá e le tolse la libertà, quella legando con forti legami ai sua piedi; la 4qual ciuettá fu poi mediante il uischio causa nó di far perdere 5la libertà ai tordi, ma la loro propria vita.; detta per quelle 6terre che si rallegrá di vedere perdere la libertá ai loro maggio7ri, mediante i quali poi perdono il soccorso, e rimágon lega8ti in potètia del loro nemico, lasciándo la libertá e spesse volte la uita.

A FABLE.

The thrushes rejoiced greatly at seeing a man take the owl and deprive her of liberty, tying her feet with strong bonds. But this owl was afterwards by means of bird-lime the cause of the thrushes losing not only their liberty, but their life. This is said for those countries which rejoice in seeing their governors lose their liberty, when by that means they themselves lose all succour, and remain in bondage in the power of their enemies, losing their liberty and often their life.

1265. 2. ostriga... colli al. 5. ce al mare... fate. 7. sera. 8. esilio... ellucide.
1266. 2. rallegraron... chellomo. 3. elle... choharti. 4. viscio. chassu... far perde. 5. malla. 6. chessi ralegrá... magai. 7. perdano il soccorso. 8. nemicho... espesse.
C. A. 1176; 3614]

FAVOLA.

1267.

A FABLE.

Dormédo: il cane · sopra la pelle · d’un castrone, vna delle sua pulci · sentédo · l’odore · della vnta · lana ·, giudicò quello dovesso essere · loco di migliore · vita e piv sicura da denti e unghie del cane, che paschier6si del cane ·; e senza altri pensieri abbandonò il cane · e l entrata 6infra la folta lana · cominciò ciò somma fatica a volere 7trapassare alle radici de’ peli ·; la quale inpresà dopo molto 8sudore trovò esser uana ·, perché tali peli erano tanto spessi che quasi si toccavano, e nò u’era spazio dove la pulce potesse saggirre tal pelle ·; onde dopo lugo travaglio e fatica cominciò a vole14re ritornare al suo cane ·, il quale essendo già partito, fu 12costretta dopo lugo pétiméto e amari piáti a morirsi di fame.

C. A. 66a; 2004]

FAVOLA.

1268.

A FABLE.

Non si còntendo · il uano · e vagabúdo parpaglione · di potere · comodevolmente volare · per l’aria · vinto · dalla dilettevole · fiamma · della cádela · delibéro · volare in quella ·; e l suo · giòcodo · moviméto · fu cagione di subita · tristitia ·, inperché in detto 7lume si consumarono · le sottili ali · che l parpaglione · misero caduto · tutto · bruciato a pié del 6candeliere ·; dopo · molto · pianto e pétim6to · si rasciugò · le lagrime dai bagniotti · alla 11· e levato · il uiso in alto · disse ·: o falsa luce ·, 12quáti · come me debi tu · avere · ne passa13· ti tempi · avere miser· rabilméte · inganati e sei 11· pvere volere · vedere · la luce ·, nò doveu1· · io cono15sciere il sole · dal falso · lume dello spuroc sevo?

1267.

A FABLE.

A dog, lying asleep on the fur of a sheep, one of his fleas, perceiving the odour of the greasy wool, judged that this must be a land of better living, and also more secure from the teeth and nails of the dog than where he fed on the dog; and without farther reflection he left the dog and went into the thick wool. There he began with great labour to try to pass among the roots of the hairs; but after much sweating had to give up the task as vain, because these hairs were so close that they almost touched each other, and there was no space where fleas could taste the skin. Hence, after much labour and fatigue, he began to wish to return to his dog, who however had already departed; so he was constrained after long repentance and bitter tears, to die of hunger.

1268.

A FABLE.

The vain and wandering butterfly, not content with being able to fly at its ease through the air, overcome by the tempting flame of the candle, decided to fly into it; but its sportive impulse was the cause of a sudden fall, for its delicate wings were burnt in the flame. And the hapless butterfly falling having dropped, all scorched, at the foot of the candlestick, after much lamento·tion and repentance, dried the tears from its swimming eyes, and raising its face exclaimed: O false light! how many must thou have miserably deceived in the past, like me; or if I must indeed see light so near, ought I not to have known the sun from the false glare of dirty tallow?

1367. 2. castrone. 4. doveisi · locho · sicura · da denti e vangà della cane · che pascierè. 5. essanza · abbandono. 6. in·fralla · seme faiche. 7. multa [faj]. 9. to chauano · potesi sagiare. 10. faiche cimincio. 12. pétiméto amari.

questo vecelletto, lo cominciò a baciarci; e per lo sviscerato amore tanto lo bacìò, e rivolse, e stringe, ch'ella gli tolse la vita; è detta per quelli che per nò gastigare i figlioli capita no male.

C. A. 66; 2004

*FAVOLA.*

2. Stando il topo assediato in una piccola sua abitazione dalla donna, la quale lo costrinse alla disfazione, e per uno, il piccolo spicchio riguardò il suo grà pericolo; intrattanto venne la gatta, e subito prese essa donna, e immediatamente ebbe diuorata; allora il ratto, fatto sacrificio a Giove d'alquàte sua nocciola, ringraziò sommamente la sua deità, e uscì fori dalla sua buca a possedere la già persa libertà, della quale subito in sieme colla vita fu dalle feroci unghie de' denti della gatta privato.

C. A. 66; 2014

*FAVOLA.*

1. La fornica trovato vno grano di miglio, il grano sètendosi preso da quella gridò: se mi fai taito piaceri di lasciarmi fuire il mio desiderio del nascierno, io ti redenrò cieto me medesimi; e così fu fatto.

2. Trovò il ragnio disposto a uve, il quale per la sua dolcezza era molto visitato da avi e diversi质量的 di mosche, lì parve avere trovato loco molto comodo al suo inganno; e cala tosi giù per lo suo sottile filo, e' ètrato nella notte va abitàzione. Il ogni giorno facièdosi atti spicchi, fatti dalli interualli de' grani dell'uue, assaltava come ladrone i miseri animali che da lui non si guardauano; e passati alquanti giorni il uendemiatore colse essa uva e, messa coll'altrì insieme, con quelle fu pigiata; e così l'una fu laccio e inganno dello inganatore ragnio, come delle ingannate mosche.

22. Addormentatosi l'asino sopra il ghiaccio d'à profondo lago, il suo calore dissolve esso ghiaccio, e l'asino sott'acqua a mal suo danno si destò e subito annegò.
Il falcone, nò potendo sopportare có patiètia 3½ il nascòdere che fa l'anitra, fu-gièdo se le dinàzì 38 e entràdo sotto acqua ;volle, come quelle, sott'aquà 39 seguitare, e bagnatosi le penne rimase in essa 3ò acqua; e l'anitra, leuantasi in aria, scherne 3½ il fal-cone che annegava.

3½ Il raggio, volendo pigliare la mosca có sue 3½ false reti, fu sopra quelle dal calabrone 3½ crudelmente morto.

30 Volendo l'aquila scernire il gufo, rimase 3½ coll'alie inpaniata, e fu dall'omo presa e morta.

Trovandosi l'acqua nel superbo mare, suo elemèto, le vene voglia di mòtare sopra l'aria, e cófartata dal foco elemèto, releutassì i sottile vapore, 4 quasi parea della sottigliezza dell'aria; mòtata in alto givnse ifra l'aria piv sottile e fredda, dove fu abàdonna 3½ dal foco, e i piccoli granicoli, 8 sendo ristretti, già s'uniscono e fasònosi pesanti, ove cadèdo la superbia 3½ si cóuerte in fuga, e cade dal cielo, 10 ode poi fu bevuta dalla secca terra, 12 dove lùgo tèpo incarcierata 13 fece penitètia del suo peccato.

The water finding that its element was the lordly ocean, was seized with a desire to rise above the air, and being encouraged by the element of fire and rising as a very subtle vapour, it seemed as though it were really as thin as air. But having risen very high, it reached the air that was still more rare and cold, where the fire forsok it, and the minute particles, being brought together, united and became heavy; whence its haughti-ness deserting it, it betok itself to flight and it fell from the sky, and was drunk up by the dry earth, where, being imprisoned for a long time, it did penance for its sin.

A falcon, unable to endure with patience the disappearance of a duck, which, flying before him had plunged under water, wished to follow it under water, and having soaked his feathers had to remain in the water while the duck rising to the air mocked at the falcon as he drowned.

The spider wishing to take flies in her treacherous net, was cruelly killed in it by the hornet.

An eagle wanting to mock at the owl was caught by the wings in bird-lime and was taken and killed by a man.

FABLE.

A FABLE.

The razor having one day come forth from the handle which serves as its sheath and having placed himself in the sun, saw the sun reflected in his body, which filled him with great pride. And turning it over in his thoughts he began to say to himself: "And shall I return again to that shop from which I have just come? Certainly not; such splendid beauty shall not, please God, be turned to such base uses. What folly it would be that could lead me to shave the lathered beards of rustic peas-ants and perform such menial service! Is this body destined for such work? Certainly not. I will hide myself in some retired spot and
FABLES.

no; Io mi voglio nascondere in qualche oculo loco, e il cò trágullo riposo passare mia vita ; E così nascosto per alquíati mesi, 16 vn giorno ritornò all'aria e uscito fori della sua guaina, vide se essere fatto a si-
militudine d'una rugginèta sega, e la sua superfìtite non quì speciﬁare piv lo splendète sole; 12 cò vano pétimeto indarno piása lo inimparabile danno, con seco dicédio: o quanto 13 meglio era esercitare col barbierè il mio perduto taglio di tòta sottilità; dov'è la lustrante 14 superfìtite? cìerto la fastitiosa e brutta ruggine l'à consumata!

15 Questo medesimo accade nell'ingegni che in scábio dello esercitio si danno al l'otio; 16 I quali trà superfìtine del sopra detto rasoojì perdono la tagliente sua sotti-
tità, e la rugine della ignorantia guasta la sua forma.

FAUOLA.

19 Vna pietra novamète per l'acque scoperta di bella gràdezza si staua sopra vn cierto loco rilevato, 26 dove terminava un dilettèvole boschetto sopra nva sassosà strada in co21 paginia d'erbe, di uari fiori di diversi colori ornate, e vedea 22 la grà somma delle pietre che nella a se sotto posta strada collocate erano; le unne desiderio di là giv lasciarsi ca24dere, dicédio: cò seco: che fo io qui: cò queste erbe? io voglio cò quelle mie sorellè in copág-

ni abitarè; e giv lasciatiso cadere infra 25 le desiderate cópagnie finì su volubile corso; e stata alquàto co27micò a essere dalle rote de' carri', dai piede' de' ferrati cavalli, e de 28 viandati a essere in continvo travagliò; chi la volta, quello la pesta29va; alcuna volta se leuava alcuno pezzo, quàdo stava coperta da fà30go o stcro di qualche animale, e in vano riguardava il loco dò-
de partita s'era in nel loco della solletaria e trágulla pace.

27 Così accade a quelli che dalla vita solletaria cotenplativa voglio24 no venire abi-
tare nelle città infra i popoli pieni d'infiniti mali.

there pass my life in tranquil repose." And having thus remained hidden for some months, one day he came out into the air, and issuing from his sheath, saw himself turned to the similitude of a rusty saw while his surface no longer reflected the resplendent sun. With useless repentance he vainly deplored the irreparable mischief saying to himself: "Oh! how far better was it to employ at the barbers my lost edge of such exquisite keen-

ness! Where is that lustrous surface? It has been consumed by this vexatious and unsightly rust."

The same thing happens to those minds which instead of exercise give themselves up to sloth. They are like the razor here spoken of, and lose the keenness of their edge, while the rust of ignorance spoils their form.

A FABLE.

A stone of some size recently uncovered by the water lay on a certain spot some-
what raised, and just where a delightful grove ended by a stony road; here it was sur-
rounded by plants decorated by various flowers of divers colours. And as it saw the great quantity of stones collected together in the roadway below, it began to wish it could let itself fall down there, saying to itself: "What have I to do here with these plants? I want to live in the company of those, my sisters." And letting itself fall, its rapid course ended among these longed for companions. When it had been there sometime it began to find itself constantly toiling under the wheels of the carts the iron-shoed feet of horses and of travellers. This one rolled it over, that one trod upon it; sometimes it lifted itself a little and then it was covered with mud or the dung of some animal, and it was in vain that it looked at the spot whence it had come as a place of solitude and tranquil place.

Thus it happens to those who choose to leave a life of solitary contemplation, and come to live in cities among people full of infinite evil.

elli chì... chosì naschosto. 10. gorno... vaccito... fatto assi. 11. ruginète... ella... novam spechiare. 12. cho... dano cho secho... o qua. 13. cho... il mi... lusstante. 14. fasaddiana... ruggins. 15. chisamischil... 16. assimilithine... detto nosoro perde... suttaflita. 17. ella... guasta. 18. pietra... "novamète per l'acque scoperta" di bella gràde, lo cho... locho... 20. vidì lieneile boschetto... Tchì, 21. derbenemi usai... chori ornati. 22. soma... ase. 23. chlochate... unno... lasseirai cha. 24. chìsco... chì. 25. sorellè... chìpagna. 26. chìpagnè... cho. 27. dale... charri... dèferati chavalli. 28. chomivo... quale la. 29. alchuma... alchuno pero... choperta. 30. osster... cho... locho. 31. partata... inel locho. 32. acade accqueli che della... chìtenplativa voglia.
HUMOROUS WRITINGS.

1273.

Some flames had already lasted in the furnace of a glass-blower, when they saw a candle approaching in a beautiful and glittering candlestick. With ardent longing they strove to reach it; and one of them, quitting its natural course, writhed up to an unburnt brand on which it fed and passed at the opposite end out by a narrow chink to the candle which was near. It flung itself upon it, and with fierce jealousy and greediness it devoured it, having reduced it almost to death, and, wishing to procure the prolongation of its life, it tried to return to the furnace whence it had come. But in vain, for it was compelled to die, the wood perishing together with the candle, being at last converted, with lamentation and repentance, into foul smoke, while leaving all its sisters in brilliant and enduring life and beauty.

1274.

A small patch of snow finding itself clinging to the top of a rock which was lying on the topmost height of a very high mountain and being left to its own imaginations, it began to reflect in this way, saying to itself: "Now, shall not I be thought vain and proud for having placed myself—such a small patch of snow—in so lofty a spot, and for allowing that so large a quantity of snow as I have seen here around me, should take a place lower than mine? Certainly my small dimensions by no means merit this elevation. How easily may I, in proof of my insignificance, experience the same fate as that which the sun brought about yesterday to my companions, who were all, in a few hours, destroyed by the sun. And this happened from their having placed themselves higher than became them. I will flee from the wrath of the sun, and humble myself and find a place befitting my small importance." Thus, slinking itself down, it began to descend, hurrying from its high home on to the other snow; but the more it sought a low place


1274: 1. pocha. 2. apichata . . comita. 3. chôlechate soprapra lasstremma. 4. teza . rachol. 5. lamaginatione chomickio chon. 6. considerare. 7. givichada. 8. piccola droma. 9. choe essoportare che tante. 10. quanto . . veduta so stia. 11. pocha. 12. nomerta questa alteza. 13. pichola .. chonossie .. chon. 16. disface ecuesto interuene. 17. alora. 18. abastarmi. 19. chouenier. 20. chomiciata . . rotatò. 21. dell . . spiegie . quato. 22. imodo. 23. sopra l
modo che, terminato il suo corso sopra uno colle, si trouò di nò quasi minor \( \text{grandezza} \) che 'l colle che essa sostenea; e fu l'ultima che in quella state dal sole disfatta; detta per quelli che s'umilliano, son esaltate.

The cedar, being desirous of producing a fine and noble fruit at its summit, set to work to form it with all the strength of its sap. But this fruit, when grown, was the cause of this tall and upright tree-top being bent over.

The peach, being envious of the vast quantity of fruit which she saw borne on the nut-tree, her neighbour, determined to do the same, and loaded herself with her own in such a way that the weight of the fruit pulled her up by the roots and broke her down to the ground.

The nut-tree stood always by a road side displaying the wealth of its fruit to the passers by, and every one cast stones at it.

The fig-tree, having no fruit, no one looked at it; then, wishing to produce fruits that it might be praised by men, it was bent and broken down by them.

The fig-tree, standing by the side of the elm and seeing that its boughs were bare of fruit, yet that it had the audacity to keep the Sun from its own unripe figs with its branches, said to it: "Oh elm! art thou not ashamed to stand in front of me. But wait till my offspring are fully grown and you will see where you are!" But when her offspring were mature, a troop of soldiers coming by fell upon the fig-tree and her
HUMOROUS WRITINGS.

rotto; il quale stádo poi così 24 storniato delle sue mèbra, l’olmo lo dimándò dîcié²do: o fico quíto era il meglio a stare sanza figlioli 26 che per quelli venire in si miserabile stato!

S. K. M. III. 4gel

La piáta si dole del palo 2 secco e vecchio che se l’era 5 posto al lato e de’pali 6 seccchi che la circúdano;
5 L’ùlò mài tiene diritto, 6 ‘l’altro lo guardar dalla 7 triste cópagna.

C. A. 66 ½ 200 ½

FAVOLA.

2 Trovádosi la noce essere della cornacchia 3 portata sopra vn alto campanile, e per 4 vna fessura, doue cadé, fu liberata dal mortale 5 suo becco; pregó 6 esso muro 7 per quella gratia che Dio li aveva dato del essere tanto 7 penimente e magnif. e ricco di si belle càpane e di tà 8 to onorevole suono che ella douesse soccorrere, 9 poi ch’ella non avea potuta cadere sotto 10 i verdi rami del suo vecchio padre, e essere nella gras sa terra, ricoperta dalle sue cadéti foglie, che non la 12 volese lui abandonare, 10péro ch’ella, trovádosi 13 nel becco della fiera corua, 14 votò, che scappádo da essa voleua finire la ui 15 té sua, in un piccolo buco; alle quali parole 16 il muro, mosso, a cópazion, fu cótento ricidettar 7 la nel loco ov’era cadata; e in infra poco té 18 la noce cominciò aprirsi e mettere le radici infra 19 le fessure delle pietre, e quelle allargaro, e gittá 20 re i rami fori della sua caverna.; e quegli 24 in breve leuati sopra lo edifizio, e ingrossate le 22 ritorte radici, cominciò aprir i mvrí e ca texturede le antiche pietre de’ loro uechi lochi; allo 24ra il muro, tardi e indarno pianse, la cagione del suo danno; 25 e in breve aprí e rovinò grà parte delle sua mèbra.

The plant complains of the old and dry stick which stands by its side and of the dry stakes that surround it.

One keeps it upright, the other keeps it from low company.

A FABLE.

A nut, having been carried by a crow to the top of a tall campanile and released by falling into a chink from the mortal grip of its beak, it prayed the wall by the grace bestowed on it by God in allowing it to be so high and thick, and to own such fine bells and of so noble a tone, that it would succour it, and that, as it had not been able to fall under the verdurous boughs of its venerable father and lie in the fat earth covered up by his fallen leaves it would not abandon it; because, finding itself in the beak of the cruel crow, it had there made a vow that if it escaped from her it would end its life in a little hole. At these words the wall, moved to compassion, was content to shelter it in the spot where it had fallen; and after a short time the nut began to split open and put forth roots between the rifts of the stones and push them apart, and to throw out shoots from its hollow shell; and, to be brief, these rose above the building and the twisted roots, growing thicker, began to thrust the walls apart, and tear out the ancient stones from their old places. Then the wall too late and in vain bewailed the cause of its destruction and in a short time, it wrought the ruin of a great part of it.

1276. 2. secco. 3. ede pa[l][l]. 4. sechi chello.
1277. 2. della cornacchia. 3. [essere] porrito... chan panile. 4. chade... liberato. 5. [becho] suo becho pregho... mivo [chella riciana]. 7. richo... chapane. 8. honorevole sono... douessi sochere. 9. perche polchela non era pututa chadere 10. nella gra. 11. tera richopero delle... chadë... nolu. 12. volessi. 13. nel fero becho... chorra chia chella &. 14. vot. [s] che schipado. 15. vnu piccolo buco. 16. chispanione... chitënto. 17. nelócho... chaduta... pocho. 18. chomëcio. 19. equelle. 20. chaverna. 21. ingrossate. 24. tardò 1° ediano° piaone... dano. 25. breve spero rovin.
FABLES.

A FABLE.

The privet feeling its tender boughs loaded with young fruit, pricked by the sharp claws and beak of the insolent blackbird, complained to the blackbird with pitious remonstrance entreat her that since she stole its delicious fruits she should not deprive it of the leaves with which it preserved them from the burning rays of the sun, and that she should not divest it of its tender bark by scratching it with her sharp claws. To which the blackbird replied with angry upbraiding: "O, be silent, uncultured shrub! Do you not know that Nature made you produce these fruits for my nourishment; do you not see that you are in the world [only] to serve me as food; do you not know, base creature, that next winter you will be food and prey for the Fire?" To which words the tree listened patiently, and not without tears. After a short time the blackbird was taken in a net and boughs were cut to make a cage, in which to imprison her. Branches were cut, among others from the plant privet, to serve for the small rods of the cage; and seeing herself to be the cause of the Blackbird's loss of liberty it rejoiced and spoke as follows: "O Blackbird, I am here, and not yet burnt by fire as you said. I shall see you in prison before you see me burnt."

A FABLE.

The laurel and the myrtle seeing the pear tree cut down cried out with a loud voice: "O pear-tree! whither are you going? Where is the pride you had when you were covered with ripe fruits? Now you will no longer shade us with your mass of leaves." Then the pear-tree replied: "I am going with the husbandman who has cut me down and who will take me to the workshop of a good sculptor who by his art will make me take the form of Jove the god; and I shall be dedicated in a temple and adored by men in the place of Jove, while you are bound always to remain maimed and stripped of your boughs, which will be placed round me to do me honour.

FAVOLA.

20Veduto il lavro e mirò tagliare il pero, con alta voce gritarono: O pero, ove vai tu? ov'è la superbia che avevi quando avevi i tuoi maturi frutti? ora no c'è farai tu obbre colle tue folte chiome; — Allora il pero rispose: io ne vedo l'agricola che mi taglia e mi porterà alla bottega d'ottimo scultore, il quale mi farà con suo' arte pigliare la forma di Giovio. Idio, e sarà dedicato nel tempio — e dagli omi adorato — invece di Giovio; e tu ti metti a piutto a rimanere spesso stonata — e pelata tua rami, i quali mi sieno dali omi per onorarmi poste d'intorno.

FAVOLA.

20Delle rami ripieni di novelli frutti dai pugnì artigli e becco delle importune merle, si doveva col pietoso rammarichio iuerso essa merla, pregando quella che, poichè lei li toglieva e sua difetti frutti, il merlo non le privasse delle foglie, le quali lo difendevano dai cocontienzi razi del sole, e che col'a cute nglicie non la sorticasse e suesstiss della sua tenera pelle. — Allà quale la merla con vilani räpognie rispose: o tacía saluatico sterto! — nò sai che la natura t' a produrre questi frutti per mio notrimetò? — nò uedi che sei al modo per servirmi di tale cibo? — nò sai, vilano, che tu farai in nella prossima iuernata notrimé e cibo del fuoco? le quali parole ascoltate dal albero patiètèmetè, nò senza lacrimi, infà poco tempo preso dalla raggia, e coti de' rami per fare gabbia per incarcerare esso merlo focò infra l'alti rami al sottile rovistico a fare legni minimi della gabbia, le quali vedèdo essere causa della persa libertà del merlo; — rallègratasi mosse tale parole: O merlo io sono qui non acora consumata, come dicievi, dal foco; prima vedrà te prigione, che tu me brugia.
HUMOROUS WRITINGS.

1279.

FAVOLA.

1. Vedèdò il castagno • l’omo • sopra il fico, il quale piegava • in verso se i suoi rami e di quelli spiccava • i maturi frutti • i quali mettevano • nell’ aperta bocca difiaci- doli e disarradati coi duri detì, crollà46 do • i lunghi rami, e’ c’o spergevoli mormorio disse: 35 O fico • quatto sei tu mì di me obbligato alla natura • l’edi come 36 in me ordinò • serrati • mi dolci figlioli, • prima vestiti di sottile cajamica, sopra la quale è posta la dura e foderata pelle • e no co- 38 tettandosi di tanto benfarchi • ch’ell’à fatto loro la forte abj3hatione, e sopra quella fondò acute • e folte • spine • aciochè le 40 mani dell’omo • no mi possino nvocere; • Allora il fico comìciò insieme coi suoi figlioli a ridere, e ferme le risa disse: 42 co- nosci l’omo essere di tale ingiugio che lui ti sappi col34 le pertiche e pietre e sterpi, tratti infrà i tua rami, farti povero 44 de’ tua frutti, e quelli caduti posta coi piedi o coi sassi, a modo 45 che i frutti tua escino stra- ciati e stirpato fora dall’armata 46 casa; e io sono co dirigizca tocco dalle mani, e no come te da bastoni e da sasso.

C. A. 56.2; 204]

1279.

Il mischio • salice trovàdisi no potere fruire il piacere di vedere i sua • sottili rami • fare over 3còdurre alla • desiderata grandezza e dirizzarsi al cielo per cagione della 4vite • e di qualunque piatà • li era uicina, • senpre elli 5era • stirpato e dirama- to • e guasto; e raccolte • in se tutti li spiri-ti • e con quelli apre e spalanca le parti alla 7imaginatione • e stando in cò- tinva • cogitatione • e ricerca • e con quella l’universo • delle piatte, co quale 9di quelle esso collegare • si potesse che non avesse bi- so • gnio • dell’aiuto • de’ sua • legami; • essendo stato • alquanto • in questa 11nutritiva • imagi- natione • co subito assa • limetto li corse • nel pensiero • la zucca • e crollato tutti i ra- mi • per grade • allegrezza • pare li avere trovato cópa • gnia • al suo • desiao • proposto • imperoè quella è pìv atta 15 a legare • altri che essere • legata; 16 e fatta tal.

A FABLE.

The chestnut, seeing a man upon the fig-tree, bending its boughs down and pulling off the ripe fruits, which he put into his open mouth destroying and crushing them with his hard teeth, it tossed its long boughs and with a noisy rustle exclaimed: “Oh fig! how much less are you protected by nature than I. See how in me my sweet offspring are set in close array; first clothed in soft wrappers over which is the hard but softly lined husk; and not content with taking this care of me, and having given them so strong a shelter, on this she has placed sharp and close-set spines so that the hand of man cannot hurt me.” Then the fig-tree and her offspring began to laugh and having laughed she said: “I know man to be of such ingenuity that with rods and stones and stakes flung up among your branches he will bereave you of your fruits; and when they are fallen, he will trample them with his feet or with stones, so that your offspring will come out of their armour, crushed and maimed; while I am touched carefully by their hands, and not like you with sticks and stones.”
diliberatione rizza sua rami in uesto il cielo aspettando 17 qualche amichevole vecchiolo, che li fusse al disiderio mezzano; 18 fira quali veduta a se vicina la sarzana disse inverso 19 di quella; o ghiatilevecchiolo, per quello soccorso 20 che a questi giorni da mattina ne' mia rami trovasti, 21 quado l'affamato, crudele e rapace falicone ti voleva diuorare, 22 e per quelli risi che sopra me spesso ai 23 vasato quado 24 l'ali tue a te riposo chiedeano, e per quelli piacere'ri che infra detti mia rami scherzando colle tue copagnie 26 ne' tua amoreggiamenti ai vasato, jo ti prieo che tu tuovi, 27 la zucca, e inpetri da quella alqua delle sue semenze; 28 e di a quelle che, nate ch'el'fieno, ch'io le trattterò no 29 altramente che se del mio corpo gnerante l'auessi; 30 e similiamente va tutte quelle parole, che di simile inteseion persiusi; sieno, benche a te, maestra de' linguaggi, insegnare non bisogni; e se questo 31 farai, io sono cotetta di ricicere il tuo nido sopra il nascimeto de' mia rami, insieme collo tua fassiglia senza pagmëo d'alcu fitto; allora la sarzana, fatto e fermato alqua capitoli di novo coll salice, e mas'33 sima che bisce o faiso soprà se mai non accettasse, 34 alzato la coda e bassato la testa e gittatis dal ramo 35 ride il suo peso all'ali, e quelle battendo sopra la fugitiva aria, ora qua, ora in la curiosamët col timo della coda 36 dirizzadòsi, peruehe a vna zucca, e col bel saluto 37 e alqua bone parole inpetrò le dimandate semenze; 38 e condotte al salice fu con lieta ciera ricevuta; 39 e raspato alqua col piè il terreno vicino al salice, 40 col becco in cierchio a esso essi grani piatto, li quali 41 in breve teco cresciedo comiciarono collo accrescimeto e aprimeto de' sua 42 rami a occupare tutti i rami del salice, e colle sue 43 gran fogie e a toglierle la bellezza del sole e del cielo; e nó 49 bastado tato male, seguendo le zucche comiciarono, per discodio preso, a tirare le cime de' rami inverso la tesiera con strane torture e disagio di quelli, she awaited eagerly some friendly bird who should be the mediator of her wishes. Presently seeing near her the magpie she said to him: "O gentle bird! by the memory of the refuge which you found this morning among my branches, when the hungry cruel, and rapacious falcon wanted to devour you, and by that repose which you have always found in me when your wings craved rest, and by the pleasure you have enjoyed among my boughs, when playing with your companions or making love—I entreat you find the gourd and obtain from her some of her seeds, and tell her that those that are born of them I will treat exactly as though they were my own flesh and blood; and in this way use all the words you can think of, which are of the same persuasive purport; though, indeed, since you are a master of language, I need not teach you. And if you will do me this service I shall be 'happy to have your nest in the fork of my boughs, and all your family without payment of any rent." Then the magpie, having made and confirmed certain new stipulations with the willow,—and principally that she should never admit upon her any snake or polecat, cocked his tail, and put down his head, and flung himself from the bough, throwing his weight upon his wings; and these, beating the fleeting air, now here, now there, bearing about inquisitively, while his tail served as a rudder to steer him, he came to a gourd; then with a handsome bow and a few polite words, he obtained the required seeds, and carried them to the willow, who received him with a cheerful face. And when he had scraped away with his foot a small quantity of the earth near the willow, describing a circle, with his beak he planted the grains, which in a short time began to grow, and by their growth and the branches to take up all the boughs of the willow, while their broad leaves deprived it of the beauty of the sun and sky. And not content with so much evil, the gourds next began, by their rude hold, to drag the ends of the tender shoots down towards the earth, with strange twisting and distortion.
Allora scontentosi, e indarno crollandosi per fare da se esse zuche cadere, e indarno vaneggiando alquati giorni in simile inganno, perchè la bona e forte collegatione tal pesiero negava, vedëdo passare il ueto, a quello racomädadosi, e quello soffiò forte; allora s' reassperse il uechio e voto gâbo del salice in 2 parti insino alle sue radici; e caduto in 2 parti indarno pianse se me desimo, e conobbe che era nato per non aver mai bene.

Then, being much annoyed, it shook itself in vain to throw off the gourd. After raving for some days in such plans vainly, because the firm union forbade it, seeing the wind come by it commended itself to him. The wind flew hard and opened the old and hollow stem of the willow in two down to the roots, so that it fell into two parts. In vain did it bewail itself recognising that it was born to no good end.

s'dossi . . crolladosi . . dasse . . chadere. 53. vanegiâto . . ingano . . efforte collegatione. 54. acquello . . ecquello 56. radice. 57. conobe.
C. A. 1279; 364 a]

Facietia.

"Andando un prete per la sua parrochia il sabato santo, dà del vn preteche e sparsamente l'acqua sopra alcune sue pitture. Essso pittore voltosi indirieto, alquato crucciato; disèse perché faciesse tale spargimento sopra le sue pitture? Allora il prete disse, essere cosi usanza, e che'era suo debito il fare cosi, e che facieva bene, e che chi fa bene debbe aspettare bene e meglio, che così promettea Dio, e che d'ogni bene, che si facieva in terra, se n'avrebbe di sopra per ogni vn 100; allora il pittore, aspettato ch'egli uscisse, se li fecie di sopra alla finestra, e gittò vn gran sechione d'acqua adosso a esso. Il prete, diciendo: ecco che di sopra ti viene per ogni vn 100, come tu dicesti, che accaderebbe del bene che mi facievi, e che la tua acqua santa, colla quale m'hai guasto meze le mie pitture."

When wine is drunk by a drunkard, that wine is revenged on the drinker.

S. K. M. iii. 734]

Il uínò òcsumato dallo 2 ubriaco, esso vino col beuitore si vèdica.

A JEST.

A priest, making the rounds of his parish on Easter Eve, and sprinkling holy water in the houses as is customary, came to a painter's room, where he sprinkled the water on some of his pictures. The painter turned round, somewhat angered, and asked him why this sprinkling had been bestowed on his pictures; then said the priest, that it was the custom and his duty to do so, and that he was doing good; and that he who did good might look for good in return, and, indeed, for better, since God had promised that every good deed that was done on earth should be rewarded a hundred-fold from above. Then the painter, waiting till he went out, went to an upper window and flung a large pail of water on the priest's back, saying: "Here is the reward a hundred-fold from above, which you said would come from the good you had done me with your holy water, by which you have damaged my pictures."
8 Trovádosi il uino, divino licore dell’uua, in vna 9avere e ricca tazza sopra la tavola di Ma' 10vetteme, e mótato in gloria di tā'11lo onore, subito fu assaltato da vna 12cotaria cegotitazione diciendo a se medesimo: che fo, e di che 13mi rallegrò io? non m’avvedo essere vicino alla 14mia morte? e lasciare l’aura abitazione de’slla tazza; e entrare in nelle brusti et fedite caverne 16del corpo vmano e li trasivtarmi di odorofe’rro e suave licore, in brutta et trista orina? e n6 18bastado tato male: ch’io ancora deba si lügdi9’mete giacere ne’brutti ricettacoli coll’altra 20fetida e corrotta materia, vscita dalle vmane inte’riora? gridò inverso il cielo, chiedé 22vedetta di tanto danno, 23e che si ponesse ora mai fine a taito dissprezzo, 24ché, poiché quello paese producua le piv belle 25e migliorì vue di tutto l’altro modo, che al meno 26essee non fussino in vino còdotte; allora Giove fece 27che l’imà bevto vino da Mavmetto eleuò l’anima sua 28inverso il cielabro, e quello in modo cotàminò che 29lo fecie matto, e partorì tanti errori che, tornà 30in se, fecie legge che nessuno, Asiatico bevesse 31vino; e furono lasciate poi libere le uii cosi suia bruta.

33Già il uino, 33entrato nel31lo stomaco, col35mincia a bolillere e sgófia37re; già l’an35ma di quello 39comincia a abà40donare il cor41po; già si volta 42inverso il ciel43lo; trova il ciel44labro, cagione 45della diuisione 46dal suo corpo; 47già lo comincia 48a cótaminare 49e farlo furia50re a modo de ma51tto; già fa in52riparabili erro53ri, ammazzàdo i su54ta amici.

Vino - artigiano andando 2 spesso a visitare vno signiore 3 sanza altro proposito dimáda4 al quale, il signore domándò 5quello che andava facícido 6questo disse ch’venia lì 7per avere de’ piaceri che Wine, the divine juice of the grape, finding itself in a golden and richly wrought cup, on the table of Mahomet, was puffed up with pride at so much honour; when suddenly it was struck by a contrary reflection, saying to itself: “What am I about, that I should rejoice, and not perceive that I am now near to my death and shall leave my golden abode in this cup to enter into the soul and fedile caverns of the human body, and to be transmuted from a fragrant and delicious liquor into a soul and base one. Nay, and as though so much evil as this were not enough, I must for a long time lie in hideous receptacles, together with other fedile and corrupt matter, cast out from human intestines.” And it cried to Heaven, imploring vengeance for so much insult, and that an end might henceforth be put to such contempt; and that, since that country produced the finest and best grapes in the whole world, at least they should not be turned into wine. Then Jove made that wine drunk by Mahomet to rise in spirit to his brain; and that in so deleterious a manner that it made him mad, and gave birth to so many follies that when he had recovered himself, he made a law that no Asiatic should drink wine, and henceforth the wine and its fruit were left free.

As soon as wine has entered the stomach it begins to ferment and swell; then the spirit of that man begins to abandon his body, rising as it were skywards, and the brain finds itself parting from the body. Then it begins to degrade him, and make him rave like a madman, and then he does irreparable evil, killing his friends.

S. K. M. III. 58[a]
lui aveva potuto; peroché volentieri vedeva omi non pivi potenti di lui, come fanno i popoli, ma che si ignora non poter vedere se non omi di me possa di lui; per questo il signori maca vano d'esso piacere.

C. A. 1476; 4394]

Vsano i frati minori a certi tempi alcune loro quasiere, nelle quali essi non mangiano carne ne' loro costumi, ma in viaggio, perché essi viuono di limosine, anno licititia di magiare ciò che è posto loro innanzi; ove abbattevano in detti viaggi una copia d'essi frati a vn osteria in compagnia d'un certo mercantuccio, il quale essendo una vna medesima messa, alla quale non fu portato per la povertà dell'ostiero altro che vn pvlastro cotto; ove esso mercantuccio, vedendo questo essere poco per lui, si volse a essi frati e disse: se io ho bene 'di ricordo, voi non mangiate in tali di ne' vostri costumi d'alcuna maniera di carne; alle quali parole i frati furono costretti per la regola senza altre cavallazioni a dire ciò essere la uerità; ove il mercatello ebbe il suo desiderio, e così maggio ella polasta, e i frati fecero il meglio poterono; ove dopo tale desinare questi còmesari si partirono tutti e 3 di compagnia, e dopo alquantu di viaggio, trovaro vn fiume di bona larghezza e profondità, essendo tutti 3 a piedi, i frati per povertà e l'altro per aurità, fu necessario per l'uso dellà della compagnia che vno de' frati, essendo scalzi, passasse sopra i suoi omeri esso mercatuccio; onde datoli il frate al serva vn zoccoli; e carico di tale uomo; onde accade, che trovandosi esso frate in mezzo del fiume, esso ancora si ricordò della sua regola, e fermatosi a vso di San Cristoforo alzò la testa; invero quello che l'aggravava, e disse: dirì vn poco, 'ai tu nessù dinari adosso? be saj, rispose que'sto; come credete voi che a mia pari mercatâte andasse altramenti attorno? ommè, disse il frate, la nostra regola vieta che noi non possiamo portare danari adosso e subito lo gettò nell'acqua; la qual cosa conosciuta dal mercatâte facetâmè la già fatta ingiuria essere vedicâte, có piacievole uso pacificamè, mezzo arossito per vergogna, la udetta sopportò.

Franciscan begging Friars are wont, at certain times, to keep fasts, when they do not eat meat in their convents. But on journeys, as they live on charity, they have licenses to eat whatever is set before them. Now a couple of these friars on their travels, stopped at an inn, in company with a certain merchant, and sat down with him at the same table, where, from the poverty of the inn, nothing was served to them but a small roast chicken. The merchant, seeing this to be but little even for himself, turned to the friars and said: "If my memory serves me, you do not eat any kind of flesh in your convents at this season." At these words the friars were compelled by their rule to admit, without cavil, that this was the truth; so the merchant had his wish, and eat the chicken and the friars did the best they could. After dinner the messmates departed, all three together, and after travelling some distance they came to a river of some width and depth. All three being on foot—the friars by reason of their poverty, and the other from avarice—it was necessary by the custom of company that one of the friars, being barefoot, should carry the merchant on his shoulders: so having given his wooden shoes into his keeping, he took up his man. But it so happened that when the friar had got to the middle of the river, he again remembered a rule of his order, and stopping short, he looked up, like Saint Christopher, to the burden on his back and said: "Tell me, have you any money about you?—"You know I have," answered the other, "How do you suppose that a Merchant like me should go about otherwise?" "Alack!" cried the friar, "our rules forbid as to carry any money on our persons," and forthwith he dropped him into the water, which the merchant perceived was a facetious way of being revenged on the indignity he had done them; so, with a smiling face, and blushing somewhat with shame, he peaceably ended the revenge.
Facetia.

Vno volendo provare colla autorità di Pitagora, come altre volte lui era stato al modo, e vno nò li lasciava finire il suo ragionameto, allor costui disse a questo tale: è per tale segnale che tio altre volte ci fusse stato, io mi ricordo che tu eri nullo; allor costui sentodosi mordere colle parole gli confermò essere vero, che per questo cò trassegno lui si ricordava che questo tale era stato l’asino che gli portava la farina.

Facetia.

Fu dimàdato vn pittore perché fac-cìelo lui di figure si belle che erà cose morte. per che causa esso avesse fatti i figlioli si brutti; allor il pittore rispose che le pitture le fsecie di di, e i figlioli di notte.

A jest.

A man wishing to prove, by the authority of Pythagoras, that he had formerly been in the world, while another would not let him finish his argument, the first speaker said to the second: “It is by this token that I was formerly here, I remember that you were a miller.” The other one, feeling himself stung by these words, agreed that it was true, and that by the same token he remembered that the speaker had been the ass that carried the flour.

A jest.

It was asked of a painter why, since he made such beautiful figures, which were but dead things, his children were so ugly; to which the painter replied that he made his pictures by day, and his children by night.

C. A. 1285-1287.  

A man saw a large sword which another one wore at his side. Said he “Poor fellow, for a long time I have seen you tied to that weapon; why do you not release yourself as your hands are untied, and set yourself free?” To which the other replied: “This is none of yours, on the contrary it is an old story.” The former speaker, feeling stung, replied: “I know that you are acquainted with so few things in this world, that I thought anything I could tell you would be new to you.”

C. A. 3905; 914 a.

A man gave up his intimacy with one of his friends because he often spoke ill of his other friends. The neglected friend one day lamenting to this former friend, after much complaining, entreated him to say what might be the cause that had made him forget so much friendship. To which he answered: “I will no longer be in-

1285. 2. cholla alturita. 3. pittagora. 4. lussiava. 5. chosstui. 6. acestoto. 7. cifussi. 8. chetta. 9. chosstui. 11. richordaua. 12. chelli. 13. picctore. 17. chausa. 18. rispsose chelle. 19. figlio.

1286. 2 acestota. 6. dislegli [e sta libe] avedo. 12. dociolte. 3. costui rispsose. 4. rispsose. 5. chosstui atte fusii.

1287. 1. lassio. 2. amico. 3. susessio. 5. lassciato amico [si do]. 4. cholla amico. 5. diciessi. 6. chagione chello auxsii. 7. rispsose. 8. no. 9. nino. 10. amico. 14. ahhia chosse me affine trista.
1288. A man was arguing and boasting that he knew many and various tricks. Another among the bystanders said: "I know how to play a trick which will make whomsoever I like pull off his breeches." The first man—the boaster—said: "You won't make me pull off mine, and I bet you a pair of hose on it." He who proposed the game, having accepted the offer, produced breeches and drew them across the face of him who bet the pair of hose and won the bet [4].

A man said to an acquaintance: "Your eyes are changed to a strange colour." The other replied: "It often happens, but you have not noticed it." "When does it happen?" said the former. "Every time that my eyes see your ugly face, from the shock of so unpleasing a sight they suddenly turn pale and change to a strange colour."

A man said to another: "Your eyes are changed to a strange colour." The other replied: "It is because my eyes behold your strange ugly face."

A man said that in his country were the strangest things in the world. Another answered: "You, who were born there, confirm this as true, by the strangeness of your ugly face."

1289. An old man was publicly casting contempt on a young one, and boldly showing that he did not fear him; on which the young man replied that his advanced age served him better as a shield than either his tongue or his strength.

C. A. 73.4; 209.4

Vno disputado e vantadosi di sapere fare molti vari e belli giochi. 6n altro de' circostantii disse: io so fare vno gioco il quale farà trarre le brache a chi a me parirà; il primo vantatore trovandosi senza brache, disse: che a me non le sarai trarre e vo'dare vn pajo di calze; il propontore d'esso gioco accettato 4 lo invitò in pro mvo piva pja di brache, e trassele nel volto al mettitore delle calze, e vinse il peginio.

Vno disse a vn suo conosciute: tu aisti tutti li ochi trasmutati in strano colore; Quello li rispose interuenirli 6 spesso, ma tu no ci a posto cura;—e quâdo t'aduiè questo?—rispose l'alto: ogni volta, che mia ochi vedono jì tuo viso 7 strano, per la violenza ricievuta da si grà dispiaciere subito s'impalidiscono e mvtno in istrò colore.

Vno disse a un altro: tu aisti li ochi mutati in istrò strano; Quello li rispose egli è perché i mia ochi vedono il tuo viso strano.

Vno disse che in suo paese nascie vano le pivo strane cose del modo; l'altro rispose: tu che sei vi na11to, confermi ciò esser uero per la stranezza della tua brutta presenza.

Tr. 78]

Dispreggiando uno vecchio publicametè vn giovane mostrando audracìemètè nò temer quello, onde il giovane li rispuose che la sua luga età li facia migliore scudo che la lingua 4 o la forza.

1288. The joke turns, it appears, on two meanings of 'trarre' and is not easily translated.
HUMOROUS WRITINGS:

S. K. M. II. 410]

1290.


A JEST.

A sick man finding himself in articulo mortis heard a knock at the door, and asking one of his servants who was knocking, the servant went out, and answered that it was a woman calling herself Madonna Bona. Then the sick man lifting his arms to Heaven thanked God with a loud voice, and told the servants that they were to let her come in at once, so that he might see one good woman before he died, since in all his life he had never yet seen one.

S. K. M. II. 415]

1291.


A JEST.

A man was desired to rise from bed, because the sun was already risen. To which he replied: "If I had as far to go, and as much to do as he has, I should be risen by now; but having but a little way to go, I shall not rise yet."

1292.

Vno vedendo vna femina parata a tener ta' vola in giostra guardò il tavolaccio e gridò vedendo la sua lancia: oimè quest'e troppo pic'col lavorante a si grà bottega.

A man, seeing a woman ready to hold up the target for a jousting match, exclaimed, looking at the shield, and considering his spear: "Alack! this is too small a workman for so great a business."

1290. risposo. 6. eser. 8. rigrazia. 9. chissi. 11. potessi. 12. hessomorissi. 13. iperocbo

1291. chissi. 3. del. 4. Ellui. 5. affare. 6. "e facend[e]" quanto. 7. a'ido aaff. 8. anchora no. 9. mi

1292. ingostra. 3. tassua. 4. assi. bottega.

1290. Sendo uno infermo in articulo di morte, esso senti battere la porta, e domando vno de' sua serui chi era che batteva l'uscio, esso seruo rispose esser vna che si chiamava madonna Bona; allora l'infermo alzato le braccia al cielo ringraziò Dio con al'la voce; poi dise ai serui che lasciassino venire presto questa, acciò ch'è potesse vedere vna donna bona inazi che esso morisse, imperoché in sua vita mai ne vide nessuna.

1291. Fu detto a vno che si levasse dal letto, perchè gia era levato il sole; E lui rispose: se io avessi a fare tanto viaggio e facende quanto lui, ancora io sarei gia levato, e per avendo a far si poco camini, ancora non mi voglio levare.

1292. Vno vedendo vna femina parata a tener ta' vola in giostra guardò il tavolaccio e gridò vedendo la sua lancia: oimè quest'e troppo pic'col lavorante a si grà bottega.
IV.

PROPHECIES.

C. Delle formiche.

3 Prima delle cose degli animali; secòda
delli 3 irrationali; 3 a delle piàte, quarta delle
cerimonie; 4 quita de' costumi; sesta della
casi overo editti, over quisìstioni; settima
de' casi che nò possono stare 5 in natura,
come dire di quella cosa, quato pív ne le-
vì pív crescie; e riserua i grádi casi 8 inverso
il fine, e debo] dà dal principio, 9 e mostra
prima i mali, e poi le punitioni 10 delle cose
filosofiche.

1293. THE DIVISION OF THE PROPHECIES.

First, of things relating to animals;
secondly, of irrational creatures; thirdly of
plants; fourthly, of ceremonies; fifthly, of
manners; sixthly, of cases or edicts or
quarrels; seventhly, of cases that are impos-
sible in nature [paradoxes], as, for instance,
of those things which, the more is taken
from them, the more they grow. And reserve
the great matters till the end, and the small
matters give at the beginning. And first
show the evils and then the punishment of
philosophical things.

OF Ants.)

These creatures will form many commu-
nities, which will hide themselves and their
young ones and victuals in dark caverns, and
they will feed themselves and their families
in dark places for many months without any
light, artificial or natural.

1293. Lines 1—51 are in the original written in
one column, beginning with the text of line 11. At
the end of the column is the programme for the
arrangement of the prophecies, placed here at
the head: Lines 56—79 form a second column,
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lines 80—97 a third one (see the reproduction
of the text on the facsimile Pl. CXVIII).

Another suggestion for the arrangement of
the prophecies is to be found among the notes 55—57
on page 357.
(Dell’api.)

17 E a molti altri sarà tolte le mvcnitioni e lor cibi, e crudelmente da giête sanza ragione saranno sommese e annegate; o giustitia di Dio perché no ti desti a vedere così malmenare e tua creati?

(Delle pecore vacche e capre e simili.)

A innumerali saranno i loro piccoli figliolli e quelli scavati e crudelissimamente squartati.

(Delle noci e vliue e ghiaffe e castagne e simili.)

20 Molte piccole da spietate bastone e fierno tolte dalle proprie braccia delle loro madri e gittate in terra e poi lacerati.

(De’ fanciulli che stanno legati nelle fascie.)

O città marine, io vedo in uoi i nostri cittadini così femine come maschi stretteamente dai forti legami colle braccia e gambe esser legati da gente che non intenderanno i nostri luoghi e solui potrete sfogare li vostri dolori e perduta libertà mediante i lagrimesi pianti e li sospiri e lamentatione infrà uoi medesiimi, chè chi vi lega, non v’intenderà, né voi loro intenderete.

(Delle creature che mangiano i topi.)

A voi città dell’Africa si uadrà i vostri nati essere squarciati nelle proprie case de’ crudelissimi e raipaci animali del paese vostro.

(Delli asini bastonati.)

O natura, perché ti sei fatto partiale, facciédoti a tua figli d’alcuna pietosa e benigna madre, ad’altri crudelissima e spietatìta patrignia? io vedo i tua figlioli esser dati in altrì truìseruti sanza benificio alcuno, e in lo52co di remunerazione de’ fatti benifìti esser pagati di gràdissimi martiri, e spèdere sempre la lo53r vita in benificio del suo mal fattore.

(Of Bees.)

And many others will be deprived of their store and their food, and will be cruelly submerged and drowned by folks devoid of reason. Oh Justice of God! Why dost thou not wake and behold thy creatures thus ill used?

(Of Sheep, Cows, Goats and the like.)

Endless multitudes of these will have their little children taken from them ripped open and flayed and most barbarously quartered.

(Of Nuts, and Olives, and Acorns, and Chesnuts, and such like.)

Many offspring shall be snatched by cruel thrashing from the very arms of their mothers, and flung on the ground, and crushed.

(Of Children bound in Bundles.)

O cities of the Sea! In you I see your citizens—both females and males—tightly bound, arms and legs, with strong withes by folks who will not understand your language. And you will only be able to assuage your sorrows and lost liberty by means of tearful complaints and sighing and lamentation among yourselves; for those who will bind you will not understand you, nor will you understand them.

(Of Cats that eat Rats.)

In you, O cities of Africa your children will be seen quartered in their own houses by most cruel and rapacious beasts of your own country.

(Of Asses that are beaten.)

[48] O Nature! Wherefore art thou so partial; being to some of thy children a tender and benign mother, and to others a most cruel and pitiless stepmother? I see children of thine given up to slavery to others, without any sort of advantage, and instead of remuneration for the good they do, they are paid with the severest suffering, and spend their whole life in benefitting those who ill treat them.

16. apè. 17. e amolti | “[era]” altri . . . tolto la. 18. ragione saranno. 19. giustitia. 20. deasi. 22. vache. 23. essimili. 24. inmersibili . . . il loro piccoli. 25. ecchell [crudelissimamente] scavati [esse]. 26. essimili. 29. dispiegate. 30. fete. 32. fanciulli. chesstano. 33. fascie. 34. veghe . . . usauri. 35. dini [esse] cosi . . . massi essere istare. 36. dei . . . cole br. 38. esol . . . infogare li usauri “dolori e’ eper. 39. mediante [il gran pia] i lagrimesi. 40. elle i sospiri ellamentazione. 43. migli o e topi. 44. usauri. 46. vosstro. 47. bastonati. 48. O natura [sanza] in stacchurata perchett seiuffata. 49. dalchuna. 50. dispieuts. 51. veghe. 52. alchuno eillo. 53. cho. 54. da [ere] di gràdissime [bastonate]

48. Compare No. 845.
PROPHECIES.

[Delli omini che dormono nell'asse d'alberi.]

57 Li omini dormiranno e maglieranno e abberàno 58 infra li alberi nella selue e campagne.

[Del sognare.]

60 Alli omini parrà vedere nel cielo nove fiamme; parrà in quello leuarsi a uolo, e di quello fuggirà e cò penvrà le fiamme che di lui discenderà; sentirà parlare li animali di qua e là, sorte in linguaggio umano; sorrederanno inmediate colla loro persona 66 in diverse parti del modo sanza modo; vedranno nelle tenebre grandissimi splendori; o maraviglia della vmanà 69 specie qual frena sia si condotto! 77 parlerà cogli animali di qualche specie, 77 e quelli cò teco in linguaggio umano, 74 vedrài caderà dere di grande alture sanza tuo danno; i torrèti t'accompagna e mischeràno col lor rapido corso . . .

[De' cristiani.]

85 Molti che tengono la fede del figliol e sol fan tempi nel nome 85 della madre.

[Del cibo stato animato.]

84 Gran parte de' corpi animati 85 passerà pe' corpi degli altri animali, 86 cioè le case disabitate passerà 87 in pezzi per le case abitate, dan88 o a quella vtile, e portà89 o cò seco i suoi danni; 99 cioè la uita dell'omo si fa dalle cose 99 maggiate, le quali portà con se90 o la parte dell'omo ch'è morta . . .

C. A. 1456; 46247

[Delli uff j funerali e processioni e lumi e càpane e còpagna.]

4 Agli omini saran fatti grandissimi onori e ponpe sanza lor saputa.


1294.

[of Men who sleep on boards of Trees.]

Men shall sleep, and eat, and dwell among trees, in the forests and open country.

[of Dreaming.]

Men will seem to see new destructions in the sky. The flames that fall from it will seem to rise in it and to fly from it with terror. They will hear every kind of animals speak in human language. They will instantaneously run in person in various parts of the world, without motion. They will see the greatest splendour in the midst of darkness. O! marvel of the human race! What madness has led you thus! You will speak with animals of every species and they with you in human speech. You will see yourself fall from great heights without any harm and torments will accompany you, and will mingle with their rapid course.

[of Christians.]

Many who hold the faith of the Son only build temples in the name of the Mother.

[of Food which has been alive.]

(84) A great portion of bodies that have been alive will pass into the bodies of other animals; which is as much as to say, that the deserted tenements will pass piecemeal into the inhabited ones, furnishing them with good things, and carrying with them their evils. That is to say the life of man is formed from things eaten, and these carry with them that part of man which dies . . .

[of Funeral Rites, and Processions, and Lights, and Bells, and Followers.]

The greatest honours will be paid to men, and much pomp, without their knowledge.
2 Molti fien quelli che con ogni studio e sollecitudine seguiranno con furia quella cosa che sempre li à spauetati, nò conoscendo la sua malignità.

Delli omini che, quato piv inuechiano, piv si fanno avari, chè auèdosi a star poco dovrebbero farsi liberali.

7 Vedansì a quelli, che son giudicati di piv spereítà e giudìtio, quanto ègli' anno mè bisogno delle cose, có piv auidità cercarle e riseruarle.

11 Starà molti occupati in esercitio a leuare di quella cosa che tanto crescierà, quan'to se ne leuò.

Del peso posto sul piumaccio.

E a molti corpi nel vedere da lor leuar la testa, si uederà manifesta'mente crescere, e rendendo loro la leuata testa · immediatamente dimisinviscono la grádecza.

Del pigiare de' pidocchi.

E saran molti cacciatori d'animali che, quanto piv ne piglieranno mâco n'avran, e così de conuerso piv n'avrà, quato men ne piglere'ranno.

Dello tignere l'acqua colle 2 sechie a vna sola corda.

E rimaranno occupati molti che quato piv tirarão in già la cosa, essa piv se ne fugìra in contrario modo.

Le lingue de' porci e vitelli nelle budelle.

O cosa spurca, che si vedrà l'uno animale aver la lingua in culo all'altro.

De' crivelli fatti di pelle d'animali.

Vedrassi il cibo degli animali passar dentro alle lor pelli per ogni parte salvo che per la bocca, e penetra' re dall'opposita parte insino alla piana terra.

1295.

Of the Avaricious.

There will be many who will eagerly and with great care and solicitude follow up a thing, which, if they only knew its malignity, would always terrify them.

Of those men, who, the older they grow, the more avaricious they become, whereas, having but little time to stay, they should become more liberal.

We see those who are regarded as being most experienced and judicious, when they least need a thing, seek and cherish it with most avidity.

Of the Ditch.

Many will be busied in taking away from a thing, which will grow in proportion as it is diminished.

Of a Weight placed on a Feather-pillow.

And it will be seen in many bodies that by raising the head they shall visibly; and by laying the raised head down again, their size will immediately be diminished.

Of catching Lice.

And many will be hunters of animals, which, the fewer there are the more will be taken; and conversely, the more there are, the fewer will be taken.

Of Drawing Water in two Buckets with a single Rope.

And many will be busily occupied, though the more of the thing they draw up, the more will escape at the other end.

Of the Tongues of Figs and Calves in Sausage-skins.

Oh! how foul a thing, that we should see the tongue of one animal in the guts of another.

Of Sieves made of the Hair of Animals.

We shall see the food of animals pass through their skin everyway excepting through their mouths, and penetrate from the outside downwards to the ground.
(Delle lanterne.)

35 Le feroci corna de' possenti tori difenderanno la luce notturna dall'impetuoso furor di uëti.

(Delle piume ne' letti.)

38 Li animali volatili sosterrà l'omini colle lor propie penne.

(Li animali che uà sopra li alberi, adando in zoccoli.)

41 Sarà si gràde i fanghi che li omini andranno sopra l'alberi de' lor paesi.

(Delle sole della carcere che son di bue.)

44 E si vedrà in gran parte del paese caminare sopra le pelli dell'grandi animali.

(Del nauicare.)

47 Saranno gran venti, per li quali le cose orietali si faranno occidentali, e quelli di mezzodi in grà parte miste col corso de' uë di seguiranolo per lunghi paesi.

(Delle pitture ne' santi adorati.)

51 Parleranno li'omini alli animali che non sentiranno; avrà gli occhi aperti e nò uedranno, parlaranno a quelli e nò fia loro risposta; chiederà gratie a chi avrà orecchi e non ode; farà lume a chi 54 è orbo.

(De' segatori.)

59 Saranno molti che si moverà l'uno contro dell'altro, tenendo in mano il tagliente ferro; Questi nò si faranno infra loro altro nocimeto che di stàchezza, perché qu'è l'uno si caccierà inanti, tanto l'altro si riterrà indiretto; ma tristo che s'inframetterà in mezzo, perché al fine rimarrà tagliato in pezzi.

(Il filatoio da seta.)

66 Sentirassì le dolenti gridà, le alte strida, le rause e infocate vocie di quei che fiemo con tormento spogliati e al fine li ascianti ignudi e senza moto; e questo fia per causa del motore che tutto volge.

animali. 46. sara...occi lù. 48. eqiuelle diemerodi. 51. parlerano...arà gli lù. 53. sciarà orci...lume e lù. 54. be orbo parerà color di cò gra... sce. 55. prensisìche. 56. metti per ordine e messia irminone chessà...e si fa del. 57. gorno e della notte. 59. molti chèssà...arò verà...[chelle br lùr]. 60. ontra...itagliente. 61. infrarolo. 62. chachiara inati. 63. tristo...chessà...rimara. 64. inpezi. 65. dassetà. 66. dolenti grida...diverse voci le. 67. rave e infochate
HUMOROUS WRITINGS.

(Of putting Bread into the Mouth of the Oven and taking it out again.)

In every city, land, castle and house, men shall be seen, who for want of food will take it out of the mouths of others, who will not be able to resist in any way.

(Of tilled Land.)

The Earth will be seen turned up side down and facing the opposite hemispheres, uncovering the lurking holes of the fiercest animals.

(Of Sowing Seed.)

Then many of the men who will remain alive, will throw the victuals they have preserved out of their houses, a free prey to the birds and beasts of the earth, without taking any care of them at all.

(Of the Rains, which, by making the Rivers muddy, wash away the Land.)

[81] Something will fall from the sky which will transport a large part of Africa which lies under that sky towards Europe, and that of Europe towards Africa, and that of the Scythian countries will meet with tremendous revolutions[84].

(Of Wood that burns.)

The trees and shrubs in the great forests will be converted into cinder.

(Of Kilns for Bricks and Lime.)

Finally the earth will turn red from a conflagration of many days and the stones will be turned to cinders.

(Of boiled Fish.)

The natives of the waters will die in the boiling flood.

(Of the Olives which fall from the Olive trees, shedding oil which makes light.)

And things will fall with great force from above, which will give us nourishment and light.

... cheffiren i “con tormento” isposiglisi. 68. lassati inugnidi “e senza moto” ecoceopto... chaussa... chettitutto. 69. estrarre... della bocha. 70. ettere e chastelle e chasse “per desiderio di magiare” trarre. 71. [bibo] proprio... bocha “fino all’altro” sanza... alchuna. 73. risguardare... 74. eschoprire... spillonche... 75. allor [li omini] in... 77. chase... 78. terresti... chirurarsi. 79. piove chienanche. 81. africcha. 82. chessi mostra a... eccella di curo. 83. lafricha... equelle... simichieranno. 84. cho... revolutione [al fine si fermeranno e miteranno natura di novi frutti]. Lines 86–88 come in the original after lines 85 and 90, but Leonardo directs us to invert the order by writing 2' at the beginning of the former passage and 1' at the head of the latter one. 86. bruca no. 87. aliusti... conversarano. 89. gorni. 90. elle... conversarono [in polvere] “in cenere”. 92. esessci. 93. morirono... acq’et”. 94. chasci... ciloci... 95. succeschecellula alla parra. 96. tessa esaltera... li ochin. 97. tessa... danimali [vescidi delle]
(Delle cicette e gufi; ciò che succhiella alla parra.)

96 Molti periranno di fracassamento di testa e salteranno loro li ochi in grà par-7te della testa per causa d'animali pavrosi vscti dalle tenebre.

(Del lino che fa la cura de' giéti.)

99 Sarà reveriti e onorati e co' reuerètia e amore ascoltati, li sua precetti di chi prima fusse legato, stratifiato o mortarizzato da molte e diuerse battojoe.

(De' libri che insegnano precetti.)

102 I corpi sanz' anima ci daranno con lor sententie precetti vtili al ben morire.

(De' battuti e scoreggiati.)

104 Li omini si nasconderanno sotto le scorze delle scorticate erbe, e quiui gri-105 dando si darà martiri con battimi di menbra a se medesimi.

(Delle maniche de' coltegli fatte di corna di castrone.)

112 Nelle corna dell'animali si vedranno tagli dei feri colli quali si torna la uita a molti di loro bette.

(Della notte che nò si conosce alcun colore.)

117 Verrà a tanto che non si conoscerà differenza infra colori, anzi si faran tutti di nera qualità.

(Delle spade e lance che per se mai nuoco a nessuno.)

121 Chi per se è mäsueto e sanza alcuna offensione, si farà spuentevole e feroce mediante le triste cópa ignie, e torrà la vita crudelissimamente a molte genti; e piv n'ucciderebbe, se corpi s'animali e usciti dalle spelonche non li difendessino, cioè le corazze di ferro.

(De' laccioli e trappole.)

128 Molti morti si moverà con furia e piglieranno vivi, e serviranno gli a lor nemici circa la lor morte e distrucione.

( Of Owls and screech owls and what will happen to certain birds.)

- Many will perish of dashing their heads in pieces, and the eyes of many will jump out of their heads by reason of fearful creatures come out of the darkness.

( Of flax which works the cure of men.)

That which was at first bound, cast out and rent by many and various beaters will be respected and honoured, and its precepts will be listened to with reverence and love.

(Of Books which teach Precepts.)

Bodies without souls will, by their contents give us precepts by which to die well.

(Of Flagellants.)

Men will hide themselves under the bark of trees, and, screaming, they will make themselves martyrs, by striking their own limbs.

(Of the Handles of Knives made of the Horns of Sheep.)

We shall see the horns of certain beasts fitted to iron tools, which will take the lives of many of their kind.

(Of Night when no Colour can be discerned.)

There will come a time when no difference can be discerned between colours, on the contrary, everything will be black alike.

(Of Swords and Spears which by themselves never hurt any one.)

One who by himself is mild enough and void of all offence will become terrible and fierce by being in bad company, and will most cruelly take the life of many men, and would kill many more if they were not hindered by bodies having no soul, that have come out of caverns-that is, breastplates of iron.

(Of Snares and Traps.)

Many dead things will move furiously, and will take and bind the living, and will ensnare them for the enemies who seek their death and destruction.
That shall be brought forth out of dark and obscure caves, which will put the whole human race in great anxiety, peril and death. To many that seek them, after many sorrows they will give delight, and to those who are not in their company, death with want and misfortune. This will lead to the commission of endless crimes; this will increase and persuade bad men to assassinations, robberies and treachery, and by reason of it each will be suspicious of his partner. This will deprive free cities of their happy condition; this will take away the lives of many; this will make men torment each other with many artifices deceptions and treasons. O monstrous creature! How much better would it be for men that every thing should return to Hell! For this the vast forests will be devastated of their trees; for this endless animals will lose their lives.

Of Ships which sink.

Huge bodies will be seen, devoid of life, carrying, in fierce haste, a multitude of men to the destruction of their lives.

Of Oxen, which are eaten.

The masters of estates will eat their own labourers.

Of beating Beds to renew them.

Men will be seen so deeply ungrateful that they will turn upon that which has harboured them, for nothing at all; they will so load it with blows that a great part of its inside will come out of its place, and will be turned over and over in its body.

Of Things which are eaten and which first are killed.

Those who nourish them will be killed by them and afflicted by merciless deaths.

De' metalli.)

Of Metals.)

De' navili che segnavano.

Of Ships which sink.

De' boi che si mägiano.

Of Oxen, which are eaten.

De' battere il letto per rifarlo.

Of beating Beds to renew them.

Delle cose che si mägiano.

Of Things which are eaten and which first are killed.

152 Nascì di piccolo principio, 154 chi si farà cò prestezza grande; ques'85 postpone stimerà alcuna creata 155 cosa, anzi colla sua potètia 157 quasi il tutto avrà in potètia 158 di trasformare di suo essere 159 in vn altro.

152 Nascì di piccolo principio, 154 chi si farà cò prestezza grande; ques'85 postpone stimerà alcuna creata 155 cosa, anzi colla sua potètia 157 quasi il tutto avrà in potètia 158 di trasformare di suo essere 159 in vn altro.

151 Uscìra dalle oscure e tenebrose 152 speleone, che metterà tutta l'umana speleone in grandi affanni, pericoli e mor- 153 te; a molti segua136 ci lor, dopo molti af- 154 fanni, darà 137 diletto; ma chi nò fia suo par- 155 tigiano morrà 138 con stento e calamità; 156 questo commette 139 in infiniti tradimèti, que- 157 sto avmète 149 rà e persuaderà li omini tristi 158 alli assassinamèti 141 e latrocini e le per- 159 fidie; questa darà 141 sospetto - a i suo par- 159 tigiani; questo torrà 141 lo stato delle città 160 liberè; questo torrà 141 la uita a molti; que- 160 sto travaglierà 142 li omini infra loro con molte arti, 142 inganni e tradimèti; o animal mo'143 struso! quato sarebbe meglio agli 144 omini che tutti tornassero nell'inferno! per costui 149 rimarrà diserte le grà selue delle lor 150 piate; per costui infiniti animali perderanno la uita.
PROPHECIES.

(Prophecy.

(Prophecy of the Reflection of Walls of Cities in the Water of their Ditches.)

The high walls of great cities will be seen up side down in their ditches.

(Of Water, which flows turbid and mixed with Soil and Dust; and of Mist, which is mixed with the Air; and of Fire which is mixed with its own, and each with each.)

All the elements will be seen mixed together in a great whirling mass, now borne towards the centre of the world, now towards the sky; and now furiously rushing from the South towards the frozen North, and sometimes from the East towards the West, and then again from this hemisphere to the other.

(The World may be divided into two Hemispheres at any Point.)

All men will suddenly be transferred into opposite hemispheres.

(The division of the East from the West may be made at any point.)

All living creatures will be moved from the East to the West; and in the same way from North to South, and vice versa.

(Of the Motion of Water which carries wood, which is dead.)

Bodies devoid of life will move by themselves and carry with them endless generations of the dead, taking the wealth from the bystanders.

(Of Eggs which being eaten cannot form Chickens.)

Oh! how many will they be that never come to the birth!

(Of Fishes which are eaten unborn.)

Endless generations will be lost by the death of the pregnant.

(Of the Lamentation on Good Friday.)

Throughout Europe there will be a lamentation of great nations over the death of one man who died in the East.

139. delle parte. 131. scorci... . il fre. 132. to settantrione acqua. 133. emisferio. 134. po. 135. immediate. 136. mo-
verosi. 200. meridio. 201. acqua. 202. e legnami chesson. 204. innumerable... : morti [dando esti] togli. 206. chesendo
magiat.a... posa. 208. pulcini. 208. nascire. 209. pesce... chiaro noc. 211. della animali ch e castrano. 212. a
gran parte delle specie... cari tolto loro e tes. 213. richi... da prelibito el generare. 214. delle bestie... le une... fa tolto ettagliato lor le reto. 218. insieme cholla ira [ello avendo ipichedi figliolleti in corpo]. 219. venerdi... 220. popoli la. 221. homo. 224. chia. 225. chossi chollomo. 227. vedrassi... cfiguir. 228. chesse guairanno. 229. dun-

VOL. II.
Men will walk and not stir, they will talk to those who are not present, and hear those who do not speak.

Of a Man’s Shadow which moves with him.

Shapes and figures of men and animals will be seen following these animals and men wherever they flee. And exactly as the one moves the other moves; but what seems so wonderful is the variety of height they assume.

Of our Shadow cast by the Sun, and our Reflection in the Water at one and the same time.

Many a time will one man be seen as three and all three move together, and often the most real one quits him.

Of wooden Chests which contain great Treasures.

Within walnuts and trees and other plants vast treasures will be found, which lie hidden there and well guarded.

Of putting out the Light when going to Bed.

Many persons puffing out a breath with too much haste, will thereby lose their sight, and soon after all consciousness.

Of the Bells of Mules, which are close to their Ears.

In many parts of Europe instruments of various sizes will be heard making divers harmonies, with great labour to those who hear them most closely.

Of Asses.

The severest labour will be repaid with hunger and thirst, and discomfort, and blows, and goadings, and curses, and great abuse.

Of Soldiers on horseback.

Many men will be seen carried by large animals, swift of pace, to the loss of their lives and immediate death.

In the air and on earth animals will be seen of divers colours furiously carrying men to the destruction of their lives.

Of the Stars of Spurs.

By the aid of the stars men will be seen who will be as swift as any swift animal.

362 HUMOROUS WRITINGS. 

Del sogniare.

ANDRANNO LÌ OMENI E NÒ SI MOVERANO, PARLERANNO CO’ CHI NÒ SI TROVA, SENTIRÀNDO CHI NÒ PARLA.

Dell’ombra del sole e dello spechiarsi nell’acqua in un medesimo tepo.

Troverrassì dentro a de’ noci e deli alberi e’ altre piante tesori gràdissimi, i quali stanno occulti e ben guardati.

Delle casse che risuorano molti tesori.

Tu li metti sotto di verde e l’alberi e’ altre piante tesori gràdissimi, i quali stanno occulti e ben guardati.

Delle canpanelle de’ muli che stanno presso ai loro orecchi.

Sentirassì in molte parti dell’Europa strùrì, di varie magnitudini far diuerse armzone con grandissime fatiche di chi piv presso l’ode.

Delli asini.

Le molte fatiche saran remnverate di fame, di sete, di disagio, e di mazzate, e di piirere, e bestemie, e grà uiillanue.

De’ soldati a cauallo.

Molti sarà veduti portati da gràdì ani’ mali con veloce corso alla ruina della sua vita e prestissima morte.

Per l’aria e per la terra saranno veduti ani’ mali di diuerse colori portarne co fu’soreli li omni alla destruzione di lor vita.

Delle stelle dell’asini.

Per causa delle stelle si uedranno li omni esser velocissimi al pari di qualsìche animal veloce.
PROPHECIES.

1296.

(II bastone ch'è morto.)

Il movimento de' morti farà fugire
có dolore e piatto e có grido molti
viui.

(Dell' esca.)

Có pietra e con ferro si rende annan
visibili le cose che prima nó si vedano.

C. A. 362 & 1131, 8

(Del navigare.)

Vedrasi li alberi delle grà selue
di Távrus, e di Sinai, Apenino, e Atlante
scorrere per l'aria da oriête a occidète, da
aqulione a meridète, e porteranno per l'aria
grà moltitudine d'omini; o quáti voli! o quáti mor'ti! o quanta seperatión d'amiici e
di parèti! o quáti fèi quelli che nó rivedranno
più le loro pròvvince nè le loro patrie, e che
moriranno sanza sepoltura colle loro ossa
sparse in diversi siti del mòdo!

(Dello sgomberare l'ogni santi.)

Molti abandoneranno le propie abita-
tioni, e portarán có seco tutti e sua valsenti,
e andran'no abitare in altri paesi.

(Del di de' morti.)

E quáti fèi quelli che piägeranno i
lor'antichi morti portàdo lumi a quelli.

(De' frati che spèdendo parole; riceuono
di gràricchezze e danno il paradiso.)

Le invisibili monete farà trófave molti
spèditori di quelle.

(Degli archi fatti colli corni de'boi.)

Molti fèi quelli che per causa delle
bouine com'na moriranno di dolente morte.

(Dello scriver lettere da vn paese a vn
altro.)

Parleransi li uomini di remotissimi paesi
l'uno all'altro e rispòderàsi.

(Degli emisperi che sono infiniti e da
infinito linee son divisi, in modo che sempre
ciascuno uomo n'è una d'esse linee infra
l'ù de' piedi e l'altro.)

Parleransi e coccheransi e abbraccieran
si li omni stanti da l'uno all'altro emispero,
e tendersan i loro linguaggi.

(Of a Stick, which is dead.)

The motions of a dead thing will make
many living ones flee with pain and lamenta-
tion and cries.

(Of Tinder.)

With a stone and with iron things will
be made visible which before were not seen.

(Of going in Ships.)

Whe shall see the trees of the great forests
of Taurus and of Sinai and of the Appenines
and others, rush by means of the air, from
East to West and from North to South; and
carry, by means of the air, great multi-
tudes of men. Oh! how many vows! Oh! how many deaths! Oh! how many
partings of friends and relations! Oh! how
many will those be who will never again
see their own country nor their native land,
and who will die unburied, with their bones
strewn in various parts of the world!

(Of moving on All Saints' Day.)

Many will forsake their own dwellings
and carry with them all their belongings
and will go to live in other parts.

(Of All Souls' Day.)

How many will they be who will bewail
their deceased forefathers, carrying lights
to them.

(Of Friars, who spending nothing but words,
receive great gifts and bestow Paradise.)

Invisible money will procure the triumph
of many who will spend it.

(Of Bows made of the Horns of Oxen.)

Many will there be who will die a painful
death by means of the horns of cattle.

(Of writing Letters from one Country to
another.)

Men will speak with each other from the
most remote countries, and reply.

(Of Hemispheres, which are infinite; and
which are divided by an infinite number of
Lines, so that every Man always has one of
these Lines between his Feet.)

Men standing in opposite hemispheres will
converse and deride each other and embrace each
other, and understand each other's language.
(De' preti che dicono messe.)

40 Molti fien quelli che per esercitare la lor arte si uesrira richissi·mamente e questo parrà esser fatto secódo l'uso de' grébiail.

(De' frati confessori.)

41 Le suétrate donne di propria volontà andranno a palesare agli omini tutti le loro lussurie e opere vergognose e se·gretissime.

(Delle chiese e abitazion de' frati.)

51 Assai saranno che lascieranno essi i exerciti e le fatiche e povertà di uita e di roba, e andranno abitare nelle ricchezze e triófanti edifiti mostrando questo esser il mezzo di farsi amico a Dio.

(Del uendere il paradiso.)

64 Infinita moltitudine venderanno publicamente e pacificamente, e sì le cose di grandissimo prezzo sanza licenza del padrone di quelle, e che mai non furò loro né in lor potestà, e a questo nò provendrà la giustizia vmana.

(De' morti che si uanno a sotterrar.)

66 I semplici popoli porterà gran quantità di lumi per far lumi ne' viaggi a tutti quelli che integralmente àno perso la uirtù, e sì viaggia.

(Delle doti delle fanciulle.)

77 E doue prima la gioventù feminina nò si potea diuendere dal la lussuria e rapina de' maschi, nè per guardie di parenti né fortezze di mura, verrà tenpo che bisognierà che padri e paréti d'esse fanciulle le paghino di grà prezzi chi voglia dormire con loro, ancorché esse sien ricche, nobili, e bellissime; cierto è, par qui che la natura voglia spegnere la umana spe·tie come cosa invitics al mondo, e guastatrice di tutte le cose create.

(Della crudeltà dell'omo.)

79 Vedrannosi animali sopra della terra, quali senza combatteranno infra loro e

(Of Priests who say Mass.)

There will be many men who, when they go to their labour will put on the richest clothes, and these will be made after the fashion of aprons [petticoats].

(Of Friars who are Confessors.)

And unhappy women will, of their own free will, reveal to men all their sins and shameful and most secret deeds.

(Of Churches and the Habitations of Friars.)

Many will there be who will give up work and labour and poverty of life and goods, and will go to live among wealth in splendid buildings, declaring that this is the way to make themselves acceptable to God.

(Of Selling Paradise.)

An infinite number of men will sell publicly and unhindered things of the very highest price, without leave from the Master of it; while it never was theirs nor in their power; and human justice will not prevent it.

(Of the Dead which are carried to be buried.)

The simple folks will carry vast quantities of lights to light up the road for those who have entirely lost the power of sight.

(Of Dowries for Maidens.)

And whereas, at first, maidens could not be protected against the violence of Men, neither by the watchfulness of parents nor by strong walls, the time will come when the fathers and parents of those girls will pay a large price to a man who wants to marry them, even if they are rich, noble and most handsome. Certainly this seems as though nature wished to eradicate the human race as being useless to the world, and as spoiling all created things.

(Of the Cruelty of Man.)

Animals will be seen on the earth who will always be fighting against each other
PROPHETIES.

with the greatest loss and frequent deaths on each side. And there will be no end to their malignity; by their strong limbs we shall see a great portion of the trees of the vast forests laid low throughout the universe; and, when they are filled with food the satisfaction of their desires will be to deal death and grief and labour and wars and fury to every living thing; and from their immoderate pride they will desire to rise towards heaven, but the too great weight of their limbs will keep them down. Nothing will remain on earth, or under the earth or in the waters which will not be persecuted, disturbed and spoiled, and those of one country removed into another. And their bodies will become the sepulture and means of transit of all they have killed.

O Earth! why dost thou not open and engulf them in the fissures of thy vast abyss and caverns, and no longer display in the sight of heaven such a cruel and horrible monster.

Br. M. 42 f]

PROPHECIES.

There will be many which will increase in their destruction.

([The Ball of Snow rolling over Snow.)

There will be many who, forgetting their existence and their name, will lie as dead on the spoils of other dead creatures.

(Sleeping on the Feathers of Birds.)

The East will be seen to rush to the West and the South to the North in confusion round and about the universe, with great noise and trembling or fury.

(In the East wind which rushes to the West.)

The solar rays will kindle fire on the earth, by which a thing that is under the sky will be set on fire, and, being reflected by some obstacle, it will bend downwards.

(The Concave Mirror kindles a Fire, with which we heat the oven, and this has its foundation beneath its roof.)

... esspresso ... ciascuna. 81. parte ... an. ... 82. atterra. 83. poiché sarà passati ... dellor.84. affanno “fatiches e guerre e furie” accasualiche cosa animata “e per la loro islassurata superbia” questi. 85. malla ... gravezza “delle lor membra” gli terna. 86. resatera ... ossuto ellaqua. 87. quanta escuellenza. 88. ettransito ... iga da. 89. chome me nò tapi e precipita nell'altrre fessure. 90. palatri espeltonche e no ... dissip. 1297. 2. cresce. 3. diméthicato. 10. lesspoglie de. 13. dellocie. 14. vedrassi le parce. 15. li [trans] discorrere. 16. ochiden- tallelle me. 17. settantri. 18. visilupando. 19. cegna. 20. strepito e tremore “o furor.” 23. rali. 25. il. 26. coche, 27. riporchiosi. 29. mto ritornanza. 31. pechi. 32. acíede. 33. 36. celo. 38. o si fugira. 39. sotto ... celo. 40. ritornu
37 Gran parte del mare si fuggirà in verso il cielo e per molto tempo non farà ritorno; (Cioè pe' nuvole.)

44 Restaci il moto che separa il motore dal mobile.

49 Sarà annegato chi fa il lume al culto diuino. (Le ape che 45 fa no la cera delle candele.)

49 I morti usciranno di sotto terra e coi loro fieri mouimenti cacceranno dal mondo i misteri bili creature umane. (Il ferro uscito di sotto terra è morto, e se ne fa l'arme che 51 ammorti tanti uomini.)

54 Le grandissime montagne 56 acorache sieno remosche da marini liti, scaccierà il mare dal suo sito. (Questo sono li fumi che portano le terre, da loro leute dalle montagnie, e le scariche no ai marini liti, e dove entra la terra si fuggie il mare.)

62 L'acqua caduta dai nuvole ancora in moto sopra le spigie de' moti si fermerà per l'ultimo spazio di tempo sanza fare alcú moto, e questo accade 70 in molte e diuerse provincie. (La neve che fioca che è acqua.)

73 I gran sassi de' monti gitterà fuoco tale che brucieranno il le 73 gname di molte e gràdisseme selve e molte fere salutiches e dimestiche. (La pietra del bucile, che fa foco che consuma ma tutte le some del 86 le legnies con che si disfà le selve; E cuocerazzsi con esse la carne delle bestie.)

81 O quanti grandi edifizj fieno ruinati per causa del fuoco! (Del fuoco delle bonbarde.)

89 I buoi fieno in gran parte cavsa delle ruine delle città, e similmente cavalli e bufoli (Tirà le bonbarde.)

A great part of the sea will fly towards heaven and for a long time will not return. (That is, in Clouds.)

There remains the motion which divides the mover from the thing moved.

Those who give light for divine service will be destroyed. (The Bees which make the Wax for Candles.)

Dead things will come from underground and by their fierce movements will send numberless human beings out of the world. (Iron, which comes from under ground is dead but the Weapons are made of it which kill so many Men.)

The greatest mountains, even those which are remote from the sea shore, will drive the sea from its place.

(The Flint in the Tender-box which makes a Fire that consumes all the loads of Wood of which the Forests are despsoled and with this the flesh of Beasts is cooked.)

Oh! how many great buildings will be ruined by reason of Fire.

(The Fire of great Guns.)

Oxen will be to a great extent the cause of the destruction of cities, and in the same way horses and buffaloes

(by drawing Guns.)
1298.

The Lion tribe will be seen tearing open the earth with their clawed paws and in the caves thus made, burying themselves together with the other animals that are beneath them.

Animals will come forth from the earth in gloomy gesture, which will attack the human species with astonishing assaults, and which by their ferocious bites will make confusion of blood among those they devour.

Again the air will be filled with a mischievous winged race which willassi men and beasts and feed upon them with much noise—filling themselves with scarlet blood.

1299.

Blood will be seen issuing from the torn flesh of men, and trickling down the surface.

Men will have such cruel maladies that they will tear their flesh with their own nails. ([The Itch.])

Plants will be seen left without leaves, and the rivers standing still in their channels.

The waters of the sea will rise above the high peaks of the mountains towards heaven and fall again on to the dwellings of men. ([That is, in Clouds.])

The largest trees of the forest will be seen carried by the fury of the winds from East to West. ([That is across the Sea.])

Men will cast away their own victuals. ([That is, in Sowing.])

1300.

Human beings will be seen who will not understand each other's speech; that is, a German with a Turk.

 Fathers will be seen giving their daughters into the power of man and giving up all their former care in guarding them. ([When Girls are married.])

Men will come out their graves turned into flying creatures; and they will attack other men, taking their food from their very hand or table. ([As Flies.])

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1298. 1. vedrassi…colle unghiate 2. branche aprire la terra e nelle fatte 3. spelonche…seppellire se insieme co’ altri animali a se sottoposti.


10. Acora scorrerà per l’aria…la nefida spietà volutile, 11. la quale…assalirà i’ omni e li animali e li altri animali…ciberanno così 13. gridore; empieranno i loro vètri di verminio sangue.

1299. Vedrassi il sangue uscire dalle stracciate carni, 2. rigare le superfìtiali parti delle omìni;

1. Verrà alli omìni…tal crudel malattia, che colo proprie vnghi…si straccierannó le loro carni || (siarà la rognia;)

6. Vedrannò le piatte rimanere senza foglie, 7. e i fiumi fermare i loro corsi; 8. L’acqua del mare si leuerà sopra l’alte cime de’ monti 9. verso il cielo, e ricadera sopra all’abitazione de’ omìni || (cioè per nuvoli;)

11. Vedrannó i maggiori alberi delle selue essere 12. portati dal furor de’ venti dallassese 13. all’occidente, || (cioè per mare;)

14. Li omìni gitteràno via le propie vettovaglie || (cioè seminàno.)

1300. Verrà a tale la generatione vmana 1. che nò si intederà il parlare l’uno del’altro; 2. cioè un tedesco con un turco.

4. Vedrassì ai padri donare le lor figliole 5. a lussuría…delli omìni e premiare e abbàdonare ogni 6. passata guardia || (quando si maritano le putte.)

7. Usciràno li omìni dalle sepulture co’ uertiti 8. in vecelli; e assirannó li altri omìni togliendo 9. loro il cibo dalle propie mani e mese || (le mosche.)
1301. Many will there be who, flaying their mother, will tear the skin from her back. (Hubbandmen tilling the Earth.)

Happy will they be who lend ear to the words of the Dead. (Who read good works and obey them.)

Feathers will raise men, as they do birds, towards heaven (that is, by the letters which are written with quills.)

The works of men's hands will occasion their death. (Swords and Spears.)

Men out of fear will cling to the thing they most fear. (That is they will be miserable lest they should fall into misery.)

Things that are separate shall be united and acquire such virtue that they will restore to man his lost memory; that is papyrus [sheets] which are made of separate strips and have preserved the memory of the things and acts of men.

The bones of the Dead will be seen to govern the fortunes of him who moves them. (By Dice.)

Cattle with their horns protect the Flamme from its death. (In a Lantern.)

The Forests will bring forth young which will be the cause of their death. (The handle of the hatchet.)

1302. Men will deal bitter to blows to that which is the cause of their life. (In thrashing Grain.)

The skins of animals will rouse men from their silence with great outcries and curses. (Balls for playing Games.)

Very often a thing that is itself broken is the occasion of much union. (That is the Comb made of split Cane which unites the threads of Silk.)

The wind passing through the skins of animals will make men dance. (That is the Bag-pipe, which makes people dance.)

1. See note page 357.
1303.

(prophè西es)

1303. (De' noci battuti.)

'Quelli che avranno fatto meglio, saranno invidiosi, e i suoi figlioli troveranno i frutti che sono finiti da cattiva e violenta morte.

(Delle scolture.)

Oimè, che vedo il salvatore di novo crocifissato.

(Della bocca dell'omo ch'è sepoltura.)

Usciranno grà romori dalle sepolture di quelli che sono finiti da cattiva e violenta morte.

(Delle pelli degli animali che tengono il senso del fetore che v'è sulle scolture.)

Qua'to piv si parlerà. Colle pelli, veste del sentimento, tanto piv s'acquisterà sapètia.

(De' preti che tengono l'ostia in corpo.)

Allora tutti quasi i tabernacoli dove sta il corpus domini si vedranno manifestamente per se stessi andare per diverse strade del modo.

1304.

E quelli che pascono l'erbe farà della notte giornata; || (sevo.)

E molti terrestri e aquatici animali mòterànò fralle stelle; || (cioè pianeti.)

Vedrassi i morti portare vivi; ||

Carri e navi in diverse parti.

A molti fara tolto il cibo di bocca;

(Al forno.)

E quelli che si inboccheranno, per l'altri mania fia lor tolto il cibo di boca; || (il forno.)

1305.

(De' crocifissi vèduti.)

Io vedo di novo veduto e crocifisso Cristo e marterizzare i sua sàti.

(Il medici che uiuono de' malati.)

Verranno li omi in tanta viltà, che avrà di gratia, che altri trionfo sopra i loro malì e ovvero della perduta lor uera ricchezza, cioè la sanità.

2. arano. 3. e sua. 4. esscorticha. 5. strana. 7. ome. 8. della bocha. 9. vascira. 10. quei chesso finiti de. 11. belle. 12. tengano. 13. che vesule. 14. cholle pelleveste de. 15. chettengan. 16. vederano. 20. stesse.


1305. 2. i veda. 3. marterizar. 4. uina. 5. verano. 6. truèn. 7. ovedella. 8. richeza eon. 9. della religio.

VOL. II.
1306. (Of Children who are suckled.)

Many Franciscans, Dominicans and Benedictines will eat that which at other times was eaten by others, who for some months to come will not be able to speak.

(Of Cockles and Sea Snails which are thrown up by the sea and which rot inside their shells.)

How many will there be who, after they are dead, will putrefy inside their own houses, filling all the surrounding air with a fetid smell.

1307. (Of Mules which have on them rich burdens of silver and gold.)

Much treasure and great riches will be laid upon four-footed beasts, which will convey them to divers places.

1308. (Of the Shadow cast by a man at night with a light.)

Huge figures will appear in human shape, and the nearer you get to them, the more will their immense size diminish.

1307. It seems to me probable that this note, which occurs in the note book used in 1502, when Leonardo, in the service of Cesare Borgia, visited Urbino, was suggested by the famous pilage of the riches of the palace of Guidobaldo, whose treasures Cesare Borgia at once had carried to Cesena (see GREGOROVIVUS, Geschichte der Stadt Rom im Mittelalter, XIII, 5, 4).
(Prophecies.

1309.

(Of Snakes, carried by Storks.)
Serpents of great length will be seen at a great height in the air, fighting with birds.

(Of great guns, which come out of a pit and a mould.)
Creatures will come from underground which with their terrific noise will stun all who are near; and with their breath will kill men and destroy cities and castles.

1310.

(Of Grain and other Seeds.)
Men will fling out of their houses those victuals which were intended to sustain their life.

(Of Trees, which nourish grafted shoots.)
Fathers and mothers will be seen to take much more delight in their step-children than in their own children.

(Of the Censer.)
Some will go about in white garments with arrogant gestures threatening others with metal and fire which will do no harm at all to them.

1311.

(Of drying Fodder.)
Innumerable lives will be destroyed and innumerable vacant spaces will be made on the earth.

(Of the Life of Men, who every year change their bodily substance.)
Men, when dead, will pass through their own bowels.

1309. 1. bisce. 2. vedrassi. 3. alteza. 4. lughissimi serpenti. 5. combatere. 6. escas della. 7. vescica. 8. circostanti. 9. fiato.
1310. 1. chase. 2. assosstetti. 3. nutriscano e nesti. 4. vedrassi. 5. escas della. 6. governo. 7. figliastri. 8. uesitmete bileche. 9. arrognante. 10. medaglia. 11. colli uccelli.
1311. 1. spoglieransi innumerabili. 2. invmera. 3. aul. 4. reser. 5. gudelle. 6. de vai. 7. innumerabili.
[I 1312. 1313]

1312.

[I calzolari.]  
Men will take pleasure in seeing their own work destroyed and injured.

1313.

[Shoemakers.]  
The time of Herod will come again, for the little innocent children will be taken from their nurses, and will die of terrible wounds inflicted by cruel men.

S. K. M. II.2; 69a

[Of Kids.]  
The time of Herod will come again, for the little innocent children will be taken from their nurses, and will die of terrible wounds inflicted by cruel men.

S. K. M. II.2; 69a

1312. 1–3 R. 2. vederà chò. 3. disfare.
1313. 2. [saràn tolù] ritornerà. 3. perche [i pì]. 4. li nociùi figiùi. 7. gra.
V.

DRAUGHTS AND SCHEMES FOR THE HUMOROUS WRITINGS.

FAUOLA.

The crab standing under the rock to catch the fish which crept under it, it came to pass that the rock fell with a ruinous downfall of stones, and by their fall the crab was crushed.

QUEL MEDESIMO.

The spider, being among the grapes, caught the flies which were feeding on those grapes. Then came the vintage, and the spider was cut down with the grapes.

1314.

The ball of snow when, as it rolls, it descends from the snowy mountains, increases in size as it falls.

The willow, which by its long shoots hopes as it grows, to outstrip every other plant, from having associated itself with the vine which is pruned every year was always crippled.
HUMOROUS WRITINGS.

Fauola della lingua morsa dai dòti.

Il ciedro insuperbito dalla sua bellezza  
dubita delle piante che li sò dìtorno, e fat-
tole si torre dinanzi; il ucto poi non es-
se1do interrotto, lo gittò per terra diradico-
cato.

La uitalba non stàdo còteta nella sua
siepe, commòciò a passare coi sua rami la
\omme strada e appicarsi all'opposta
siepe; donde da íiàdanti poi fu rotta.

Fable of the tongue bitten by the teeth.
The cedar puffed up with pride of its
beauty, separated itself from the trees around
it and in so doing it turned away towards
the wind, which not being broken in its fury,
flung it uprooted on the earth.

The traveller's joy, not content in its
hedge, began to fling its branches out over the
high road, and cling to the opposite hedge,
and for this it was broken away by the passers by.

Il calderugio dà la vittouaglia  
ai figliuoli ingabbiati; — pri'ima morte che perdere lib-
bertà.

The goldfinch gives victuals to its caged
young. Death rather than loss of liberty.

Le capre còdur3rano il uino alle  
città.

Goats will convey the wine to the city.

Tutte le cose che nel uerno fìe  
nascoste sotto la neve rimarano scoperte e palesi
nell'estate; (detta per la bugia che nò può
stare occultata.)

All those things which in winter are
hidden under the snow, will be uncovered
and laid bare in summer. (for Falsehood,
which cannot remain hidden.)

Il giglio si pose sopra la ripa di  
Tessino, e la corrette tirò la ripa ísieme col
lilio.

The lily set itself down by the shores
of the Ticino, and the current carried away
bank and the lily with it.

Perchè li Ungheri têgono la croce  

dvppia.

Why Hungarian ducats have a double
cross on them.

1316. Above this text is another note, also referring to liberty; see No. 694.
COPARATIONE.

A simile.

A vase of unbaked clay, when broken, may be remoulded, but not a baked one.

Seeing the paper all stained with the deep blackness of ink, it he deeply regrets it; and this proves to the paper that the words, composed upon it were the cause of its being preserved.

The pen must necessarily have the penknife for a companion, and it is a useful companionship, for one is not good for much without the other.

The knife, which is an artificial weapons, deprives man of his nails, his natural weapons.

The mirror conducts itself haughtily holding mirrored in itself the Queen. When she departs the mirror remains there...

Flax is dedicated to death, and to the corruption of mortals. To death, by being used for snares and nets for birds, animals and fish; to corruption, by the flaxen sheets in which the dead are wrapped when they are buried, and who become corrupt in these winding sheets.—And again, this flax does not separate its fibre till it has begun to steep and putrefy; and this is the flower with which garlands and decorations for funerals should be made.

Shadows will come from the East which will blacken with great colour darkness the sky that covers Italy.

All men will take refuge in Africa.
1327.

Per il pannilino che si 2tiè colla mano nel co7rso dell'acqua correttamente, nella quale acqua 3il panno lascia 4tutte le sue brutture, significa 5questo ecc. 

9Per lo spino inscritto 6gli sopra boni frutti significa quel'illo che per se non è da disposto a vir 8tù, ma median 9te l'aiuto dei primi ecettori da di se 10vn fassi nome vir 11tù.

1328.

A COMMON THING.

A wretched person will be flattered, and these flatterers are always the deceivers, robbers and murderers of the wretched person.

The image of the sun where it falls appears as a thing which covers the person who attempts to cover it.

(Money and Gold.)

Out of cavernous pits a thing shall come forth which will make all the nations of the world toil and sweat with the greatest torments, anxiety and labour, that they may gain its aid.

(Of the Dread of Poverty.)

The malicious and terrible [monster] will cause so much terror of itself in men that they will rush together, with a rapid motion, like madmen, thinking they are escaping her boundless force.

(Of Advice.)

The man who may be most necessary to him who needs him, will be repaid with ingratitude, that is greatly contemned.

W. XXXI

(Of Bees.)

They live together in communities, they are destroyed that we may take the honey from them. Many and very great nations will be destroyed in their own dwellings.

1327. 1-18 R. 1. panolino chessi. 3. acq 122. 5. pano lascia. 7. significha. 9. losspino insidio. 11. significha. 13. disposto.

1328. 1. vcomune. 2. mescian. 4. messciano. 5. percusione. 6. aparirà . cedrera. 7. dailie. 9. vescia delle. 10. effatichare 

1329. 2. vivano apopolì enisimo. 3. anegate. 5. [co] gati nelle loro prospie. 6. [sì some] sarà se.
PERCHÉ LI CANI ODORÀ VOLENTIERI IL CULO L'UNO ALL'ALTRO.

Questo animale à in odio io po' veri, perché e' magiano tristi cibi; e ama li richi, perché essi à' bone vivâ' ede massime di carne; E lo sterco deli animali sempre ri-
diene della virtù della sua origine, come mo' strano le feccie . . . .

10 Ora li cani anno si sottilissimo odos' rato che col naso sentono la virtù rimasta in tali feccie; e che sie uero, se le trovâ 'per le strade odorano, e se vi sentono dentro visità di carne o d'altro, essi li pigliano, e se no, li lasciano; e per tornare al quesito di ò caso, che se conoscono il cane mediante tali odorì essere ben pas-
uito, essi lo riguar'dano, perché stimano quello avere potèt e ricco pa'drone, e se no sentono tale odore cò virtù, essi sti'mano tal cane essere da poco, e avere povero è tristo padrone, e però mordono tali cani come fare bù'bbere il suo padrone.

C. A. 684; 2034]

SONO LI MOTI DELLA TERRA 4 CIRCULARI ASSAI VITI, li codiosiaché mai li omini si fer-
mano; e fà'si in piov modi, de' qua'li nell'uno li omini portano la terra in spalla, l'altro, colli bau'li, e altri col carretto; Quel che la portà in spalla si fa prima empire il uac'soi in ter'stra, e perde tepo a metterselo in spalla; Quel dello bau'se non perde tempo.

Tr. 24]


1331. 3. codossià. 4. efla. 6. por'ti. 7. inispal. 8. collebian. 9. le e . carrè. 10. chella. 11. inispala. 12. inispalla . della ban. 13. la non.

1332. 1. petrarcha . laur [iii]. 2. percheggie e bò . e ten [iii]. . 3. i no . giilce.

1333. The subject of this text has apparently no connection with the other texts of this section.

1334. Conte Porro has published these lines in the Archivio Stor. Lombardia VIII, IV; he reads the concluding line thus: I no posso di loro più (sic) co' far tesaro.—This is known to be by a contemporary poet, as Senatore Morelli informs me.
We are two brothers, each of us has a brother. Here the way of saying it makes it appear that the two brothers have become four.

C. 198

GIOCHI DI PARTITO.

2Mettri in 2 mani equali numeri; metti 4 della mà 3 destra nella sinistra ||gitta via il rimanète ||gitta via altrettânto della man sinistra ||metti vi sopra 5; ora tu ti trovi 5 in quella mano 13 ||cicò io vi ti feci mettere 4 dalla destra nella sinistra, e gittar via il rimanète; ora qui la mà destra à piv 4 che là 7 nò sonovi; io ti fo poi gittar via altrettânto dalla destra quâto tu 8gittasti dalla sinistra, che gittando dalle 2 mani due quàtità e’quali, il rimanente fia equale; ora e’ti resta 4 e 4, che fa 8, 10 e perciò il gioco nò sia conosciuto io vi ti feci mettere sopra 5 11 che fece 13.

GIOCHI DI PARTITO.

13Togli da 12 in giù che numero ti piace; togli poi tâti de’ mia che 14 tu finisca il numero di 12, e quel che rimane a me è 15 il numero che tu aveui prima; perché quâdo io ti dissi to16gli da 12 in giù quel numero ti piace, io mi missi in mano 17 12, e di questo mio 12 tu togliesti tale numero, che tu 18 facesti il tuo numero 12; ecco che tu cresciesti al tuo numero 12 merco che tu togliesti al mio; cicò che se tu aveui 8, a andare insino 20 in 12, tu togliesti del

1333. 1. nosiamo... classcu. 2. quì el.
1334. 3. destra. 4. tutti trovi. 5. coe... della destra. 6. chella. 7. soneva... desstra. 8. gittasti... sinistra. 9. ressta... cheffa. 10. gocho... cogossecco... fees. 11. chefece. 12. givochi di part... "to". 13. polii. 14. tu finisca... eque... ammehe. 15. chettu prima tu perche. 16. ingu. 17. questo mi 12 tu togliesti... chettu. 18. faciessi... chettu cresciessi. 19. mero tu togliesti... coessettu. 8. andare. 20. togliesti. 21. atte... ressta. 22. e he quale... chello faciessi.

1334. G. Govi says in the 'Saggio' p. 22: Si dilêto Leonardo di giuochi di prestigia e molti (?) ne descrisse, che si leggono poi riportati dal Paciolo nel suo libro: de Viribus Quantitatis, e che, se non tutti, sono certo in gran parte inventions del Vinci.
mio 12 vn. 4; onde quel 4 trasmutâtato da me a te fa che'l mio 12 resta 8, c'èl tuo 8 si fa 12; adunque il mio 8 è eguale al tuo 8 innanzi, che lo facesse 12.

4 transferred from me to you reduced my 12 to a remainder of 8, and your 8 became 12; so that my 8 is equal to your 8, before it was made 12.

If you want to teach someone a subject you do not know yourself, let him measure the length of an object unknown to you, and he will learn the measure you did not know before;—Master Giovanni da Lodi.

Se tu vuoi insegnia're a vno·vna cosa che tu·nò sappia, falli misurare la lunghezza d'una cosa a te incogniata, e lui saprà la mìsura che tu prima no sa-peu; — maestro Gio'vanni da Lodi.

1335. 1. settu volli insegni. 3. chettu sapia. 4. lungheza. 5. atte. 6. ellui. 7. chettu. 8. maestro. 9. dallodi.
XXI.


When we consider how superficial and imperfect are the accounts of Leonardo's life written some time after his death by Vasari and others, any notes or letters which can throw more light on his personal circumstances cannot fail to be in the highest degree interesting. The texts here given as Nos. 1351—1353, set his residence in Rome in quite a new aspect; nay, the picture which irresistibly dwells in our minds after reading these details of his life in the Vatican, forms a striking contrast to the contemporary life of Raphael at Rome.

I have placed foremost of these documents the very remarkable letters to the Defterdar of Syria. In these Leonardo speaks of himself as having staid among the mountains of Armenia, and as the biographies of the master tell nothing of any such distant journeys, it would seem most obvious to treat this passage as fiction, and so spare ourselves the onus of proof and discussion. But on close examination no one can doubt that these documents, with the accompanying sketches, are the work of Leonardo's own hand. Not merely is the character of the handwriting his, but the spelling and the language are his also. In one respect only does the writing betray any marked deviation from the rest of the notes, especially those treating on scientific questions; namely, in these observations he seems to have taken particular pains to give the most distinct and best form of expression to all he had to say; we find erasures and emendations in almost every line. He proceeded, as we shall see, in the same way in the sketches for letters to Giuliano de' Medici, and what can be more natural, I may ask, than to find the draft of a letter thus altered and improved when it is to contain an account of a definite subject, and when personal interests are in the scale? The finished copies as sent off are not known to exist; if we had these instead of the rough drafts, we might unhesit-
tatingly have declared that some unknown Italian engineer must have been, at that
time, engaged in Armenia in the service of the Egyptian Sultan, and that Leonardo had
copied his documents. Under this hypothesis however we should have to state that this
unknown writer must have been so far one in mind with Leonardo as to use the same
style of language and even the same lines of thought. This explanation might—as I
say—have been possible, if only we had the finished letters. But why should these rough
drafts of letters be regarded as anything else than what they actually and obviously are? If Leonardo had been a man of our own time, we might perhaps have attempted
to account for the facts by saying that Leonardo, without having been in the East him-
self, might have undertaken to write a Romance of which the scene was laid in Armenia,
and at the desire of his publisher had made sketches of landscape to illustrate the text.

I feel bound to mention this singular hypothesis as it has actually been put for-
ward (see No. 1336 note 5); and it would certainly seem as though there were no other
possible way of evading the conclusion to which these letters point, and their bearing
on the life of the master,—absurd as the alternative is. But, if, on a question of such
importance, we are justified in suggesting theories that have no foundation in probability,
I could suggest another which, as compared with that of a Fiction by Leonardo, would
be neither more nor less plausible; it is, moreover the only other hypothesis, perhaps,
which can be devised to account for these passages, if it were possible to prove that the
interpretation that the documents themselves suggest, must be rejected a priori; viz
may not Leonardo have written them with the intention of mystifying those who, after
his death, should try to decipher these manuscripts with a view to publishing them?
But if, in fact, no objection that will stand the test of criticism can be brought against
the simple and direct interpretation of the words as they stand, we are bound to regard
Leonardo's travels in the East as an established fact. There is, I believe nothing in
what we know of his biography to negative such a fact, especially as the details of his
life for some few years are wholly unknown; nor need we be at a loss for evidence which
may serve to explain—at any rate to some extent—the strangeness of his undertaking
such a journey. We have no information as to Leonardo's history between 1482 and
1486; it cannot be proved that he was either in Milan or in Florence. On the other
hand the tenor of this letter does not require us to assume a longer absence than a year
or two. For, even if his appointment (officio) as Engineer in Syria had been a perma-
nent one, it might have become untenable—by the death perhaps of the Defterdah, his
patron, or by his removal from office—, and Leonardo on his return home may have
kept silence on the subject of an episode which probably had ended in failure and
disappointment.

From the text of No. 1379 we can hardly doubt that Leonardo intended
to make an excursion secretly from Rome to Naples, although so far as has hitherto
been known, his biographers never allude to it. In another place (No. 1077) he says that
he had worked as an Engineer in Friuli. Are we to doubt this statement too, merely
because no biographer has hitherto given us any information on the matter? In the
geographical notes Leonardo frequently speaks of the East, and though such passages
afford no direct proof of his having been there, they show beyond a doubt that, next to the Nile, the Euphrates, the Tigris and the Taurus mountains had a special interest in his eyes. As a still further proof of the futility of the argument that there is nothing in his drawings to show that he had travelled in the East, we find on Pl. CXX a study of oriental heads of Armenian type,—though of course this may have been made in Italy.

If the style of these letters were less sober, and the expressions less strictly to the point throughout, it might be possible to regard them as a romantic fiction instead of a narrative of fact. Nay, we have only to compare them with such obviously fanciful passages as No. 1354, Nos. 670—673, and the Fables and Prophecies. It is unnecessary to discuss the subject any further here; such explanations as the letter needs are given in the foot notes.

The drafts of letters to Lodovico il Moro are very remarkable. Leonardo and this prince were certainly far less closely connected, than has hitherto been supposed. It is impossible that Leonardo can have remained so long in the service of this prince, because the salary was good, as is commonly stated. On the contrary, it would seem, that what kept him there, in spite of his sore need of the money owed him by the prince, was the hope of some day being able to carry out the project of casting the 'gran cavallo'.

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Al Diodario di Siria locotenente del Sacro Sultano di Babylonia.

Il nuovo accidete accaduto in queste nostre parti settentrionali, il quale so certo che no solamente a te ma a tutto l'universo

1336.

TO THE DEVATDAR OF SYRIA, LIEUTENANT OF THE SACRED SULTAN OF BABYLON.

[3] The recent disaster in our Northern parts which I am certain will terrify not you alone but the whole world, which

1336. 1. sotto. 3. [asca ri] "doto" [vono] "il nuovo" accidete | "achaduto" in queste . parte settentrionali [le quali sol] "il

1336. Lines 1—52 are reproduced in facsimile on Pl. CXVI.

1. Diodario. This word is not to be found in any Italian dictionary, and for a long time I vainly sought an explanation of it. The youthful reminiscences of my youth afforded the desired clue. The chief town of each Turkish Vilayet, or province—such as Broussa, for instance, in Asia Minor, is the residence of a Defterdar, who presides over the financial affairs of the province. Defterdar hanc was, in former times, the name given to the Ministry of Finance at Constantinople; the Minister of Finance to the Porte is now known as the Maliit-Nauri and the Defterdars are his subordinates. A Defterdar, at the present day is merely the head of the finance department in each Provincial district. With regard to my suggestion that Leonardo's Diodario might be identical with the Defterdar of former times, the late M. C. DEFRÉMÉRIE, Arabic Professor, and Membre de l'Institut de France wrote to me as follows: Votre conjecture est parfaitement fondée; diodario est l'équivalent de deftardar ou plus exactement défendar, titre d'une importante dignité en Egypte, sous les Mamelouks.

The word is however not of Turkish, but of Perso-Arabic derivation. دهستر دار (Persian) literally Defter (Arabic) meaning fakir; for dar (Persian) Book-keeper or holder is the English equivalent; and the idea is that of a deputy in command. During the Mamalook supremacy over Syria, which corresponded in date with Leonardo's time, the office of Defterdar was the third in importance in the State.

Sultano di Babylonia. The name of Babylon was commonly applied to Cairo in the middle ages. For instance BREIDENBACH, Itinerarium Hierosolyma p. 218 says: "At last we reached Babylon. But this is not that Babylon which stood on the further shore of the river Chobor, but that which is called the Egyptian Babylon. It is close by Cairo and the twain are but one and not two towns: one half is called Cairo and the other Babylon, whence they are called together Cairo-Babylon; originally the town is said to have been named Memphis and then Babylon, but now it is called Cairo." Compare No. 1085, 6. Egypt was governed from 1382 till 1517 by the Borgite or Tcherkessian dynasty of the Mamalook Sultans. One of the most famous of these, Sultan Kaft Bey, ruled from 1468—1496 during whose reign the Gama (or Mosque) of Kaft Bey and tomb of Kaft Bey near the Okella Kaft Bey were erected in Cairo, which preserve his name to this day. Under the rule of this great and wise prince many foreigners, particularly Italians, found occupation in Egypt, as may be seen in the 'Viaggio di Josaphat Barbaro', among other travellers. "Next to Leonardo (so I learn from Prof. Jac. Burckhardt of Bâle) Kaft Bey's most helpful engineer was a German C.C.C.
who in about 1487 superintended the construction of the Mole at Alexandria. Felix Fabri knew him and mentions him in his *Historia Sacerworum*, written in 1488."

3. *Il nuovo accaduto, or as Leonardo first wrote and then erased, è accaduto un nuovo accadente.* From the sequel this must refer to an earthquake, and indeed these were frequent at that period, particularly in Asia Minor, where they caused immense mischief. See No. 1101 note.

4. The text here breaks off. The following lines are a fresh beginning of a letter, evidently addressed to the same person, but, as it would seem, written at a later date than the previous text. The numerous corrections and amendments amply prove that it is not a copy from any account of a journey by some unknown person; but, on the contrary, that Leonardo was particularly anxious to choose such words and phrases as might best express his own ideas.

5. *Parti d'Erminia.* See No. 945, note. The extent of Armenia in Leonardo's time is only approximately known. In the XVth century the Persians governed the Eastern, and the Arabs the Southern portions. Arabic authors—as, for instance, Abulfeda—include Cilicia and a part of Cappadocia in Armenia, and Greater Armenia was the tract of that country known later as Turcomania, while Armenia Minor was the territory between Cappadocia and the Euphrates. It was not till 1522, or even 1574 that the whole country came under the dominion of the Ottoman Turks, in the reign of Selim I.

The Mameluk Sultans of Egypt seem to have taken a particular interest in this, the most Northern province of their empire, which was even then in danger of being conquered by the Turks. In the autumn of 1477 Sultan Kaft Bey made a journey of inspection, visiting Antich and the valleys of the Tigris and Euphrates with a numerous and brilliant escort. This tour is briefly alluded to by Moodshirè'eddin p. 561; and by Well, *Geschichte der Abbasiden V*, p. 338. An anonymous member of the suite wrote a diary of the expedition in Arabic, which has been published by R. V. Lanzone (*Viaggio in Palestina e Soria di Kaid la XVIII sultano della II dinastia mamei-euca, fatto nel 1477*, *Testo arabo. Torino 1878*, without notes or commentary). Compare the critique on this edition, by J. Gildehnuister in *Zeitschrift des Deutschen Palastina Vereins* (Vol. III p. 246—249). Lanzone's edition seems to be no more than an abridged copy of the original. I owe to Professor Schéfer, Membre de l'Institut, the information that he is in possession of a manuscript in which the text is fuller, and more correctly given. The Mameluk dynasty was, as is well known, of Circassian origin, and a large proportion of the Egyptian Army was recruited in Circassia even so late as in the XVIth century. That was a period of political storms in Syria and Asia Minor and it is easy to suppose that the Sultan's minister, to whom Leonardo addresses his report as his superior, had a special interest in the welfare of those frontier provinces. Only to mention a few historical events of Sultan Kaft Bey's reign, we find that in 1488 he assisted the Circassians to resist the encroachments of Aladdoulet, an Asiatic prince who had allied himself with the Osmanli to threaten the province; the consequence was a war in Cilicia by sea and land, which broke out in the following year between the contending powers. Only a few years earlier the same province had been the scene of the so-called Caramenian war in which the united Venetian, Neapolitan and Slavonic fleets had been engaged. (See Corialano Cippico, *Della guerra dei Venetian nell'Ara di 1469—1474*, Venezia 1796, p. 54) and we learn incidentally that a certain Leonardo Boldo, Governor of Scutari under Sultan Mahmoud,—as his name would indicate, one of the numerous renegades of Italian birth—played an important part in the negotiations for peace.

Tu mi mandasti. The address *tu* to a personage so high in office is singular and suggests personal intimacy; Leonardo seems to have been a favourite with the Dodiario. Compare lines 54 and 55.

I have endeavoured to show, and I believe that I am also in a position to prove with regard to these texts, that they are draughts of letters actually written by Leonardo; at the same time I must not omit to mention that shortly after I had discovered
nistro, entrai nella città di Calindra, vicina ai nostri confini; questa città è posta nelle spiagge di quella parte del moto Tavro, che è diuisa dall' Eufrates e riguarda i corni del grā Tavro per ponente; questi corni son di tanta alta che par che tocchin al cielo, ch'ell' universo non è parte terrestre più alta della sua cima; e sempre 4 ore inanzi di è per

the city of Calindra[7], near to our frontiers. This city is situated at the base of that part of the Taurus mountains which is divided from the Euphrates and looks towards the peaks of the great Mount Taurus[8] to the West[9]. These peaks are of such a height that they seem to touch the sky, and in all the world there is no part of the earth, higher than its summit[10], and the rays of

di chalindra... confini [e] questa... ispegga [del m] di quel. 8. diuisa [dal lago] dallesufrates [essa per e] e riguarda i [grā] corni del "grā". 9. altura [che lo per me non credo] "che par chetochino il celo" che nell' universo [si] "none" parie. 10. ste pìv al della... essepre... di [alii] e perchossa... sole [che alie si nostra]. II. lesere... 

these texts in the Codex Atlanticus and published a paper on the subject in the Zeit- schrift für bildende Kunst (Vol. XVI), Prof. Govi put forward this hypothesis to account for their origin.

"Quanto alle notizie sul monte Tauro, sull'Armenia e sull'Asia minore che si contengono negli altri frammenti, esse vanno prese da qualche geografo o viaggiatore contemporaneo. Dall'indice imperfetto che accompagna questi frammenti, si potrebbe dedurre che Leonardo volesse farne un libro, che poi non venne compiuto. A ogni modo, non è possibile di trovare in questi brani nessun indizio di un viaggio di Leonardo in oriente, né della sua conversazione alla religione di Mosametto, come qualcuno pretenderrebbe. Leonardo amava con passione gli studi geografici, e ne suoi scritti s'incontran spesso itinerari, indicazioni, o descrizioni di luoghi, schizzi di carte e abboni topografici di varie regioni, non ì quindi strano che egli, obile narratore conteva, si fosse proposito di scrivere una specie di Romano in forma episodica sviluppendo l'intreccio nell'Asia Minore, intorno alla quale i libri d'allora, e fors'è qualche viaggiatore amico suo, gli avevano somministrato alcuni elementi più o meno fantasistici. (See Tratanti della Reale Accademia de Lincei Vol. V Ser. 3).

It is hardly necessary to point out that Prof. Govi omits to name the sources from which Leonardo could be supposed to have drawn his information, and I may leave it to the reader to pronounce judgment on the anomaly which is involved in the hypothesis that we have here a fragment of a Romance, cast in the form of a correspondence. At the same time, I cannot but admit that the solution of the difficulties proposed by Prof. Govi is, under the circumstances, certainly the easiest way of dealing with the question. But we should then be equally justified in supposing some more of Leonardo's letters to be fragments of such romances; particularly those of which the addresses can no longer be named. Still, as regards these drafts of letters to the Diadario, if we accept the Romance theory, as proposed by Prof. Govi, we are also compelled to assume that Leonardo purposed from the first to illustrate his tale; for it needs only a glance at the sketches on Pl. CXVI to CXIX to perceive that they are connected with the texts; and of course the rest of Leonardo's numerous notes on matters pertaining to the East, the greater part of which are here published for the first time, may also be somehow connected with this strange romance.

7. Città de Calindra (Chalindra). The position of this city is so exactly determined, between the valley of the Euphrates and the Taurus range that it ought to be possible to identify it. But it can hardly be the same as the sea port of Cilicia with a somewhat similar name Celenderis, Kelandria, Celendria, Kilindria, now the Turkish Gulnar. In two Catalanian Portulans in the Bibliothèque Nationale in Paris—one dating from the XVth century, by Wilhelm von Soler, the other by Olivez de Majorca, in 1584—I find this place called Calandra. But Leonardo's Calindra must certainly have lain more to the North West, probably somewhere in Kurdistan. The fact that the geographical position is so carefully determined by Leonardo seems to prove that it was a place of no great importance and little known. It is singular that the words first written in l. 8 were divisa dal lago (Lake Van?), altered afterwards to dall'Eufrates.

Nostri confini, and in l.46 proposto nostro. These refer to the frontier and to the affairs of the Mamelook Sultan. Lines 65 and 66 throw some light on the purpose of Leonardo's mission.

8. I corni del grā mite Tauro. Compare the sketches Pl. CXVI—CXVIII. So long as it is impossible to identify the situation of Calindra it is most difficult to decide with any certainty which peak of the Taurus is here meant; and I greatly regret that I had no foreknowledge of this puzzling topographical question when, in 1876, I was pursuing archaeological enquiries in the Provinces of Aleppo and Cilicia, and had to travel for some time in view of the imposing snow-peaks of Bulghar Dagh and Ala Tepessi.

9—10. The opinion here expressed as to the height of the mountain would be unmeaning, unless it had been written before Leonardo moved to Milan, where Monte Rosa is so conspicuous an
cossa dai razzi del sole in oriéte; e per essere lei di pietra biaèhissima, essa forte risplende, e fa l’ufitio a questi Ermini come farebbe vn bel lume di luna nel mezzo delle tenebri; e per la sua grande altarza essa passa la somma altezza de’ nuvoli per spazio di 4 miglia; e per linia retta questa cima è ueduta di grà parte dell’occidente alluminata dal sole dopo il suo tramontare insino alla 3a parte della notte; ed è quella che appresso di noi te’ tempi sereni abbiano già giudicato essere una cometa, e pare a noi nelle 15 tenebre della notte mv-tarsi in varie figure, e quàdo diuidersi in due o in 3 parti, e quàdo lúga e quàdo corta; e questo nasce per li 12 nuvoli che nel orizzonte del cielo s’interpongono infra parte d’esso monte e il sole, e per tagliare l’uno essi razzi solari, il lume del monte è interrotto con vari spazi di nvolvi, e però è di figvra uaria18bile nel suo splendore.

DIVISIONE DEL LIBRO.

20 La predica e persuasione di fede;
21 La subita inoàdazione insin al 24 fine suo;
23 La ruina della città;
24 La morte del popolo e disperazione;
26 La cerca del predica soore e la sua liberazione e benivolentia;
29 Descrzione della causà di tal ruina del monte;
31 Il danno ch’ella fece;

[essa] “essa forte risplende é’ fa acquesto chome alza de’ nuvoli per [più di 4 miglia] “per inspazio di 4 miglia” a per [per 13 ueduta [prima per] di doll’occhidentale [pi] allumi. 14. e “minò alla 3 parte della notte” de quella che apresso div[er] e tempi; abbi ga gudicato; cu meta; anni. 15. mv-tarsi varie e equiùo parti “e equiùo lúga eequo corta” ec. essere nascisse. 16. aoi. ori zonti; celo sinterpongano; esole; essira. 17. llume; monte he; varri [e] spazi; nvogli. 24 popolo [el suo píato]. 26 la [cofermatio] la cerca. 27 ella; venivo. 35. alagamentó; parte. 40. profeta [mostra]; che eis wanting.

object in the landscape. 4 ore inanui seems to mean, four hours before the sun’s rays penetrate to the bottom of the valleys.

11. Pietra bianchissima. The Taurus Mountains consist in great part of limestone.

14. Appresso di voi. Leonardo had at first written noi as though his meaning had been: This peak appeared to us to be a comet when you and I observed it in North Syria (at Aleppo? at Alisás?). The description of the curious reflection in the evening, resembling the “Alpine-glow” is certainly not an invented fiction, for in the next lines an explanation of the phenomenon is offered, or at least attempted.

19. The next 33 lines are evidently the contents of a connected Report or Book, but not of one which he had at hand; more probably, indeed, of one he purported writing.

20. Persuasione de fede. The Mohammedan or the Mohammedan faith? We must suppose the latter, at the beginning of a document addressed to so high a Mohammedan official. Predica probably stands as an abbreviation for predicazione (lat. praedicatione) in the sense of praise or glorification; very probably it may mean some such initial doxology as we find in Mohammedan works. (Comp. l. 40.)

26. 28. The phraseology of this is too general for any conjecture as to its meaning to be worth hazarding.

30. Ruina del monte. Of course by an earthquake. In a catalogue of earthquakes, entitled kef asusil saatik an awag tash-alik, and written by Djelal eddin

**FIGURA DEL MÒTE TAVRO.**

54. Non sono, o Diodario, da essere da te inputato di pigritia come le tue ràpogne par che accennino, ma lo isfrenato amore, il quale ha creato il beneficio ch'io posseggo da te, è quello, che mi a costretto co' somma sollecitudine a cercare e cò diligenzia a investigare la causà di si grande e stupendo effetto; la qual cosa no sanza tèpo a potuto avere effetto; ora, per farti ben satffatto della causa di si grande effetto, è necessario ch'io ti mostri la forma del sito, e poi verrò allo effetto del quale credo rimarrài satffato;

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**Syouthy,** the following statement occurs: “In the year 889 (1484 A.D.) there were six shocks of earth-quake at Aleppo. They were excessively violent and threw the inhabitants into consternation.” I owe this communication to the kindness of Prof. Ch. Schéfer, Membre de l’Institut, to whom this unpublished Arabic MS. belongs. The foregoing entries refer to two earthquakes in Cairo, in 1476 and 1481: the following ones indicate a time at which Leonardo was, certainly, living in Milan.

36. **Tagliata di Monte Tavro.** The Ephrathas flows through the Taurus range near the influx of the Kura Shai; it rushes through a rift in the wildest cliffs from 2000 to 3000 feet high and runs on for 90 miles in 300 falls or rapids till it reaches Telék, near which at a spot called Giekásh, or the Hart’s leap, it measures only 35 paces across. Compare the map on Pl. CXIX and the explanation fo it on p. 391.

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[32] Fall of snow.  
The finding of the prophet.  
His prophesy.  
[35] The inundation of the lower portion of Eastern Armenia, the draining of which was effected by the cutting through the Taurus Mountains.  
How the new prophet showed that this destruction would happen as he had foretold.  
Description of the Taurus Mountains and the river Ephrathas.  
Why the mountain shines at the top, from half to a third of the night, and looks like a comet to the inhabitants of the West after the sunset, and before day to those of the East.  
Why this comet appears of variable forms, so that it is now round and now long, and now again divided into two or three parts, and now in one piece, and when it is to be seen again.

**OF THE SHAPE OF THE TAURUS MOUNTAINS.**

I am not to be accused, Oh Devatdar, of idleness, as your chidings seem to hint; but your excessive love for me, which gave rise to the benefits you have conferred on me is that which has also compelled me to the utmost painstaking in seeking out and diligently investigating the cause of so great and stupendous an effect. And this could not be done without time; now, in order to satisfy you fully as to the cause of so great an effect, it is requisite that I should explain to you the form of the place, and then I will proceed to the effect, by which I believe you will be amply satisfied.

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40. **New profeta, l. 33. profeta.** Mohammed. Leonardo here refers to the Koran:  
*In the name of the most merciful God.—When the earth shall be shaken by an earthquake; and the earth shall cast forth her burdens; and a man shall say, what aileth her? On that day the earth shall declare her tiltings, for that thy Lord will inspire her. On that day men shall go forward in distinct classes, that they may behold their works. And whoever shall have wrought good of the weight of an ant, shall behold the same. And whoever shall have wrought evil of the weight of an ant, shall behold the same. (The Koran, translated by G. Sale, Chapter XCIX, p. 452).*

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53–94. The facsimile of this passage is given on Pl. CXVII.

54. The foregoing sketch of a letter, lines 5–18, appears to have remained a fragment when Leonardo received pressing orders which caused
59 Nò ti dolere, o Diodario, del mio tardare a dar risposta alla tua desiderosa richiesta, perché queste cose, di che tu mi richiedevi, son di natura che nò può essere espresso in tempo si possono bene esprimere, e massime perché, a voler mostrare la causa di questo grande effetto, bisogna descrivere co' quali modi si forma la natura del sito, e mediante quella tu potrai poi co' facilità satisfatti della predetta richiesta.

60 Jo lascierò indietro la descrizione della forma dell'Asia Minore, e che mari o terre sien quelle che terminono la figura della sua quiete, perché so che la diligentia e sollecitudine de'tua studi non t'anno di tal notizia privato; e verrò a denotare la vera figura di Taurus Mòte, il quale è quello che è cavatore di si stupenda e danosa maraviglia, la quale serue alla spedizione del nostro proposito; Questo monte Tavro è quello che appresso di molti è detto essere il giogo del Monte Cavaso, ma, avendo voluto ben chiaririmi, è voluto parlare con alquali di quelli che abitano sopra del Mar Caspio, i quali mostrano che quel sia il vero Mòte Cavaso, che, benché i molti loro abbino il medesimo nome, questi son di maggiore altura, e però còsermano, perché Cavaso in lingua Séatica vuol dire somma altezza, e in ver non c'è notizia che l'oriête ne l'occidente abbia monte di si grande altura; e la prova, che così sia, è che li abitatori de' paesi, che gli stanno per ponète, vedono i razi del sole che alluminia insino alla quarta parte delle maggior notti grà parte della sua cima, e'il simile fa a quelli paesi che gli stanno per oriête.

QUALITÀ E QUANTITÀ DEL MÔTE TAVRO.

71 L'onbra di questo giogo del Tauro è di tanta altura che, quado di mezzo giugno il sole è a mezzo giorno, la sua obìa s'a-

59-62. This passage was evidently intended as an improvement on that immediately preceding it. The purport of both is essentially the same, but the first is pitched in a key of ill-disguised annoyance which is absent from the second. I do not see how these two versions can be reconciled with the romance-theory held by Prof. Govi.

68. Cavaso; Herodot Καυσαος; Armen. Kakhaz.
73-75. The statements are of course founded on those of the 'inhabitants' spoken of in l. 67.
74. etende insino al principio della Sarmatia, che sò giornate 12, e a mezzo dicembre s’astende insino ai mobi Iperborei, che è viaggio d’un mese inverso tramontana; e s’è sempre la sua parte opposita al sol che soffia è priva di nuvole e nebbie, perchè il vento, che s’apre nella percussione del sass, dopo esso sasso si uene a richiudere, e in tal moto porta con seco i nuvole da ogni parte, e lasciali nella loro percussione; e sempre è piena di percussione di saette per la grà molitudine di nuvole che li sò ricettati, onde il sasso è tutto fracassato e pien di grà ruine; Questo nelle 75 sua radici è abitato da richissimi popoli, ed è pieno di bellissimi fonti e fiumi. è ferito e abondante d’ogni bene e massime nelle parti che riguardano a mezzo giorno; — 80 ma quando se n’è montato circa 3 miglia, si comincia a trovar le selue de’ grà di abeti, pini e faggi e altri simili alberi; dopo questi per spatio di 3 all’altre miglia si trovano praterie e gràdissime pasture, e tutto il resto, insino al nascimento del Monte Tavro, sono nevi shadow extends as far as the borders of Sarmatia, twelve days off; and in the middle of December it extends as far as the Hyperborean mountains, which are at a month’s journey to the North.[75]. And the side which faces the wind is always free from clouds and mists, because the wind which is parted in beating on the rock, closes again on the further side of that rock, and in its motion carries with it the clouds from all quarters and leaves them where it strikes. And it is always full of thunderbolts from the great quantity of clouds which accumulate there, whence the rock is all riven and full of huge débris.[77] This mountain, at its base, is inhabited by a very rich population and is full of most beautiful springs and rivers, and is fertile and abounding in all good produce, particularly in those parts which face to the South. But after mounting about three miles we find forests of great fir trees, and beech and other similar trees; after this, for a space of three more miles, there are meadows and vast pastures; and all the rest, as far as the beginning of the Taurus, is eternal snows.

chelli. 73. gogho .. mero gugnio .. he a mezzo gorno. 74. insino [alla sarmatia] al .. chesò gornate .. mezo dily]. cembre sasse. 75. he viaggio Easenpre .. oposo. 76. chesoffia .. nuvole emeобильe .. chesapre .. percussionne. 77. vedere [perche] e fn .. nuvole .. parte [e ac] ellascià .. percussionne. The text between the words percussionne and Questa has subsequently been added and is written on the margin in 39 short lines ... angoli chelli .. eintro frachasassato 78. abista .. pienu .. effiumi. 79. mero gorno. 80. montata circa .. comëna attrovare. 81. effaggi .. alberi [infrallo] dopo .. questo ispatio. 82. trova .. pasture etutto il retto. 83. nascimèuo .. 'neve eterna'. 84 tano chesassato.

77. Sudden storms are equally common on the heights of Ararat. It is hardly necessary to observe that Ararat cannot be meant here. Its summit is formed like the crater of Vesuvius. The peaks sketched on Pl. CXVI—CXVII are probably views of the same mountain, taken from different sides. Near the solitary peak, Pl. CXVIII these three names are written goba, arnigazar, carida, names most likely of different peaks. Pl. CXVI and CXVII are in the original on a single sheet folded down the middle, 30 centimetres high and 43½ wide. On the reverse of one half of the sheet are notes on pene and bilancia (weight and balance), on the other are the 'prophecies' printed under Nos. 1293 and 1294. It is evident from the arrangement that these were written subsequently, on the space which had been left blank. These pages are facsimilied on Pl. CXVIII. In Pl. CXVI—CXVIII the size is smaller than in the original; the map of Armenia, Pl. CXVIII, is on Pl. CXIX slightly enlarged. On this map we find the following names, beginning from the right hand at the top: partirdes mò (for Paryadres Mons, Arm. Parchar, now Barchal or Kolal Daghi; Trebizond is on its slope).
C. A. 217 f.; 621 f.

Avédoti. io più volte fatto • con mia lettere partecipe • delle cose che di qua • sono • accadute • no m'e paruto tacere a 
una nova • accaduta • ne' giorni passati • la quale • . . .

Avédoti io piv volte . . . . .

Essendomi io più volte con lettere rallegrato • teco della tua prospera fortuna • al presente so che come amico ti còtristera • con meco • del misero • stato nel quale mi trovo; e questo è che ne' giorni • passati • sono stato • in tati affanni, pavre, pericoli e danno • insieme con questi miseri paesani, che avevano d' avere invidia ai morti, e cierto • io nò credo • che, poiché gli elemi • con lor separatione • disfecnio • il grà caos, che essi riunissino • lor forza, anzi rabbia •

1337. On comparing this commencement of a letter l. 1—2 with that in l. 3 and 4 of No. 1336 it is quite evident that both refer to the same event. (Compare also No. 1337 l. 10—12 and 17 with No. 1336 l. 23, 24 and 32.) But the text No. 1336, including the fragment l. 3—4, was obviously written later than the draft here reproduced. The Diadario is not directly addressed—the person addressed indeed is not known—and it seems to me highly probable that it was written to some other patron and friend whose name and position are not mentioned.

Having often made you, by my letters, acquainted with the things which have happened, I think I ought not to be silent as to the events of the last few days, which—[2]...

Having several times—

Having many times rejoiced with you by letters over your prosperous fortunes, I know now that, as a friend you will be sad with me over the miserable state in which I find myself; and this is, that during the last few days I have been in so much trouble, fear, peril and loss, besides the miseries of the people here, that we have been envious of the dead; and certainly I do not believe that since the elements by their separation reduced the vast chaos to order, they have ever combined their force and fury to do so much mischief to man. As far as regards
11. Della nostra città (Leonardo first wrote di questa città). From this we may infer that he had at some time lived in the place in question wherever it might be.

17. Certe ruine di chiese. Either of Armenian churches or of Mosques, which it was not unusual to speak of as churches.

Maschi e femmine insieme unite, implies an infringement of the usually strict rule of the separation of the sexes.

18. I vicini, nostri nimici. The town must then have stood quite close to the frontier of the country. Compare 1356. 1. vicii, ai nostri confini. Dr. M. Jordan has already published lines 4-13 (see Das Malerbuch, Leipzig, 1873, p. 90—his reading differs from mine) under the title of “Description of a landscape near Lake Como”. We do in fact find, among other loose sheets in the Codex Atlanticus, certain texts referring to valleys of the Alps (see Nos. 1030, 1031 and note p. 237) and in the arrangement of the loose sheets, of which the Codex Atlanticus has been formed, these happen to be placed close to this text. The compiler stuck both on the same folio sheet; and if this is not the reason for Dr. Jordan’s choosing such a title (Description &c.) I cannot imagine what it can have been. It is, at any rate, a merely hypothetical statement. The designation of the population of the country round a city as “the enemy” (nimici) is hardly appropriate to Italy in the time of Leonardo.
lett. 1338. 1339.

it had not been for certain people who succoured us with victuals, all would have died of hunger. Now you see the state we are in. And all these evils are as nothing compared with those which are promised to us shortly.

I know that as a friend you will grieve for my misfortunes, as I, in former letters have shown my joy at your prosperity...

1339.

Like a whirling wind which rushes down a sandy and hollow valley, and which, in its hasty course, drives to its centre every thing that opposes its furious course....

No otherwise does the Northern blast whirl round in its tempestuous progress....

1339.

It may be inferred from the character of the writing, which is in the style of the note in facsimile Vol. I, p. 297, that this passage was written between 1470 and 1480. As the figure 6 at the end of the text indicates, it was continued on another page, but I have searched in vain for it. The reverse of this leaf is coloured red for drawing in silver point, but has not been used for that purpose but for writing on, and at about the same date. The passages are given as Nos. 1217, 1218, 1219, 1162 and No. 994 (see note page 218). The text given above is obviously not a fragment of a letter, but a record of some personal experience. No. 1379 also seems to refer to Leonardo's journeys in Southern Italy.
7 No fa si grì mugghio il tèpestoso
mare. 8 quôdo il settefrionale aquiline 9 lo ripercuote colle scivmose onde fra Scilla e Cariddi, ò Nostrobonlì e Mògibello, quando le solfuree fàmie, essendo richiuse, 11 per forza rospédo e aprédo il gràmòte, fulmi-
nàdo 12 per l'aria pietre terra isme col-
l'scita et vòmita fàmìa ...

13 Nò quàdo le infocate caverne di Mò-
gibello riviornàto il male tenuto elemèto, spingindrò 14 alla sua regione, có furìa cacciàdo inàzi qualche ostacòlo 15 s'inter-
pone alla sua ipetousa furìa ...

E tiràto dalla mia bramosa voglia, vago di vedere la gran có ... 17 delle varìe et strane forme fatte dalla artifìciosa natura, ragira-
tomi 18 alquàto jfà gli obìssó scogli per-
vveni all'èttrata d'una 19 grà caverne dinanzi alla quale restàto alquàto 20 stupefàto,—e
igniorante di tal cosa piegào le mie rene 21 in arco et ferma la stàca mano sopra il
ginocchio e colla destra mi feci tenebra
alle abbasate et chivse ciglia; e spesso piegàdìo in qua et in là per ve22dere dè-
tro vi discernessi alcuna cosa, et questo
vietatoni per 23 la gràde oscurità, che là
entro era, et stato alquàto, subito si de-
starono 23ìn me 2 cose, pavà e desiderio;
paura per la minaccio26sa oscura spilonca, desidero per vedere se là òtro fusse alcuna
miracolosa cosa .....

C. A. 3b2 a; 11b2 a]

1340.

Most illustrious Lord, Having now suf-
cicently considered the specimens of all those
who proclaim, themselves skilled contriv-
s

13 Mògibello is a name commonly given in
Sicily to Mount Etna (from Djebel, Arab.=mountain).
Fr. Ferrara, Descrizione dell'Etna con la storia delle
eruzioni (Palermo, 1818, p. 88) tells us, on the au-
thority of the Cronaca del Monastero Benedettino di Licodìa,
of an eruption of the Volcano with a great flow of
lava on Sept. 21, 1447. The next records of the
mountain are from the years 1533 and 1536.
A. Percy neither does mention any eruptions of
Etna during the years to which this note must
probably refer (Mémoire des tremblements de terre
de la phénisule italique, Vol. XXII des Mémoires
couronnés et Mémoires des savants étrangers.
Académie Royale de Belgique).

A literal interpretation of the passage would
not, however, indicate an allusion to any great
eruption; particularly in the connection with Strom-
boli, where the periodical outbreaks in very short
intervals are very striking to any observer, especially
at night time, when passing the island on the way
from Naples to Messina.

1340. The numerous corrections, the alterations
in the figures (l. 18) and the absence of any signa-
ture prove that this is merely the rough draft of a
LETTERS.

compositori di instrumeti bellici, et che la
invenzione di operatione di detti instrumeti
no sono niente aliene dal commune vso:
Mi forzerò, no derogando a nessuno altro,
sfarmi intendere da Vostra Eccellenzia, aprè-
of instruments of war, and that the invention
and operation of the said instruments are
nothing different to those in common use:
I shall endeavour, without prejudice to any
one else, to explain myself to your Excellency

do a quella li secreti mei, e appresso
offrendoli ad ogni suo piacimento i tempi
opportuni operare cü effetto ancora tutte
quelle cose che sub breuità in parte saranno
qui disotto 6 notate.

letter to Lodovico il Moro. It is one of the very
few manuscripts which are written from left to
right—see the facsimile of the beginning as here
reproduced. This is probably the final sketch of a
document the clean of which copy was written
in the usual manner. Leonardo no doubt very
rarely wrote so, and this is probably the reason of
the conspicuous dissimilarity in the handwriting,
when he did. (Compare Pl. XXXVIII.) It is note-
worthy too that here the orthography and abbre-
viation are also exceptional. But such superficial
peculiarities are not enough to stamp the document
as altogether spurious. It is neither a forgery nor
the production of any artist but Leonardo himself.
As to this point the contents leave us no doubt as
to its authenticity, particularly l. 32 (see No. 719,
where this passage is repeated). But whether the
fragment, as we here see it, was written from
Leonardo's dictation—a theory favoured by the
orthography, the erasures and corrections—or
whether it may be a copy made for or by Melzi
or Mazenta is comparatively unimportant. There
are in the Codex Atlanticus a few other documents
not written by Leonardo himself, but the notes in
his own hand found on the reverse pages of these
leaves amply prove that they were certainly in
Leonardo's possession. This mark of ownership is
wanting to the text in question, but the compiler
of the Codex Atlanticus, at any rate, accepted it as
a genuine document.

With regard to the probable date of this pro-
jected letter see Vol. II, p. 3.
1. Ho modi di ponti leggiadissimi e forti, e atti ad portare faccississimamente, et ciò quelli seguire e alcuna volta fuggire il inimici, e altri securi e ioffensibile da foco e battaglia, facili e co' nodi: da levare e poner. - Et modi di ardere e disfare quelli dell'inimico.

10. 2. So i la ossidione di una terra toglieia via l'acqua de' fossi; e fare infiniti poti: gatti e scale e altri istruimenti pertinenti a detta spedizione.

12. 3. Ité se per altezza di argine o per fortezza di loco e di sito nò si potesse i la ossidione di vna terra usare l'officio delle bombarde: ho modi di ruinare omni rocca o altra fortezza, se già nò fosse fondata i su el sasso ecc.

15. 4. Ho ancora modi di bombarde còmodissime e facili a portare: Et con quelle buttare minuti sassi a similitudine quasi di tempesta; E con il fumo di quella dando grade spaucito all'inimico con graue suo danno e confessione ecc.


20. 5. Ité ho modi: per caue e uie secrete distorte falle senza alcuno strepito per uenire disegnato ancora che bisognassse passare sotto fossi o alcuno fume.

22. 6. Item farò carri coperti e sicuri ioffensibili, i quali ètrádo itra li inimici con sue artiglierie, nò è si grade multi-2studine di gente d'arme che nò rompessino: E dietro a questi potranno seguire fáterie assai illesi e seza alcuno ìpîmêmîto.

25. 7. Item occorrendo di bisogno, farò bôbárde, mortari et passauolanti di bellissime e utili forme delo comune uso.

26. 8. Doué màcasse la operatione delle bôbárde comporrò briccole, màgnani i tràbuchets e altri istruimenti di mirabile efficacia e fuori del' usato: Et l'sòñha secondo la varietà de' casi cóporro uarie e infinite cose da offèdere e di . . .

[secondo le occorрид]e fuggire, 9. de dè . . . qlli. 10. obsidione de . . . toglieri't' via laqua, et . . . ghati. 11. ad dicta expedi- tion. 12. de ágine . . . de loco . . . potesse . . . obsidione de. 13. dele . . . omni [forse] o [ 'rocca']'l' altra. 14. saxo. 15. anchora . . . de bombilde . . . facil ad . . . Et cu [qlli . . . minuti [sax]]. 16. a [disimilitudine quasi] di . . . cuel . . . qlla. 17. cuí . . . accedàni de . . . strùndi acrisiîm. . . offendi e defendé. 19. de . . . 'gro's'assim. . . polsi. 20. facce . . . uscire [ad uno cert'10] e diergra'to. 21. [s] anchora . . . coperti . . . 'eci sici' e . . . eg'[e] I [friso] itra [la] inimica cuí . . . il grosso grande. 23. darrne . . . Et . . . poteranno inlesi. 24. alcuno. 25. occorreendo di bi sog . . . mòtari . . . uile forma fora del co. 26. màcassi . . . de le composero . . . màgniani. 27. fora . . . sòdo . . . cófo罗斯 . . . ed ||||. 28. credo satisfare . . . 5 . . . edisti e p. 29. et patti . . . 41. ho a sort of extremely light and strong bridges, adapted to be most easily carried, and with them you may pursue, and at any time flee from the enemy; and others, secure and indestructible by fire and battle, easy and convenient to lift and place. Also methods of burning and destroying those of the enemy.

2) I know how, when a place is besieged, to take the water out of the trenches, and make endless variety of bridges, and covered ways and ladders, and other machines pertaining to such expeditions.

3) Item. If, by reason of the height of the banks, or the strength of the place and its position, it is impossible, when besieging a place, to avail oneself of the plan of bombardment, I have methods for destroying every rock or other fortress, even if it were founded on a rock, &c.

4) Again I have kinds of mortars; most convenient and easy to carry; and with these can fling small stones almost resembling a storm; and with the smoke of these causing great terror to the enemy, to his great detriment and confusion.

9) [8]And when the fight should be at sea I have kinds of many machines most efficient for offence and defence; and vessels which will resist the attack of the largest guns and powder and fumes.

5) Item I have means by secret and tortuous mines and ways, made without noise to reach a designated [spot], even if it were needed to pass under a trench or a river.

6) Item. I will make covered chariots, safe and unattackable which, entering among the enemy with their artillery, there is no body of men so great but they would break them. And behind these, infantry could follow quite unhurt and without any hindrance.

7) Item. In case of need I will make big guns, mortars and light ordnance of fine and useful forms, out of the common type.

8) Where the operation of bombardment should fail, I would contrive catapults, mangonels, trabocchi and other machines of marvellous efficacy and not in common use. And in short, according to the variety of cases, I can contrive various and endless means of offence and defence.
10 In time of peace I believe I can give perfect satisfaction and to the equal of any other in architecture and the composition of buildings public and private; and in guiding water from one place to another.

Item: I can carry out sculpture in marble, bronze or clay, and also in painting whatever may be done, and as well as any other, be him whom he may.

And if any one of the above-named things seem to any one to be impossible or not feasible, I am most ready to make the experiment in your park, or in whatever place may please your Excellency—to whom I commend myself with the utmost humility.

S. K. M. III, 284]

Al mio Illustriissimo Signore Lodovico, Duca di Bari. Leonardo Da Vinci Fiorentino.

1341.


S. K. M. III, 234]

Vi piace vedere uno modello del quale risulterà vtile a voi e a me, e utilità a quelli che fiero cagione di nostra utilità.

1342.

You would like to see a model which will prove useful to you and to me, also, it will be of use to those who will be the cause of our usefulness.

còduz aqua, ... ad offende e difend. 30. còdurer. 31. ad, ... uole. 32. Anchora si potera ... honor de la. 33. s"r"vo"r" pare e dela. 31. Et se alcuno deh spo"r" dicte ... possibile e infastibile me offer. 35. ad fare uno esperimento ... ad. 36. humilitate... me recondo de.

1341. Written from left to right. 1. Ill"mo" Sig"re", 2. bari.

1342. 1. vedere I modello, 2. inve. 3. acquelli cheffene chagione.

1341. Evidently a note of the superscription of a letter to the Duke, and written, like the foregoing from left to right. The manuscript containing it is of the year 1493. Lodovico was not proclaimed Duke of Milan till September 1494. The Dukedom of Bari belonged to the Sforza family till 1499.

1342. 1343. These two notes occur in the same not very voluminous MS. as the former one and it is possible that they are fragments of the same letter. By the Modello, the equestrian statue is probably meant, particularly as the model of this statue was publicly exhibited in this very year, 1493, on the occasion of the marriage of the Emperor Maximilian with Bianca Maria Sforza.
1343.

Ecco · signor · molti · giêtìl omini che faranno intra loro · questa · spesa, lasciando loro · godere l'entrata dell'acque, invina e passaggio di navili, e quando se' sarà veduto · loro il prezzo loro reredarono il navilio di Martigiana...

There are here, my Lord, many gentlemen who will undertake this expense among them, if they are allowed to enjoy the use of admission to the waters, the mills, and the passage of vessels and when it is sold to them the price will be repaid to them by the canal of Martesana.

1344.

Assai mi rincresce d'essere i neciessità, ma pív mi dele che quella · sia causa · dello interroppere il desiderio mio, il quale · è sempre disposto a vbidir uostra Eccellentia; forse che uostra Eccellentia nò commise altro a messer Gualtieri, credendo che io avessi dina'rìi.

I am greatly vexed to be in necessity, but I still more regret that this should be the cause of the hindrance of my wish which is always disposed to obey your Excellency.

Perhaps your Excellency did not give further orders to Messer Gualtiero, believing that I had money enough.

1345.

E se mi dato piv alcuna commissione d'alcuna...

del premio del mio servitio, perché nò so da essere da...
cose assegnationi, perché loro anno in...
tante di pe...
tie che bene possono assettare piv di me...
nò la mia aria, la quale voglio mvvare ed...
dato qualche vestineto si oso vna somma...

And if any other comission is given me by any...
of the reward of my service. Because I am not [able] to be...
things assigned because meanwhile they have...
to them...

which they well may settle rather than I...
not my art which I wish to change and...
given some clothing if I dare a sum...

The paper on which this is written is torn down the middle; about half of each line remains.
My Lord, I knowing your Excellency's mind to be occupied... to remind your Lordship of my small matters and the arts put to silence that my silence might be the cause of making your Lordship scorn...

My life in your service. I hold myself ever in readiness to obey...

[11] Of the horse I will say nothing because I know the times [are bad]
to your Lordship how I had still to receive two years' salary of the...
with the two skilled workmen who are constantly in my pay and at my cost that at last I found myself advanced the said sum about 15 lire... works of fame by which I could show to those who shall see it that I have been everywhere, but I do not know where I could bestow my work [more]...

[17] I, having been working to gain my living...

I not having been informed what it is, I find myself...

[19] remember the commission to paint the rooms...

I conveyed to your Lordship only requesting you...

Magnificent Commissioners of Buildings
I, understanding that your Magnificences have made up your minds to make certain great works in bronze, will remind you of certain things: first that you should not be so hasty or so quick to give the commission, lest by this haste it should become impossible to select a good model and a good master; and some man of small merit may be chosen, who by his insufficiency may cause you to

11. See No. 723, where this passage is repeated. 17. See No. 1344 L. 12.
19. In April, 1498, Leonardo was engaged in painting the Saletta Nigra of the Castello at Milan. (See G. MONZI, L'Arte in Milano, 1872, p. 417.)

Magnifici fabbricieri, intendendo io vostre magnificenze avere preso partito di fare certe magnifiche opere di bronzo; delle quali io vi dirò alcuno ricordo prima che voi non siate tanto veloci e tanto presti a fare essa allocatione che per essa celerità sia tolto a voi il potere fare bona elietione d'opere e maestri; e qualche omo che per la sua insufficienza abbia apresso a vostri successori a vituperare, se ella vo-

ellarcimease, 9. fusili chaussa. 10. mi tié. 11. jà dinaro. 12. chomio... 'avere' el. 13. maestri... c'è un giovane stettono... salario esame. 14. avanzato ditta... circhi. 15. opere... di fama... per elle... acquelli che uerano. 16. opere [in priv] a per.
18. trovo [come e mi]. 19. richiesta della commissione... acquella.

1346. 1. [venerabili] e magnifici fabbricieri [parédi amme fare in parte]. 2. fíciere [volere] avere. 3. richiedo... ettando pressi a "saffare essa allocatione" [figliare partito]. 4. tutto "la via del potere fare bona elietione doper e maestri" qualche homo [di picho] che... abia... vosstri. 5. successori... ella vosstra esta "echettalà sias iu ciedi boni igiegui"... ved-

il Moro. One may infer from the concluding sentence (No. 1346, l. 33. 34 and No. 1347), that Leonardo, who no doubt compiled this letter, did not forward it to the piazza himself, but gave it to some influential patron, under whose name and signature a copy of it was sent to the Commission.

C. A. 3168; 98.8]

Draft of letter to be sent to Pisa

(1346. 1347.)
La principale parte che per le città si ricerci si sono i domi, ai quali appressatisi, le prime cose, che all'occhio appariscono, sono le porte donde in esse chiese passare si possa.

Guardate, signori fabbricieri, che la troppa celertà del volere voi con tanta prestezza dare spedizione alla locazione di tanta magna opera, quanto io sento che per voi s'è ordinata, non sia cagione che quello, che per onore di dio e delle omini si fa, non torni in grà disonore de' nostri giudizi e della vostra città, dove, per essere terra degna e di passo, è concorso d'innumerevoli forestieri; e questo disonore accaderebbe, quàdo per le vuotre indigiette voi prestasti fede a qualche vantatore che per le sue frasche o per favore, che di quà dato li fusse, da dui auessi a inpetrare simile opera, per la quale a se e a voi auessi a partorire lunga e gràdisissima infamia; che non posso fare che io non mi crucci a ripensare quali omini sieno quelli che abbino conferito volere in simile impresa straetare sanza pensare alla loro sofitièza, sanza dirne altro, che è maestro di boccali, che di corazze be abused by your descendants, judging that this age was but ill supplied with men of good counsel and with good masters; seeing that other cities, and chiefly the city of the Florentines, has been as it were in these very days, endowed with beautiful and grand works in bronze; among which are the doors of their Baptistry. And this town of Florence, like Piacenza, is a place of intercourse, through which many foreigners pass; who, seeing that the works are fine and of good quality, carry away a good impression, and will say that this city is well filled with worthy inhabitants, seeing the works which bear witness to their opinion; and on the other hand, I say seeing so much, metal expended and so badly wrought, it were less shame to the city if the doors had been of plain wood; because, the material, costing so little, would not seem to merit any great outlay of skill.

Now the principal parts which are sought for in cities are their cathedrals, and of these the first things which strike the eye are the doors, by which one passes into these churches.

Beware, gentlemen of the Commission, lest too great speed in your determination, and so much haste to expedite the entrusting of so great a work as that which I hear you have ordered, be the cause that that which was intended for the honour of God and of men should be turned to great dishonour of your judgments, and of your city, which, being a place of mark, is the resort and gathering-place of innumerable foreigners. And this dishonour would result if by your lack of diligence you were to put your trust in some vaunter, who by his tricks or by favour shown to him here should obtain such work from you, by which lasting and very great shame would result to him and to you. Thus I cannot help being angry when I consider what men those are who have conferred with you as wishing to undertake this great work without thinking of their sufficiency for it, not to say more. This one is a potter, that one a maker of cuirasses, this one is a
chi canpanaro, alcuno 25 sonagliere, E insiino bombardiere, fra i quali vno Delsignore s'è uiatato che tra l'esserne 26 lui compare de Messere. Ambrosio Ferrere—chi a qualche commissione—dal quale lui à buone promessioni; e se quello nò basterà 27 che müterà a cavallo e andrà dal signiore e impetèrà tali lettere, 28 che per voi mai simile opera nò gli sarà dinegata; o guardate dove i maestri, 39 atti a simili opere, sono ridotti quàdo con simili omni àno a ga-reggiare; 39'aprite li ochi e vogliate bò uedere che i vostri dinari nò si spèdino 39 in compare; le uostre vergogni; jo vi so aunnitare che di questa terra voi nò 39 tra-re te se non è opere di sorte e di vili e grossi magisteri; nò ci è uomo che vaglia; 33'e credetelo a me, salvo Leonardo Fiorètino, che fa il cavallal del duca Fracessco di bròzo, che non è bisognio fare stima, 34 perché a che fare il tempo di sua vita, e dubito che per l'esser si grade opera che non la finirà mai.

33'I miiseri 36 studiosti . . . 41 con che spe-
43'ranza e' posso 43'no aspettare pre 44'no di lor virtù?

C. A. 316; 4584]

Ecco vno il quale il signiore, per fare questa sua opera à tratto di Firenze 2 che è degno maestro, ma à tâta facièda che non la finirà mai; 36 credete voi che diffe-
36'retta sia a vedere vna cosa bella da una brutta; 41 allega Plinio.

Illmo ac Ráhio Dno Meo Unico.
D. Hip. Car. 3i Estensi D. meo Colìnio.
Ferrarie.
Illin ac R. me D. ne mi hu. co. men.
Pochi giorni sono ch'io venni da Milano, et trovando che uno mio fratelo maggiore
bell-founder, another a bell ringer, and one is even a bombardier; and among them one in his Lordship's service, who boasted that he was the gossip of Messer Ambrosio Ferrere [26], who has some power and who has made him some promises; and if this were not enough he would mount on horse-
back, and go to his Lord and obtain such letters that you could never refuse to give him the work. But consider where masters of real talent and fit for such work are brought when they have to compete with such men as these. Open your eyes and look carefully lest your money should be spent in buying your own disgrace. I can declare to you that from that place you will procure none but average works of inferior and coarse masters. There is no capable man,—[33] and you may believe me,—except Leonardo the Florentine, who is making the equestrian statue in bronze of the Duke Francesco and who has no need to bring himself into notice, because he has work for all his life time; and I doubt, whether being so great a work, he will ever finish it[34].

The miserable painstakers . . . with what hope may they expect a reward of their merit?

[1347.]

1347.

There is one whom his Lordship invited from Florence to do this work and who is a worthy master, but with so very much business he will never finish it; and you may imagine that a difference there is to be seen between a beautiful object and an ugly one. Quote Pliny.

[1348.]

Most Illustrious and most Reverend Lord.
The Lord Ippolito, Cardinal of Este .
at Ferrare.

Most Illustrious and most Reverend Lord.
I arrived from Milan but a few days since and finding that my elder brother refuses to

1346. 26. Messer Ambrogio Ferrere was Farmer of the Customs under the Duke. Placentia at that time belonged to Milan.
1348. This letter addressed to the Cardinal Ippolito d'Este is here given from Marchese G. Campori's publication: Nuovi documenti per la Vita di Leonardo da Vinci. Atti e Memorie delle R. R. Depu-
tazioni di Storia patria per la provincie modenese e par-
1349.

Jo ho sospetto che la poca mia remunerazione de' gran benefici che io ho ricevuti da nostra Ecceltia non l'abbino al

carry into effect a will, made three years ago when my father died—as also, and no less, because I would not fail in a matter I esteem most important—I cannot forbear to crave of your Highness a letter of recommendation and favour to Ser Raphael Hieronymo, at present one of the illustrious members of the Signoria before whom my cause is being argued; and more particularly it has been laid by his Excellency the Gonfaloniere into the hands of the said Ser Raphael, that his Worship may have to decide and end it before the festival of All Saints. And therefore, my Lord, I entreat you, as urgently as I know and am able, that your Highness will write a letter to the said Ser Raphael in that admirable and pressing manner which your Highness can use, recommending to him Leonardo Vincio, your most humble servant as I am, and shall always be; requesting him and pressing him not only to do me justice but to do so with dispatch; and I have not the least doubt, from many things that I hear, that Ser Raphael, being most affectionately devoted to your Highness, the matter will issue ad votum. And this I shall attribute to your most Reverend Highness' letter, to whom I once more humbly commend myself. Et bene valeat.

Florence XVIII 7bris 1507

E. V. R. D.

S. tor Humil.

Leonardus Vincius pictor.

I am afraid lest the small return I have made for the great benefits, I have received from your Excellency, have not made you

Draft of Letter to the Governor of Milan.

1349.

C. A. 3102; 9440]

I am afraid lest the small return I have made for the great benefits, I have received from your Excellency, have not made you

menei, Vol. III. It is the only text throughout this work which I have not myself examined and copied from the original. The learned discoverer of this letter—the only letter from Leonardo hitherto known as having been sent—adds these interesting remarks: Coletto Cardinale nato ad Ercule i, nel 1470, arrivavesci di Strignonia a sette anni, poi d'Agra, aveva conseguito nel 1497 la pinge ed ottima cortesia di Milano, la dove avesse conosciuto il Vincio, desine del suo amore ch'ei professava alle arti lasci credere che le protette di sercilia di Leonardo piu che a gratitudine per favori ricevuti e per onore a lui allegate, accennino a speranza per un favore che si aspetta. Notabile è ancora in questo prezioso documento la ripetuta signatura del grande artista che si scrive Vincio e Vinciue, non da Vincio come si tiene comune, sebbene l'una e l'altra possano valere a significare così il casato come il paese; restando a sapere se il nome del paese di Vincio fosse assunto a cognome della famiglia di Leonardo nel qual supposto più propriamente avrebbe a valersi Leonardo Vincio, o Vinciue (latinamente Vincius) con'egli stesso amò signorarsi in questa lettera, e come scrissero parecchi contemporanei di lui, il Cast, il Casarino, Geoffroy Tory, il Giurico, il Bandello, Raffaello Maffe, il Paciolo. Per ultimo non lacerò d'avventurare come la lettera del Vincio è assai ben conservata, di nitide e larga scrittura in forma piemamente corrispondente a quella dei suoi manoscritti, vergata all'uso comune da sinistra a destra, anzi contrariamente come fa suo costume; ma indubbiamente autentica e fornita della menzione e del sigillo che fresco ancora conserva l'impronta di una testa di profilo da un piccolo antico cammeo. (Compare No. 1368, noto.)
somewhat angry with me, and that this is why to so many letters which I have written to your Lordship I have never had an answer. I now send Salai to explain to your Lordship that I am almost at an end of the litigation I had with my brother; that I hope to find myself with you this Easter, and to carry with me two pictures of two Madonnas of different sizes. These were done for our most Christian King, or for whomsoever your Lordship may please. I should be very glad to know on my return thence where I may have to reside, for I would not give any more trouble to your Lordship. Also, as I have worked for the most Christian King, whether my salary is to continue or not. I wrote to the President as to that water which the king granted me, and which I was not put in possession of because at that time there was a dearth in the canal by reason of the great droughts and because (10) its outlets were not regulated; but he certainly promised me that when this was done I should be put in possession. Thus I pray your Lordship that you will take so much trouble, now that these outlets are regulated, as to remind the President of my matter; that is, to give me possession of this water, because on my return I hope to make there instruments and other things which will greatly please our most Christian King. Nothing else occurs to me. I am always yours to command.

C. A. 3614; 11384]

Drafts of Letters to the Superintendents of Canals and to Fr. Mezzi.

1350. Magnifico presidete, io mando costi Salai mio discipolo, il quale di questa sia apor- tatore e da lui intenderete a bocca la causa del mio tanto sopra (sedere)...

noustra. 4. lettigio... fratelli... cassi in questa. 5. pasqua eportar commenche..., nostre... quale. 6. cristianissi- simo... nostra... arei. 7. cost... asstare per instanza... nostre he... re sella... he per... onno. 9. possessione. 10. sechi... bochelli non era... promesse. 11. possessione siche io preghio nostra... nelle incresca. 12. expedizione coe di darne. 13. possesion... i spero... chesará. 14. nomi acade.

1350. 1. Magnifico presidente [questa sol per condare] io... quale [di questa sia]. 2. [la porta] di questa... aboca sopra. 3. Ma-

1349. Charles d'Amboise, Maréchal de Chaumont, was Governor of Milan under Louis XII. Leonardo was in personal communication with him so early as in 1503. He was absent from Milan in the autumn of 1506 and from October 1510—when he besieged Pope Julius II. in Bologna—till his death, which took place at Correggio, February 11, 1511. Francesco Vinci, Leonardo's uncle, died—as Amo- retti tells us—in the winter of 1510—11 (or according to Uzielli in 1506?), and Leonardo remained in Florence for business connected with his estate. The letter written with reference to this affair, No. 1348, is undoubtedly earlier than the letters Nos. 1349 and 1350. Amoretti tells us, Memorie

Storie, ch. II, that the following note existed on the same leaf in MS. C. A. I have not however succeeded in finding it. The passage runs thus: Jo sono quasi al fine del mio letigio che io à con mio fratetg. ... Ancora ricorda a V. Excus la facenda che à cum Ser Juliano mio Fratello capo dell' altri fratelli ricordandoli come se offese di conciar le cose foste fra noi fratelli del comun della eredità de mio Zio, e guelli constringa alla espeditione, quale contenere la lettera che lì me mando.

10. Compare Nos. 1099 and 1010. Leonardo has noted the payment of the pension from the king in 1505.
Magnific President: Having oftentimes remembered the proposals made many times to me by your Excellency, I take the liberty of writing to remind your Lordship of the promise made to me at my last departure, that is the possession of the twelve inches of water granted to me by the most Christian King. Your Lordship knows that I did not enter into possession, because at that time it was given to me there was a dearth of water in the canal, as well by reason of the great drought as also because the outlets were not regulated; but your Excellency promised me that as soon as this was done, I should have my rights. Afterwards hearing that the canal was complete I wrote several times to your Lordship and to Messer Girolamo da Cusano, who has in his keeping the deed of this gift; and so also I wrote to Corigero and never had a reply. I now send this to Salai, my pupil, the bearer of this, to whom your Lordship may tell by word of mouth all that happened in the matter about which I petition your Excellency. I expect to go to this Easter since I am nearly at the end of my lawsuit, and I will take with me two pictures of our Lady which I have begun, and at the present time have brought them on to a very good end; nothing else occurs to me.

My Lord the love which your Excellency has always shown me and the benefits that I have constantly received from you I have hitherto...

I am fearful lest the small return I have made for the great benefits I have received from your Excellency may not have made you somewhat annoyed with me. And this is why, to many letters which I have written to your Excellency I have never had an answer. I now send to you Salai to explain to your Excellency that I am almost at the end of my litigation with my brothers, and that I hope to be with you this Easter and carry with me two pictures on which are two Madonnas of different sizes which I began for the most Christian King, or for whomsoever you please. I should be very glad to
alla mia tornata di costà, dove io ó a stare per stanza, perchè nó urrei dare più noia a uostra Signoria, e áscrivora, auendo io luarato pel cristianissimo Rè, se la mia pruisione è per correre o no; io scriuò al preside² del quell' acqua che mi donò il rè, della quale fui messo in possessione per esserne carestia nel navilio per ca²usa de' grá secchi, e perchè i sua bocchelli non erà moderati; ma bë mi promise che, fatta tal moderazione, l'ne sarei ²messo in possessione, sicch' io vi prego che, scon-trandovi in esso presidente, nó mi incresca che ora, che tali bocchelli só ² moderati, di ricordare a detto presidente di farmi dare la possessione d'essa acqua, che mi parue intùdere che in grá par²te staua a lui; altro non mi accade; sono senpre a uostri comúdi.

28 Buò di, messer Francesco, puó lo fare Iddio che di tante lettere ch'io v'ò scrivute che mai voi non m'abbiate risposto; Or aspetta² ch'io venga costà, per Dio, ch'io vi farò tanto scrivere che forse vi rin-crescerà.

30 Caro mio, messer Francesco, io màdo costi Salai per intendere dalla magnificentia del presidente che fine à avuta quella ²moderatione dell'acque che alla mia partita fu ordinata per li bocchelli del navilio, perchè el magnifico presidète mi promis²se che subito fatta tal moderatione, io sarei spedito; Ora egli è più tempo che io intesi che il nauilio s'accollàiaua, e similmente i sua bocchelli, e immediate scrissi al presidente e a uoi, e poi replicai, e mai ebbi ²risposta; adique voi degnerete di rispódermi quel ch'è seguito, e non essendo per spedirsi nó u'irresca per mio a²mòre di sollecitarne vn poco il presidente e così messer Girolamo da Cusano, al quale uoi mi racamáderë²te e offriretemi a sua magnificëtia.


1350. 28—36. Draft of a letter to Francesco Melzi, born 1493—a youth therefore of about 17 in 1510. Leonardo addresses his young friend as "Messer", as being the son of a noble house. know where, on my return from this place, I shall have to reside, because I do not wish to give more trouble to your Lordship; and then, having worked for the most Christian King, whether my salary is to be continued or not. I write to the President as to the water that the king granted me of which I had not been put in possession by reason of the dearth in the canal, caused by the great drought and because its outlets were not regulated; but he promised me certainly that as soon as the regulation was made, I should be put in possession of it; I therefore pray you that, if you should meet the said President, you would be good enough, now that the out-lets are regulated, to remind the said Presi-dent to cause me to be put in possession of that water, since I understand it is in great measure in his power. Nothing else occurs to me; always yours to command.

Dear Messer Francesco. I am sending this letter to learn from His Magnificence the President to what end the regulation of the water has come since, at my departure this regulation of the outlets of the canal had been ordered, because His Magnificence the President promised me that as soon as this was done I should be satisfied. It is now some time since I heard that the canal was in order, as also its outlet-s, and I immediately wrote to the President and to you, and then I repeated it, and never had an answer. So you will have the goodness to answer me as to that which happened, and as I am not to hurry the matter, would you take the trouble, for the love of me, to urge the President a little, and also Messer Girolamo Cusano, to whom you will command me and offer my duty to his Magnificence.
[Most illustrious Lord. I greatly rejoice in the most illustrious Lord at your ...]

I was so greatly rejoiced, most illustrious Lord, by the desired restoration of your health, that it almost had the effect that [my own health recovered]—[I have got through my illness]—my own illness left me — of your Excellency’s almost restored health. But I am extremely vexed that I have not been able completely to satisfy the wishes of your Excellency, by reason of the wickedness of that deceiver, for whom I left nothing undone which could be done for him by me and by which I might be of use to him; and in the first place his allowances were paid to him before the time, which I believe he would willingly deny, if I had not the writing signed by myself and the interpreter. And I, seeing that he did not work for me unless he had no work to do for others, which he was very careful in soliciting, invited him to dine with me, and to work afterwards near me, because, besides the saving of expense, he...
Presso di me, perchè oltre al conto eili acquisterebbe il linguaggio italiano; [lui sempre lo promette e mai lo volle fare]; E questo facievo ancora, perchè quel Giovâ tedesco che fa li specchi ogni di li era in bottega, e volleua vedere e intendere ciò che si facieva e publicava per la... forte biasimando; e perchè lui mägiva ciò quelli 10 della guardia del papa, e poi se n'adava in compagnia colli scoppietti, amazzâ vicielli per queste anticaglie e così seguivà da dopo desinare a sera; E se io mandavo Lorenz 11 a sollecitarli il lavoro lui si cruciava e dicevà che nò volea tanti maestri sopra capo, e che il lavorar suo era 12 per la guardaroba di vostra Eccclèlità, e passò due mesi e così seguivà e indi, trovâvâ Giannicolo della 13 guardaroba, domâdalo s'el Tedesco avea finito l'opere del magnifico, e lui mi disse non esser vero, ma che sonoâmète li avea dato a nettar dua scoppiette; di poi facìèdolo io sollecitare lui lasciò la bettega, e comìcò a lavorare 1 cameâra, e perde assai têpo nel fare vn altra morsa e lime e altri strùmèl a vite; e quiui lavorava mulinelli da torcere seta, 14 li quali nascèdevâ, quàuo di de' mia vêtèra, e con mille bestemìc e rimbotti, in modo che nessi di mea voleva piv entrere.

17 Tanto mi sò rallegrato, ilustrissimo mio Signore, del desiderato acquisto di vostra sanità che quasi il male mia da me 18 s'è fugito: Ma assai mi rincrescie il non avere io potuto integralmètete satisfare alli desideri di vostra Eccellenza 19 mediante la malignità di costesto inganatore tedesco, per il quale non o lasciato indiretto cosa alcuna, 20 colla quale io abbia creduto farli piacer; e secondariamente invitarli ad abi tare e vivere con meco, per la qual cosa io ve'drei al continuo l'opera che lui facisse, e có facilità ricorreggerli li errori; e oltre di questo inparerrebbe la lingua italiana, 22 mediante la quale Jui có facilità potrebbe parlarne sanza interprete; e li sua danari li would acquire the Italian language. He always promised, but would never do so. And this I did also, because that Giovanni, the German who makes the mirrors, was there always in the workshop, and wanted to see and to know all that was being done there and made it known outside... strongly criticising it; and because he dined with those of the Pope's guard, and then they went out with guns killing birds among the ruins; and this went on from after dinner till the evening; and when I sent Lorenzo to urge him to work he said that he would not have so many masters over him, and that his work was for your Excellency's Wardrobe; and thus two months passed and so it went on; and one day finding Gian Niccolò of the Wardrobe and asking whether the German had finished the work for your Magnificence, he told me this was not true, but only that he had given him two guns to clean. Afterwards, when I had urged him farther, he left the workshop and began to work in his room, and lost much time in making another pair of pincers and files and other tools with screws; and there he worked at mills for twisting-silk which he hid when any one of my people went in, and with a thousand oaths and mutterings, so that none of them would go there any more.

I was so greatly rejoiced, most Illustrious Lord, by the desired restoration of your health, that my own illness almost left me. But I am greatly vexed at not having been able to completely satisfy your Excellency's wishes by reason of the wickedness of that German deceiver, for whom I left nothing undone by which I could have hope to please him; and secondly I invited him to lodge and board with me, by which means I should constantly see the work he was doing and with greater ease correct his errors while, besides this, he would learn the Italian tongue, by means of which he could with more ease talk without an interpreter; his moneys were always given him in advance of the

linghaggio italiano... lui sempre [lo promesse e mai lo volle fare]. 17 Ecque"sto" facievo. On the margin in twelve short lines: ecquesto facievo ancora perché que... tedesco... ognui... ibateghe... cio chessi e publicava per la for biasimando... are quel... nidea

Here ends the note on the margin, perché liu mägiva [colloli tedeschi che so] ciò quel. 10 nädava "in compagula" colli schopietti... anichaglie "ecossi seguivà da dopo desinare asseren" Eas. 11. [a richardari] a sollecitari... lui "si scriciva e' dicieva... maestri... chapo eche [la] cche se [la] e i lavorare. 12. ghuardorobo [del s] di... e [chosi] passo... seguito ve [se no] e vardi [ti] trovârâ. 13. ghuardorobo [del s] domâdalo selli [ave] sel tedesco... magüichico ellui... Macc. 14. scoppiette... sollecitare... lasio... botteghe e conocio allavourare. ellime... llavorava mulenelli datteriere. 16. liu rinnossie... sadare... ussera. 19. inganatore [tedesco il quale] tendisco... lasciato... chosa. 20. cholle... e "p" prima l'"secondariamente" invitârlo... vi've're come che... 21. chelti faciessi. 22. ricogiere... oltre
LETTERS.

C. A. 2784; 8504

Tanto mi son rallegrato, illustissimo mio signore, del desiderato acquisto di vostra sanità, che quasi il male mio da me *s'è fuggito; dico iddio se sia laudato, Ma assai mi rincresce il non avere io potuto integralmente soddisfare all' desideri di vostra Eccellenza mediante la malignità di testo inganatore tedesco, per il quale non o lasciato indirieto cosa alcuna, *colla quale io abbia creduto farli piacere, e secondamente invitarlo ad abitare e vivere con me, per la qual cosa *io farei piantare a di questo *taliana *interprete [*eotte a di questo] "e prima" li sua. 23. inari *[al meze] al têpo alluttuto Dî . . . ricistaza . . . modeli [finiti di legname]. 24. fin [di di padre] di . . . chomelli . . . neghii. 25. dard *[di] la . . . lucea e grossezza . . . avessi affare . . . restano. 26. bottega "cenvò ([?] e canse estraermi" [nolla camera] dove. 27. nare [olla guardi] co suzi . . . ghari. . . ufidea disene vacava el pin. 28. senanda . . . oltre . . . scoprieti amazava . . . antichaglie equesto . . . asserra. 29. maestro. 30. ella. 31. lui avuto. 32. mia [ari] qui. 33. tolto [li s] la. 34. uesstra. 35. Signoria che sempre ve. 39. [vedo] Latina e che. 40. [facendolj] chella. 41. di questo [mimini] fareui. 42. discie omenirai allui. 43. lispechii. 47. ellasciade. 48. allui . . . boc. 49. tech. 51. ch pe.

I352.

I was so greatly rejoiced, most Illustrious Lord, by the wishes for recovery of your health, that my own ills have almost left me; and I say God be praised for it. But it vexes me greatly that I have not been able completely to satisfy your Excellency's wishes by reason of the wickedness of that German deceiver, for whom I left nothing undone by which I could hope to please him; and secondly I invited him to lodge and board with me, by which means I should see clearly the work he was doing.

a 2. seffuggit "dicho idio ne sia laldato" Ma . . . rincre. Here the text breaks off. 2. The text from lines 1-4: Ma assai etc. . . . ad abitare e vivere is an exact copy of lines 18-20 No. 1349. 4. comecho . . . chossa io vedrì. 7. Here follows six short lines on the margin: farei piantare vn desco . . . questo . . . potessi . . . di sot fabbricare e chossi. The marginal note ends here. . . . facessi e chò . . . ricorregierebe.
for which purpose I would have a table fixed at the foot of one of these windows, where he could work with the file and finish the things made below; and so I should constantly see the work he might do, and it could be corrected with greater ease.

This other hindered me in anatomy, blaming it before the Pope; and likewise at the hospital; and he has filled [4]this whole Belvedere with workshops for mirrors; and he did the same thing in Maestro Giorgio's room. He said that he had been promised [7]eight ducats every month, beginning with the first day, when he set out, or at latest when he spoke with you; and that you agreed.

Seeing that he seldom stayed in the workshop, and that he ate a great deal, I sent him word that, if he liked I could deal with him separately for each thing that he might make, and would give him what we might agree to be a fair valuation. He took counsel with his neighbour and gave up his room, selling every thing, and went to find...
The passage, very difficult to decipher, is on the reverse of a drawing at Windsor, Pl. CXXII, which possibly has some connection with it. The drawing is slightly reduced in this reproduction; the original being 25 cm. high by 19 cm. wide.

And clinging to his hair, and striving to hide in it, they behaved like sailors in a storm, who run up the ropes to lessen the force of the wind [by taking in sail].

News of things from the East.

It be known to you that in the month of June there appeared a Giant, who came from the Lybian desert ... mad with rage like ants ... struck down by the rude.

This great Giant was born in Mount Atlas and was a hero ... and had to fight against the Egyptians and Arabs, Medes and Persians. He lived in the sea on whales, grampuses and ships.

Mars fearing for his life took refuge under the ... of Jove.

And at the great fall it seemed as though the whole province quaked.
O felice; o avvertato spirito, dòde partisti! io ho questo uomo a male mio grado bé conoscevito; Questo è ricetto di villania, questo è proprio-ammonitione di somma ingratiudine, in copigna di tutti i viti; ma che mi vo io có parole indarno affaticadomi? la somma de’ peccati 7 solo in lui trovati sono; E se alcuno infra loro si trova, che alcuna bontà possegga, non altri metí come che me dalli altri uomini trattati sono, e in effetto io ho questa còluzione ch’è 9 male s’eli sono nimir e peggio s’eli son amici.

O blessed and happy spirit whence comest thou? Well have I known this man, much against my will. This one is a receptacle of villainy; he is a perfect heap of the utmost ingratitude combined with every vice. But of what use is it to fatigue myself with vain words? Nothing is to be found in them but every form of sin . . . And if there should be found among them any that possesses any good, they will not be treated differently to myself by other men; and in fine, I come to the conclusion that it is bad if they are hostile, and worse if they are friendly.

1356. All the ills that are or ever were, if they could be set to work by him, would not satisfy the desires of his iniquitous soul; and I could not in any length of time describe his nature to you, but I conclude . . .

C. A. 380a; 1179d

Io ho uno che per auersi di me promesso cose assai me che debite, essendo rimasto ingannato del suo prosontuoso desiderio, à te[tato di torni tutti li amici e perché li à trovati saui e non leggi[teri al suo volere mi à minacciato che trouate le annui ationi 6 che mi torrà i benefattori; óde io ho di questo informato vostra Signoria accio che, volendo questo seminare li usati 7 sciádoli, non troui terreno atto a seminare pensieri e li 8 atti della sua mala natura]; 9 che, tentàdo lui fare di vostra signoria struméto della sua iniqua e maluagia natura 10 rimàga ingannato di suo desiderio.

W. An. III, 211a

E in questo caso io so che io ne acquisterò non pochi nemici, conceptosìché nessù crederà ch’io possa dire di lui, perché pochi

And in this case I know that I shall make few enemies seeing that no one will believe what I can say of him; for they are but

1358. Below this text we read gassino = Giustino and in another passage on the same page Justin is quoted (No. 1210, 1. 45). The two have however no real connection.

\[\text{Miscellaneous drafts of letters and personal records (1356–1358).}\]

\[\text{H. J. 89a}\]

Tutti i mali che sono e che furono, essèndo messi in opera da costui 7nó sa-tisfarebbero al desiderio del suo iniquo animo; 7ì nò potrei con lunghezza di tépo descriverui la natur di costui 9, ma bé cóchivdo che . . .
son quelli 1 a ch'i i sua viti dispiacino; anzi solamente a quelli omini li dispiaciasi che son di natura cotaria a tali uii; e molti odiano li 3padri e guastan le amicitie, repressori de' sua viti e non 6vogliono cespini contrari a essi, nè nessuno vma consiglio.

7E se alcuno si ne trova virtuoso e bono, non lo scacciate 8da voi; fatteli onore, acciò che non abbia a fugirsi da 9voi e ridursi nel i eremi, o spelonche, o altri locchi soleta 10ri, per fugirsi dalle vostre insidie, e se alcun di questi 11tali si trova, fatteli onore, perchè questi sono li uostri 12terrestri, questi merità da uoi le statue e li simulacri; ma 13è bò ui ricordo che li lor simulacri nò siè da uoi màaggioi come acora in alcuna regione del India; 14ché quào li simulacri operano alcuno màrico secondo loro, si sacerdoti li tagliano in pezzi, esseni do di legno, e ne danno a tutti quelli del paese nò 15sanza premio, e ciascù raspa sottilmète la sua parte 16e mette sopra la prima vivanda che mâgiano; e così tè 17gono per fede avversi magiato il suo santo, e credono che lui li 18guardi poi da tutti li pericoli che ti pare, uomo, qui li tua specie? sei tu così sauo, come tu ti tieni? son 22queste cose da esser fatte da omni?

If you meet with any one who is virtuous do not drive him from you; do him honour, so that he may not have to flee from you and be reduced to hiding in hermitages, or caves or other solitary places to escape from your treachery; if there is such an one among you do him honour, for these are our Saints upon earth; these are they who deserve statues from us, and images; but remember that their images are not to be eaten by you, as is still done in some parts of India [15], where, when the images have according to them, performed some miracle, the priests cut them in pieces, being of wood, and give them to all the people of the country, not without payment; and each one grates his portion very fine, and puts it upon the first food he eats; and thus believes that by faith he has eaten his saint who then preserves him from all perils. What do you think here, Man, of your own species? Are you so wise as you believe yourselves to be? Are these things to be done by men?

C. A. 4 61 116

Come io vi dissi ne' di passati, voi sapete 2che io sono sanza alcuno ...

3Francesco d'Antonio
4Bernardo di Maestro Jacopo.

C. A. 38 8 124 40

Dimmi come le cose sono passate.

As I told you in past days, you know that I am without any ...

Francesco d'Antonio.

Bernardo di Maestro Jacopo.

Tell me how the things happened.

C. A. 1359.

1359.

1360.

= I went from left to right. 1. Chome lovi dia. 2. alchuno. 3. [frant dacunnie]. 4. [fra brando di m'0" iachopo]. 1360. 1. chome le cose.

L. 15. In explanation of this passage I have received the following communication from Dr. G. W. Leitner of Lahore: "So far as Indian customs are known to us, this practice spoken of by Leonardo as 'still existing in some parts of India' is perfectly unknown; and it is equally opposed to the spirit of Hinduism, Mohammedanism and Sikhism. In central Thibet the ashes of the dead, when burnt, are mixed with dough, and small figures—usually of Buddha—are stamped out of them and some are laid in the grave while others are distributed among the relations. The custom spoken of by Leonardo may have prevailed there but I never heard of it." Possibly Leonardo refers here to customs of nations of America.
1361.

This seems to be the beginning of a letter, but only the first words of the lines have been preserved, the leaf being torn down the middle. No translation is possible.

1362. A preparatory note for the passage given as No. 798, II. 41—42.

1363. This note probably refers to the text No. 1221.

1367. This note seems to be a quotation.
1368. So Leonardo writes his name on a sheet with sundry short notes, evidently to try a pen. Compare the signature with those in Nos. 1341, 1348 and 1374 (see also No. 1346, l. 33). The form "Lionardo" does not occur in the autographs. The Portrait of the Master in the Royal Library at Turin, which is reproduced—slightly diminished—on Pl. I, has in the original two lines of writing underneath; one in red chalk of two or three words is partly effaced: *lionardo ir... im (or lui?)*; the second written in pencil as follows: *fatto da lui stesso assai vecchio*. In both of these the writing is very like the Master's, but is certainly only an imitation.

1369. This date is on a drawing of a rocky landscape. See *Chronique des Arts* 1881 no. 23; *Leonard de Vinci a-t-il été au Righi le 5 août* 1473? letter by H. de Geymüller. The next following date in the MSS. is 1478 (see No. 663).

1370. While the letters in the MS. notes of 1473 and 1478 are very ornate, this note, and the texts on anatomy on the same sheet (for instance No. 805) are in the same simple hand as we see on Pl. CXVI and CXIX. No 1370 is the only dated note of the years between 1480 and 1489, and the characters are in all essential points identical with those that we see in the latest manuscripts written in France (compare the facsimiles on Pl. CXV and p. 254), so that it is hardly possible to determine exactly the date of a manuscript from the style of the handwriting, if it does not betray the peculiarities of style as displayed in the few notes dated previous to 1480.—Compare the facsimile of the manuscripts 1479 on Pl. LXII, No. 2; No. 664, note, Vol. I p. 346. This shows already a marked simplicity as compared with the calligraphy of 1478.

The text No. 720 belongs to the year 1490; No. 1510 to the year 1492; No. 1459, No. 1384 and No. 1460 to the year 1493; No. 1463, No. 1517, No. 1024, 1025 and 1461 to the year 1494; Nos. 1523 and 1524 to the year 1497.

1371. *Scrissi qui*. Leonardo does not say where; still we may assume that it was not in Milan. Amoretti writes, *Memorie Storiche*, chap. XIX: *Sembra pertanto che non nel 1499 ma nel 1500, dopo il ritorno e la prigionia del duca, sia da qui partito Lionardo per andare a Firenze; ed è quindi probabile, che i mesi di governo nuovo e incerto abbia passati col' amico suo Francesco Melzi a Vaglio, ove meglio che altrove studiar potesse la natura, e soprattutto le aquare, e l'addio specialmente, che già era stato l'oggetto delle sue idrottatiche ricerche*. At that time Melzi was only six years of age. The next date is 1502; to this year belong No. 1034, 1040, 1042, 1048 and 1053. The note No. 1525 belongs to the year 1503.
A di 9 di luglio 1504, mercoledì a ore 7 morì Ser Piero da Vinci, notaio al Palazzo del Podestà, mio padre, a ore 7, era d'età d'anni 80, lasciò 10 figlioli maschi e 2 femmine.

C. A. 700: 2085

Mercoledì a ore 7 morì Ser Piero da Vinci a di 9 di luglio 1504.

S. K. M. I. 14

Principiato da me Leonardo da Vinci a di 12 di luglio 1505.

F. 10

Comiziato a Milano a di 12 di settembre 1508.

W. An. III. 217. 4

A di 9 di giannaro 1513.

1372. Written from left to right: 1. addi... luglio 1504 en mercoledi. 2. palazzo... lasc. 4. sci et.
1373. 3. luglio.
1374. 2. uci addi.
1375. comizio... addi.
1376. addi.

1372. This statement of Ser Piero's age contradicts that of the Riusentu della portata di Antonio da Vinci (Leonardo's grandfather), who speaks of Ser Piero as being thirty years old in 1457; and that of the Riusentu della portata di Ser Piero e Francesco, sons of Antonio da Vinci, where Ser Piero is mentioned as being forty in 1469. These documents were published by G. Uzielli, Ricerche intorno a L. da Vinci, Firenze, 1872, pp. 144 and 146. Leonardo was, as is well known, a natural son. His mother 'La Catarina' was married in 1457 to Accabattigiva di Piero del Vacca da Vinci. She died in 1519. Leonardo never mentions her in the Manuscripts. In the year of Leonardo's birth Ser Piero married Albiera di Giovanni Amadoci, and after her death at the age of thirty eight he again married, Francesca, daughter of Ser Giovanni Lanfredi, then only fifteen. Their children were Leonardo's half-brothers, Antonio (b. 1476), Ser Giuliano (b. 1479), Lorenzo (b. 1484), a girl, Violante (b. 1485), and another boy Domenico (b. 1486); Domenico's descendants still exist as a family. Ser Piero married for the third time Lucrezia di Guglielmo Cortigiani by whom he had six children: Margherita (b. 1491), Benedetto (b. 1492), Pandolfo (b. 1494), Guglielmo (b. 1496), Bartolomeo (b. 1497), and Giovanni) date of birth unknown). Pierino da Vinci the sculptor (about 1520—1554) was the son of Bartolomeo, the fifth of these children. The dates of their deaths are not known, but we may infer from the above passage that they were all still living in 1505.

1373. This and the previous text it may be remarked are the only mention made by Leonardo of his father; Nos. 1526, 1527 and No. 1463 are of the year 1504.

1374. Thus he writes on the first page of the MS. The title is on the foregoing coversheet as follows: Libro titolato disstrafformazione ce (cioè) d'un corpo non (in un) altro soma diminuzione e accruimento di materia.

1375. No. 1528 and No. 1529 belong to the same year. The text Vol. I, No. 4 belongs to the following year 1509 (1508 old style); so also does No. 1009.—Nos. 1022, 1057 and 1464 belong to 1511.

1376. No. 1465 belongs to the same year. No. 1065 has the next date 1514.
A 24 di giugno il dì di san Giovanni 1518 in Abosa nel palazzo del clii.

On the 24th of June, St-John's day, 1518 at Amboise, in the palace of...
XXII.

Miscellaneous Notes.

The incidental memoranda scattered here and there throughout the MSS. can have been for the most part intelligible to the writer only; in many cases their meaning and connection are all the more obscure because we are in ignorance about the persons with whom Leonardo used to converse nor can we say what part he may have played in the various events of his time. Vasari and other early biographers give us a very superficial and far from accurate picture of Leonardo's private life. Though his own memoranda, referring for the most part to incidents of no permanent interest, do not go far towards supplying this deficiency, they are nevertheless of some importance and interest as helping us to solve the numerous mysteries in which the history of Leonardo's long life remains involved. We may at any rate assume, from Leonardo's having committed to paper notes on more or less trivial matters on his pupils, on his house-keeping, on various known and unknown personages, and a hundred other trifles—that at the time they must have been in some way important to him.

I have endeavoured to make these 'Miscellaneous Notes' as complete as possible, for in many cases an incidental memorandum will help to explain the meaning of some other note of a similar kind. The first portion of these notes (Nos. 1379—1457), as well as those referring to his pupils and to other artists and artificers who lived in his house (1458—1468) are arranged in chronological order. A considerable proportion of these notes belong to the period between 1490 and 1500, when Leonardo was living at Milan under the patronage of Lodovico il Moro, a time concerning which we have otherwise only very scanty information. If Leonardo did really—as has always been supposed,—spend also the greater part of the preceding decade in Milan, it seems hardly likely that we should not find a single note indicative of the fact, or referring to any event of that period, on the numerous loose leaves in his writing that exist. Leonardo's life in Milan between 1489 and 1500 must have been comparatively uneventful. The MSS. and memoranda of those years seem to prove that it was a tranquil period of intellectual and artistic labour rather than of bustling court life. Whatever may
have been the fate of the MSS. and note books of the foregoing years—whether they were destroyed by Leonardo himself or have been lost—it is certainly strange that nothing whatever exists to inform us as to his life and doings in Milan earlier than the consecutive series of manuscripts which begin in the year 1489.

There is nothing surprising in the fact that the notes regarding his pupils are few and meagre. Excepting for the record of money transactions only very exceptional circumstances would have prompted him to make any written observations on the persons with whom he was in daily intercourse, among whom, of course, were his pupils. Of them all none is so frequently mentioned as Salai, but the character of the notes does not—as it seems to me—justify us in supposing that he was any thing more than a sort of factotum of Leonardo’s (see 1519, note).

Leonardo’s quotations from books and his lists of titles supply nothing more than a hint as to his occasional literary studies or recreations. It was evidently no part of his ambition to be deeply read (see Nrs. 10, 11, 1159) and he more than once expressly states (in various passages which will be found in the foregoing sections) that he did not recognise the authority of the Ancients, on scientific questions, which in his day was held paramount. Archimedes is the sole exception, and Leonardo frankly owns his admiration for the illustrious Greek to whose genius his own was so much akin (see No. 1476). All his notes on various authors, excepting those which have already been inserted in the previous section, have been arranged alphabetically for the sake of convenience (1469—1508).

The passages next in order contain accounts and inventories principally of household property. The publication of these—often very trivial entries—is only justifiable as proving that the wealth, the splendid mode of life and lavish expenditure which have been attributed to Leonardo are altogether mythical; unless we put forward the very improbable hypothesis that these notes as to money in hand, outlay and receipts, refer throughout to an exceptional state of his affairs, viz. when he was short of money.

The memoranda collected at the end (No. 1505—1565) are, in the original, in the usual writing, from left to right. Besides, the style of the handwriting is at variance with what we should expect it to be, if really Leonardo himself had written these notes. Most of them are to be found in juxtaposition with undoubtedly authentic writing of his. But this may be easily explained, if we take into account the fact, that Leonardo frequently wrote on loose sheets. He may therefore have occasionally used paper on which others had made short memoranda, for the most part as it would seem, for his use. At the end of all I have given Leonardo’s will from the copy of it preserved in the Medici Library. It has already been printed by Amoretti and by Uzielli. It is not known what has become of the original document.
Find Longhi and tell him that you wait Memoranda before 1500 for him at Rome and will go with him to Naples; make you pay the donation [2] and take the book by Vitolone, and the measurements of the public buildings. [3] Have two covered boxes made to be carried on mules, but bed-covers will be best; this makes three, of which you will leave one at Vinci. [4] Obtain the from Giovanni Lombardo the linen draper of Verona. Buy handkerchiefs and towels, ... and shoes, 4 pairs of hose, a jerkin of ... and skins, to make new ones; the lake of Alessandro. [7] Sell what you cannot take with you. Get from Jean de Paris the method of painting in tempera and the way of making white

1379. The mysterious looking words, quite distinctly written, in line 1: ingol edili chetta ... ilopana. 2. fare la eno igne oal ettoli ... elle. 3. saffare ... coperte da letto.
4. lascierai ... unci ... le fochere delle granate dago.
5. lombardo il tenajo (?) di erona ... matili breto (?) scavini.
6. gubbone di ci morsa ... tornio dale. 7. si po ... piglia dIanegiphars. 8. asecho ... folie in mol. 9. ti doppi ella sua

C. A. 2432; 772 a

1379.

Truova ingol e digli che tu l'aspetti amor a e che tu andrai có seco ilopan a; fatti fare enoigand al; e tolli il libro di Vitolone, e le misure · delle editi · publici ·; fa fare 2 casse coperte da mvlattiere, ma meglio fa · le coperte da letto, che e son 3, delle quali lascierai una a Vinci; togli le fodere (?) delle grattugie (?) da Gio·va Lombardo il telajuolo di Verona; copra delle tovaglie · e matili · · · · · scarpini, calze 4 para, vn giubbone di cimoza e pelli per fare ne de' novi; il tornio d'Ales·sandro ·; vendi quel che nò si può portare; piglia da Gian di Paris il modo de colorire a secco ·, el modo del sale bianco e del fare le carte inpastate; folie in mol·ti doppi;

1379. had at the time plans for travelling further than Naples. From lines 3, 4 and 7 it is evident that he purposed, after selling every thing that was not easily portable, to leave a chest in the care of his relations at Vinci. His luggage was to be packed into two trunks especially adapted for transport by mules. The exact meaning of many sentences in the following notes must necessarily remain obscure. These brief remarks on small and irrelevant affairs and so forth are however of no historical value. The notes referring to the preparations for his journey are more intelligible.

2. Libro di Vitolone see No. 1506 note.
7 and fol. It would seem from the text that Leonardo intended to have instructions in painting on paper. It is hardly necessary to point out that the Art of illuminating was quite separate from that of painting.
e la sua cassetta de' colori; inpar la temperatura delle carnagioni, inpara a disolvere la lacca gommatata, lin del seume, de ... e dele ... biache, delle agli da Piacêia, togli De Poderibus; tolli l'opere di Leonardo cremo'nese; leua il fornello 13, ... della 'semêza de ligli e dell'erba stella, delle zuche marine, vedì l'asse della sosta, fatti: dare la ... a chi la rubò, pi'inglia il liuellare, quito terreno può cauare l'omo in un di.

C. 1380

Questo fecie Lione in piazza di castello con v vincolo e vna saetta.

II. 50#

NOMI D' EGIGNIERI.

3 Callias Rodiano, 1 Epimaco Ateniense, 4 Diogine filosofo Rodiano, 5 Calcedonio di Tracia, 6 Febar di Tiria, 7 Callimaco architetto, maestro di foichi.

Aab. II. 134

A maestro Lodovico chiedi li cödotti d'acqua.

FL. Uff.

... j Pistoj; Fiorauante di Domenico j Firenze è cöpare amantissimo, quant è mio ...


1380. 1. questa ... piazza. 2. castello chou v'uchio e vna.

1381. 3. acte niense. 4. filosofo. 6. febar de tiria. 7. challimaco architetto.

1382. maestro lodovico ciedi ... dacqta.

1383. ... e echopa j pistoja. 2. domenicho ... cöpere. 3. mio jirsuioosam (?). 4. jade nom. 5. amante quanto.

11. De Ponderibus. A large number of Leonardo's notes bear this superscription. Compare No. 1436, 3-1380. This note must have been made in Milan; as we know from the date of the MS.

1381. Callias, Architect of Aradus, mentioned by Vitruvius (X, 16, 3).—Epimachus, of Athens, invented a battering-engine for Demetrios Poliorkêtes (Vitruvius X, 16, 4).—Callimachus, the inventor of the Corinthian capital (Vitr. IV, 1, 9), and of the method of boring marble (Paus. I, 26, 7), was also famous for his casts in bronze (Plin. XXXIV, 8, 19). He invented a lamp for the temple of Athene Polias, on the Acropolis of Athens (Paus. I, 26, 7).—The other names, here mentioned, cannot be identified.

1382. Condetti d'acqua. Possibly a book, a MS. or a map.

1383. On the same sheet is the text No. 663.
S. K. M. III. 14]

A di 16 di luglio.
1384. Caterina venne a di 16 di luglio 1493.
2Morel Fioretino di messer Mariolo, cavallo 5grosso à bel collo e assai bella testa.
3Rózone bianco del falconiere à belle cose.
4Caullo grosso del Cherononino del signor Giulio.

S. K. M. III. 30a]

DELLI STRUMETO.
1Chiiuque spède uno ducato per paro 3pigli lo strumetò, e non spèderà: se non 7mezzo per premaìnëcia allo invètore dello strumetò, e vno groso per l'operatore ogni anno; non uoglio sottovitti 2all.

S. K. M. III. 35a]

Maestro Giuliano da Marliano a v bello erbalaro; 3sta a riscòtro alli Strami 4legnamieri.

C. A. 38b a 98o a]

Cristofano da Castiglio 5e sta alla Pietà, à bona 3testa.

Opere di . . . della stalla di Galeazzo; 1per la via di Brera; 2benefitio dello Stanghe; bene\fiò delle porta nova; 3benefitio di Monza; 4errore dell’ Inta\co; 5di prima li benefiti; 6e poi l'opere e poi 7le ingraturudini 8e poi le idegni e la 9in\dations e . . .

H. 3. 47d]

Chiliarco, capo di mille, 2Prefetti—captains, 3Legione, semila 63.

1384. On the 16th day of July.
1385. Caterina came on 16th day of July, 1493.
1386. Messer Mariolo's Morel the Florentin, has a big horse with a fine neck and a beautiful head.
1387. The white stallion belonging to the falconer has fine hind quarters; it is behind the Comasina Gate.
1388. The big horse of Cermonino, of Signor Giulio.

1389. Of the instrument.

Any one who spends one ducat may take the instrument; and he will not pay more than half a ducat as a premium to the inventor of the instrument and one grosso to the workman every year. I do not want sub-officials.

1386. Maestro Giuliano da Marliano has a fine herbal. He lives opposite to Strami the Carpenters.
1387. Cristofano da Castiglione who lives at the Pietà has a fine head.
1388. Work of . . . of the stable of Galeazzo; by the road of Brera [4]; benefice of Stanghe [5]; benefice of Porta Nova; benefice of Monza; Indaco's mistake; give first the benefits; then the works; then ingratitude, indignity and lamentations.

1389. Chiliarch—captain of 1000.
1383. Prefects—captains.
1384. A legion, six thousand and sixty three men.

1384. Compare Nos. 1522 and 1517. Caterina seems to have been his housekeeper.
1385. Refers perhaps to the regulation of the water in the canals.

1386. Compare No. 616, note. 4. legnamiere (milanese dialect) = legnajuolo.
1388. 4. Brera, see No. 1443; 11, 13; 5. Stanghe, see No. 1509.
MISCELLANEOUS NOTES.

1390. Vna monica sta alla Colomba 2 in Cremona che lavora bőc cordoni di paglia, e vno frate 4 di Scō Francesco.

A nun lives at La Colomba at Cremona; she works good straw plait, and a friar of Saint Francis.

1391. Aguglia,—Niccolao,—r. refe,—1 Ferrādo, —i acopo ādre,—3 tela,—6 pietra,—7 colo ri,—8 penella,—9 tavoletta da colori,—10 spū ga,—11 tavola del Duca.

Needle,—Niccolao,—thread,—Ferrando, —Iacopo Andrea,—canvas,—stone,—colours,—brushes,—pallet,—sponge,—the panel of the Duke.


Messer G. Domenico Mezzabarba and Messer Giovanni Francesco Mezzabarba. By the side of Messer Piero d’Anghiera.

1393. Côte Francesco Torello.

Conte Francesco Torello.

1394. Giuliano Trombetta,— Antonio di Ferrara, —3 olio di bolla.

Giuliano Trombetta,— Antonio di Ferrara, —Oil of . . . .

1395. Paolo fu ratto in cielo.

Paul was snatched up to heaven.

1396. Giuliano da Maria, medico 2 à vn massajo sāza mano.

Giuliano da Maria, physician, has a steward without hands.

1397. Fatti mādare spighe di 2 grā grosso da Firezze.

Have some ears of corn of large size sent from Florence.

1390. La Colomba is to this day the name of a small house at Cremona, decorated with frescoes.

1394. Near this text is the sketch of a head drawn in red chalk.

1395. See the facsimile of this note on Pl. XXIII No. 2.
S. K. M. II. 2 338

Vedi la letti"era a Scà Maria; Segreta.

S. K. M. II. 2 338

Arrigo de' avere 2 ducati 11 d'oro; Arrigo de' avere 4 ducati 4 d'oro a mezzo Agosto.

S. K. M. II. 2 638

da al patrone lo esèplo 2 del capitano, che nò lui vi"c"ce, ma li soldati medi"ate il suo cosèlio, e pur merita il saldo.

S. K. M. II. 2 688

Messer Pier Antonio.

S. K. M. II. 2 698

Olio,—2 giallo,—3 Ambrosio,—4 la bocca,—5 la masseria.

S. K. M. II. 2 758

Alessandro carissimo, 2 da Parma per la mà di...

S. K. M. II. 2 786

Giovannina, viso fantastico, 2 sta a Scà Caterina, all'ospedale.

S. K. M. II. 2 112

24 tavole fanno una pertica; 24 tavole make 1 perch.

1400. Da al patrone lo esèplo del capitano, che nò lui vi"c"ce, ma li soldati medi"ate il suo cosèlio, e pur merita il saldo. Give your master the instance of a captain who does not himself win the victory, but the soldiers do by his counsels; and so he still deserves the reward.

1401. Messer Pier Antonio.

1402. Oil,—yellow,—Ambrosio,—the mouth,—the farmhouse.

1403. My dear Alessandro from Parma, by the hand of...

1404. Giovannina, has a fantastic face,—is at Santa Caterina, at the Hospital.

1405. 24 tavole fanno una pertica; 24 tavole make 1 perch.

1399. 1. arigo. 3. arigo. 5. mezo. 1400. 1. patrone. 1401. meser pier fi'o chodi. 2. diga.

1402. 3. abrosio. 4. bocha. 5. masera. 1403. 1. charissi no. 2. sèl da da . mà dìfìlp.

1404. 1. fantasticho. 2. chaterina.

1405. 1—5. R. 1. fa l perticha. 2. fa l. 3. br e mezo fa l trabocco. 4. perticha he . br. 5. ovr.
1406. La strada di messer Mariolo è braccia 13 1/4; la casa di Vagelista è 75; 
Entra braccia 7 e 1/2 nella casa di 

1407. Domando in che parte del suo moto 
curvo la causa, che move, lascerà la cosa 
mossa e mobile.

1408. Antonio de' Risi sta al còsiglio di 
Givstitia.

1409. Disse Paolo che nessuno strumento 
che move vn altro.....

On this page and that which faces it, 
MS.12 71a, are two diagrams with numerous reference numbers, evidently relating to the measurements of a street.

The passage, of which the beginning is here given, deals with questions in mechanics. The instances in which Leonardo quotes the opinions of his contemporaries on scientific matters are so rare as to be worth noticing. Compare No. 901.
1410. Caravaggio.

1410. Caravaggio.

W. P. 7.]  
Caravaggio.

1411. Pulleys, — nails, — rope, — mercury, — cloth, Monday.

W. A. II. 36]  
Carrucole, — c1hiodi, — corda, — mercurio, — tela, — lunedì.

1412.  
RICORDO.  
— Maghino Speculus di maestro Giovanni Fraciese; — Galeno de utilità.

W. A. II. 202.]  
Memorandum.

1412.  
Memorandum.

1413. Presso al Cordusio sta Pier Antonio da Fossano e Serafino suo fratello.

1413. Near to Cordusio is Pier Antonio da Tossano and his brother Serafino.

1414.  
L. 97]  
Paolo di Vannocci in Siena.  
1 La saletta di sopra per li apostoli;  
2 Edifici di Bramante;  
3 Il castellano fatto prigione;  
4 Il Visconte strascinato e poi morto il figliuolo;  
5 Gian della Rosa tolto il danari;  
6 Borgonzo principiò e nol volle, e però fuggì le fortune;  
7 Il duca perso lo stato e la roba e libertà, 10 e nessuna sua opera si finì per lui.

1410. Caravaggio, a village not far from the Adda between Milan and Brescia, where Polidoro and Michelangelo da Caravaggio were born. This note is given in facsimile on Pl. XIII, No. 1 (above, to the left). On Pl. XIII, No. 2 above to the right we read carrozze (amcro-).  

1411. This note is written between lines 23 and 24 of the text No. 710. Cordusio, Cordusio (cura ducis) = Cordus in the Milanesian dialect, is the name of a Piazza between the Via del Broletto and the Piazza de' Mercanti at Milan. In the time of il Moro it was the centre of the town. The persons here named were members of the noble Milanese family de' Fossani; Ambrogio da Fossano, the contemporary painter, had no connection with them.

1412. Memoria after 1500.

1413. This passage evidently refers to events in Milan at the time of the overthrow of Ludovico il Moro. Amoretti published it in the 'Memorie Storiche' and added copious notes.

6. Visconti. Chi fece quel Visconte non sapremmo indovinare fra tanti di questo nome. Ariosto narra che allora arrestate furono le case de' Visconti, de' Castiglioni, de' Sansovini, e de' Batta e non è improbabile che ne fossero insultati e morti i padroni. Moli Visconti annovera lo stesso Cornista che per esserli rallegrati del ritorno del duca in Milano furono de' Francesi arrestati, e stracciati in Francia come prigionieri di stato; e fra questi Maser Francesco Visconti, e suo figliuolo Battista. (AMORETTI, Mem. Stor. XIX.)

5. Borgonzo in Borgia Batta fu regolatore delle ducati entrati sotto il Moro, alla cui fuga la casa sua fu pur massa a sacco dei partiziani francesi. (AMORETTI, l. c.)
1415. Ambrosio Petri, St. Mark, 4 boards for the window, 2 . . . . . , 3 the saints of chapels, 5 the Genoese at home.

1416. Piece of tapestry,—pair of compasses,—Tommaso's book,—the book of Giovanni Benci,—the box in the custom-house,—to cut the cloth,—the sword-belt,—to sole the boots,—a light hat,—the cane from the ruined houses,—the debt for the table linen,—swimming-belt,—a book of white paper for drawing,—charcoal.—How much is a florin . . . . , a leather bodice.

1417. Borges shall get for you the Archimedes from the bishop of Padua, and Vitellozzo the one from Borgo a San Sepolcro.

1418. Marzocco's tablet.

1419. Marcello lives in the house of Giacomo da Mengardino.

1420. Where is Valentino?—boots,—boxes in the custom-house,...,—[5] the monk at the Carmine,—squares,—[7] Piero Martelli,—[8] Salvi Borgherini,—send back the bags,—a support for the spectacles,—[11] the nude study of San Gallo,—the cloak. Porphyry,—groups,—square,—[16] Pandolfino.

3. Borgo a San Sepolcro, where Luca Paciolo, Leonardo's friend, was born.

1420. Valentino. Cesare Borgia is probably meant. After being made Archbishop of Valence by Alexander VI he was commonly called Valentinus or Valentino. With reference to Leonardo's engagements by him see pp. 224 and 243. note.

7. 8. Martelli, Borgherini; names of Florentine families. See No. 4.
11. San Gallo; possibly Giuliano da San Gallo, the Florentine architect.
16. Pandolfino; see No. 1544 note.
of cresse
The alia. 4.
increase
sino
vedrai
Vitruvius.
M
del
largeza.
quero
tro
Coltelli
F.
6
sllColtelli
l0
7
Meteora;
Metere[a];
Archimedes, de cè-
tre grauitatis;\[7\]
Anatomia, Alessa-
dro Benedetto;\[7\]
Il Dàte di Niccolò del-
la Croce.\[7\]
Al Bertuccio il Marliano il deca-
tione, Alberto de celo e mido [da fra
Bernardino]; Oratio scisse della velocità
del cielo.

F. 278]

De' 3 corpi regolari cótro alcù comèta-
tori che biasimà li atichi ivètori dòde na-
quero le gramatiche e le scientie ...

W. An. III. 277a (G)

Camera de'lla Torre da Vaneri.

Of the three regular bodies as opposed to
some commentators who disparage the An-
cients, who were the originators of grammar
and the sciences ...

1421. Concave mirrors; philosophy of Aristotle;
[2] the books of Avicenna; Messer Ottaviano
Italian and Latin vocabu- Palavicino for his
lary; Vitruvius[3].
bohemian knives; go every Saturday to the
Vitruvius;[6] hot bath where you will
see naked men;

'Meteora'[7].
Archimedes, on the centre of gravity;[9]
Inflate the lungs of a pig and ob-
anatomy[10] Alessandro
serve whether they
Benedetto;
The Dante of Niccolò and in length, or
della Croce; in width dimini-
ishing in length.

Albertus, on heaven and earth[15], [from
the monk Bernardino]. Horace has written on the
movements of the heavens.

1422.

The room in the tower of Vaneri.

1421. 2. dausinega. 3. vocabolista. — sino pel. 4. eliatino. 5. buemia. . alla. 6. vederai. 7. meteura. 9. trugrauitatis. —
16. oratio .. del celo. These six words are written in four short lines on the margin near line 1-4.

1422. 2. naserò le grammatiche elle.

1423. 1. chamera.

1421. Filosofia d'Aristotele see No. 1481 note.
2. Avicenna (Leonardo here writes it Avinega) the Arab philosopher, 980—1037, for centuries the un-
impeachable authority on all medical questions. Leonardo possibly points here to a printed edition:
Avicennae canonum libri V, latine 1476 Patavii. Other editions are, Padua 1479, and Venice 1490.
9. The works of Archimedes were not printed
during Leonardo's life-time.
10. Compare No. 1494.

14. Johannes Marliani sua etate philosophorum et me-
dicorum principis et duaeis philosophi, primi de proportione
motuum velocitate questio subtilissima incipit ex ejusdem
Marliani originali foliicer extracta, (Milano) 1482.
Another work by him has the title: Marlianus
mediolanensis. Questio de caliditate corpurum humanorum
tempore hiemis ed estate et de antiparastass ad celebrem
philosophorum et medicorum universitatem ticinensem. 1474.
15. See No. 1469, l. 7.

1423. This note is written inside the sketch of a
plan of a house. On the same page is the date
1513 (see No. 1376).
2. The figures you will have to reserve for the last book on shadows that they may appear in the study of Gerardo the illuminator at San Marco at Florence.

[Go to see Melzo, and the Ambassador, and Maestro Bernardo].

M. o']

Ermeneo filosofo.

M. 8a]

Suisset cioè calculatore, — Tisber, — Angelo Fossofrò, — Alberto.

M. 52d]

Modo del pòte leuatojo che mi mostrò Donnino, e perché c. e d. spingano in basso.

Mz. o”]

Piglerà il primo volo il gràde vcello; — sopra del dosso del suo magnio cecero, — empìèdo l’universo di stupore, — empìèdo di sua fame tutte le scritture e gloria eterna al loco dove nacque.

Tr. 22]

Questo inganno fu vsato dai Ga’lli contro a’ Romani, c seguì ne tal mortalità che tutta a Roma sì vestì a bruno.

This stratagem was used by the Gauls against the Romans, and so great a mortality ensued that all Rome was dressed in mourning.

1424. The figures you will have to reserve for the last book on shadows that they may appear in the study of Gerardo the illuminator at San Marco at Florence. [Go to see Melzo, and the Ambassador, and Maestro Bernardo].

1425. Hermes the philosopher.

1426. Suisset, viz. calculator, — Tisber, — Angelo Fossofron, — Alberto.

1427. The structure of the drawbridge shown me by Donnino, and why c and d thrust downwards.

1428. The great bird will take its first flight; on the back of his great swan, — filling the universe with wonders; filling all writings with his fame and bringing eternal glory to his birthplace.

1429. This stratagem was used by the Gauls against the Romans, and so great a mortality ensued that all Rome was dressed in mourning.
Alberto da Imola;—Algebra, that is, the demonstration of the equality of one thing to another.

Johannes Rubicissa e Robbia.

Dimāda la moglie di Biagio Crivelli come il cappone allieva e cova l’uova della gallina, essendo lui inbraciato.

The book on Water to Messer Marco Antonio.

Have Avicenna’s work on useful inventions translated; spectacles with the case, steel and fork and ..., charcoal, boards, and paper, and chalk and white, and wax; ..., for glass, a saw for bones with fine teeth, a chisel, inkstand ..., three herbs, and Agnolo Benedetto. Get a skull, nut,—mustard.

Boots,—gloves, socks, combs, papers, towels, shirts, — shoe-tapes, — shoes, penknife, pens. A skin for the chest.


Possibly Marc-Antonio della Torre, see p. 97.

Lapis. Compare Condivi, Vita di Michel-angelo Buonarroti, Chap. XVIII: Ma gli (Michel-angelo) non avevano che mostrare, prese una penna (per-
W. L. 1410]

Ricordo.

1. Andare in provisione per il mio giardino, — 2. Giordano de' pòderibus, — 3. el col·laboratore, de flusso e reflusso del mare, — 4. far fare due casse da soma, — 5. sed vedi il tornio del Beltraffio e falli trarre una pietra, — 6. lascia il libro a messere Andrea tedesco, — 7. fa una bilancia d'una freccia e pesa la cosa ilocata e poi la ri pesa fredda; — 8. lo specchio di maestro Luigi, — 9. A b flusso e reflusso dell'acque, provato al molino di Vaprio, — 11. beretta.

W. L. 2120]

Giovanni Fabre, — 2. Lazaro del Volpe, — 3. comune, — 4. Ser Piero —

W. L. 2030]


C. A. 11 b; 37 b]


1436. To make some provisions for my garden,

— Giordano, De Ponderibus [3], — the peacemaker, the flow and ebb of the sea, — have two baggage trunks made, look to Beltraffio's [6] lathe and have taken the stone, — out leave the books belonging to Messer Andrea the German, — make scales of a long reed and weigh the substance when hot and again when cold. The mirror of Master Luigi; A b the flow and ebb of the water is shown at the mill of Vaprio, — a cap.

1437. Giovanni Fabre, — Lazaro del Volpe, — the common, — Ser Piero.

[1438. Lactantius, [the book of Benozzo], groups, — to bind the book, — a lantern, — Ser Pecantino, — Pandolfino, — [Rosso] — a square, — small knives, — carriages, — curry combs — cup.

1439. Quadrant of Carlo Marmocchi, — Messer Francesco Araldo, — Ser Benedetto d'Accie perello, — Benedetto on arithmetic, — Maestro Paolo, physician, — Domenico di Michelino, — . . . . . . of the Alberti, — Messer Giovanni Argimboldi.

1436. 1. Richardo. 2. provisione. 4. frusso e refrussio. 5. dassoma. 6. effalli. 7. lasscia . messere andrea tedesco. 8. ilocata epopo. 9. losspechio . maestro. 10. frusso e refrusso . di usario.

1437. 1. giovanni. 2. lazaro . . elupio.

1438. 8. carare. 9. stregghia. 10. [cavallina].

1439. 1. charlo. 2. franc"o. 3. benedetto daccieperello. 4. abbaicho. 5. maestro paghól mediocho. 6. domenicho. 7. chaulio. 8. meser argirobolto.

1436. 3. Giordano. Jordanus Nemorarius, a mathematician of the beginning of the XIIIth century. No particulars of his life are known. The title of his principal work is: Arithmetica decem libros demonstrat, first published at Paris 1496. In 1523 appeared at Nuremberg: Liber Jordani Nemorarii de ponderibus. propositiones XIII et eorumdem demonstra-
MISCELLANEOUS NOTES.

1440.

Colore, —formulaio, — Archimedes, — Marcanto ninio; Tinned iron,—pierced iron.

1441.

See the shop that was formerly Bartolommeo's, the stationer.

1442.

The first book is by Michele di Francesco Nabini; it treats on science.

1443.

Messer Francesco, physician of Lucca, with the Cardinal Farnese.

1444.

Pandolfino's book[1], — knives, — a pen for ruling, — to have the vest dyed, — The library at St-Mark's, — The library at Santo Spirito, — Lactantius of the Baldi [7], — Antonio Covoni, — A book by Maestro Paolo Infermieri, — Boots, shoes and hose, — (Shell) lac, — An apprentice to do the models for me. Grammar, by Lorenzo de Medici, — Giovanni del Sodo, — Sansovino, [15] — a ruler, — a very sharp knife, — Spectacles, — fractions, — repair, — reparation, — Tomaso's book, — Michelagnolo's little chain; Learn the multiplication of roots from Maestro Luca; — my map of the world which Giovanni Benci has[25]; — Socks, — clothes from the custom-house-officier, — Red Cordova leather, — The map of the world, of Giovanni Benci, — a print, the districts about Milan, — Market book.

1440. Colours, formula, — Archimedes, — Marcantonio.

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1442. The first book is by Michele di Francesco Nabini; it treats on science.

1443. Messer Francesco, physician of Lucca, with the Cardinal Farnese.

1444. Pandolfino's book[1], — knives, — a pen for ruling, — to have the vest dyed, — The library at St-Mark's, — The library at Santo Spirito, — Lactantius of the Baldi [7], — Antonio Covoni, — A book by Maestro Paolo Infermieri, — Boots, shoes and hose, — (Shell) lac, — An apprentice to do the models for me. Grammar, by Lorenzo de Medici, — Giovanni del Sodo, — Sansovino, [15] — a ruler, — a very sharp knife, — Spectacles, — fractions, — repair, — reparation, — Tomaso's book, — Michelagnolo's little chain; Learn the multiplication of roots from Maestro Luca; — my map of the world which Giovanni Benci has[25]; — Socks, — clothes from the custom-house-officier, — Red Cordova leather, — The map of the world, of Giovanni Benci, — a print, the districts about Milan, — Market book.

1440. Colours, formula, — Archimedes, — Marcantonio.

1441. See the shop that was formerly Bartolommeo's, the stationer.

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1443. Messer Francesco, physician of Lucca, with the Cardinal Farnese.
MISCELLANEOUS NOTES. [1445—1448.]

C. A. 1553, 432 a

**1445.**

[*Di quel di Pavia si lauda · piv · il movimento · che nessun altra cosa;—
L'imitazione · delle cose · antiche · è piv laudabile · che quella delle moderne;—
Nò può essere bellezza · e vilità · come appare nelle fortezze · e nelli omni;—
Il trotto · è quasi di qualità · di cavallo libero;—
Douc · manca · la uiuacità naturale · biognia farne una accidetale.*

C. A. 1764; 532]

Saluadore materassai sta in sulla piazza di Sco An'drea; entra da pellicciai...

C. A. 1854; 557]

Mosignor de' Pazzi,— ser Atonio Pacini.

C. A. 222 a; 669 a]

Aligbra ch'è apresso i Marliani fatta dal loro padre,—
Dell'osso, de' Marliani,
Dell'osso che fora, Gian Giacomo da Bellinzona, e tirare fori il chiodo così facilita,—
Misura di Boccalino,—
Misura di Milano e borghi,—
Libro che tratta di Milano e sue chiese, che à l'ultimo cartolaito iuero il Corduso,—
Misura della corte vechia,—
Misura del castello,—
Fatti mostrare al maestro · d'abbaco · riquadrare · uno . . . . —
Fatti mostrare a messer Fatio 'di proporzione',—

1445. 1. lalda ... chosa. 2. cheose ... laudabile chelle. 3. pro essere bellera ... chome apare. 4. trocto ... chavallo. 5. mancha ... fare l'accedôte.
1446. 2. piazza di sco[]][[]]. 3. pellicciai[][][]. 4. desare a franc' paiò[][][][]. 5. lì di lenzola e per sco[][][].
1447. pari.
1448. 1. alchiba. 2. cheoffa giaischomo da bellinchona ettirare ... ciodo chò. 3. bochallo. 4. chettatta ... essa ... chartolaio ... chorduso. 5. chorte. 6. castello. 7. abba. 8. dabba. 9. riquadrare l magloto (7). 10. mosstrarc ... faute. 13. brallipipo.

1445. *Quel di Pavia. Pavia is possibly a clerical error for Padua, and if so the meaning of the passage is easily arrived at: *Quel di Padua* would be the bronze equestrian statue of Gattamelata, on the Piazza del Santo at Padua executed by Donatello in 1443 (see pp. 2 and 3).
MISCELLANEOUS NOTES.

11. Fatti mostrare al frate di Brera 'de pòderibus',
12. Della misura di Sco Lorenzo,
13. A fra Filippo di Brera prestai certi gruppi,
14. Ricorda a Gioanino bonbardieri del modo, come si mvrò la torre di Ferrara sáza buche,
15. Dimàda maestro Antonio, come si pianò bòbarde e bastioni di d i o d notte,
16. Domanda Benedetto Portinari in che modo si corre per lo ghiaiccio in Fiàdra,
17. Le proporzioni d’Alchino colle còsiderazioni del Marliano da messer Fatio,
18. La misura del sole promessami da maestro Giovanni frázese,
19. Balestra di maestro Gianetto,
20. Il libro di Giovanni Taverna che a messer Fatio,
21. Ritrarai Milano,
22. Misura di navilio, conche e sostegno e barche maggiori e spesa,
23. Milano i fondaméto,
24. Gruppi di Bramàte,
25. Meteora d’Aristotile vulgare,

26. Fa d’avere Vitolone ch’è nella libreria di Pavia che tratta della matematica,
27. Teneva uno maestro d’acqua, e fatti dire i riparo d’essa, e quello che costa vn riparo, e una conca, e uno navilio, e uno molino alla lornbarda,
28. Un nipote di Gian Ágelo dipitore a uno libro d’acque che fu del padre;
29. Paulino Scarpellino, detto Assiolo, è bono maestro d’acque.

C. A. 3134; 9304.

Francesco d’Antonio j Firenze.

Get the Friar di Brera to show you [the book] 'de Ponderibus' [11],

Of the measurement of San Lorenzo,
I lent certain groups to Fra Filippo de Brera, [13],

Memorandum: to ask Maestro Giovanni as to the mode in which the tower of Ferrara is walled without loopholes,
Ask Maestro Antonio how mortars are placed on bastions by day or by night,
Ask Benedetto Portinari how the people go on the ice in Flanders,
On proportions by Alchino, with notes by Marliano, from Messer Fazio,
The measurement of the sun, promised me by Maestro Giovanni, the Frenchman,
The cross bow of Maestro Gianetto,
The book by Giovanni Taverna that Messer Fazio,
You will draw Milan [21],
The measurement of the canal, locks and supports, and large boats; and the expense,
Plan of Milan [23],
Groups by Bramante [24],
The book on celestial phenomena by Aristoteles, in Italian [25],
Try to get Vitolone, which is in the library at Pavia [26] and which treats of Mathematics,—He had a master [learned] in waterworks and get him to explain the repairs and the costs, and a lock and a canal and a mill in the Lombard fashion.
A grandson of Gian Angelo’s, the painter has a book on water which was his fathers. Paulino Scarpellino, called Assiolo has great knowledge of water works.

Francesco d’Antonio at Florence.

14. richiarda a giovanni... chene... tore' di ferrara. 15. chome. 16. chome. dixio di fa'dra. 17. cholle chisideratione. 18. promissami. maestro. 22. chiche esso stegnio... magiori espensa. 26. tratte della matematica. 27. teneva i maestro dasc'a effati... e'equelle che chiosta. 26. e' i choncha e' I... o' I. 29. vnipote... già'gelo... a' l libro.
30. pagolino scarpellino... maestro.

1449. franc'oo... dant'too' jifrence (early writing).

11. 13. Brera, now Palazzo delle Scienze ed Arti. Until 1571 it was the monastery of the order of the Umiliati and afterwards of the Jesuits.
De ponderibus, compare No. 1436, 3.
12. Sco Lorenzo. A church at Milan, see pp. 39, 40 and 50.
16. The Portinari were one of the great merchant-families of Florence.
23. Fondamento is commonly used by Leonardo to mean ground-plan. See for instance p. 53.

25. Meteora. By this Leonardo means no doubt the four books τα μεταμορφώμενα. He must refer here to a MS. translation, as no Italian translation is known to have been published (see No. 1477 note).
26. Vitolone see No. 1506, note.

Libreria di Pavia. One of the most famous of Italian libraries. After the victory of Novara in April 1500, Louis XII had it conveyed to France, 'come trofeo di vittoria'!
MISCELLANEOUS NOTES.

C. A. 358r; 1124v

Gioviano Gódi,— 1 Tomaso Ridolfi,— 2 Tomaso· Paganelli,— 3 Niccolò· del Nero,— 4 Simó· Guasti,— 5 Nasi,— 6 erede di Lionardo Manelli,— 8 Guglielmo di Ser Martino,— 9 Bartolomeo· del Tovaglia,— 10 Andrea· Arrigucci,— 11 Niccolò· Capponi,— 12 Giovan Portinari.

ibr. M. 48a

Pandolfino.

ibr. M. 132r

Il Vespuccio mi vol dare un libro di geometria.

ibr. M. 159r

Marcantonio Colonna *in Sco Apostolo.

ibr. M. 191a

Cass, gabbia,—
3 Liuello, far l'uccello,—
3 Libro del Pandolfino, grisselino,—
4 Coltellini,— Venieri per la


1451. Pandolfino.

1452. Vespuccio will give me a book of Geometry.

1453. Marcantonio Colonna at Santi Apostoli.

1454.

A box, a cage,—
A square, to make the bird[2],—
Pandolfino's book, mortar[?],—
Small knives, Venieri for the

1450. 1—12 R. 4. nicholo. 5. zasti. 7. rede di. 11. nicholo.
1453. marchiontonio chollona.
1454. 1. chassa. 4. pella. 5. darrizzare . metaura. 8. casa e pazi. 9. maestro pa“lo”. 10. escarpe. 11. lacha, — trai 2 agui.

1450. 1. Giuliano Gondi. Ser Piero da Vinci, Leonardo's father, lived till 1480, in a house belonging to Giuliano Gondi. In 1498 this was pulled down to make room for the fine Palazzo built on the Piazza San Firenze by Giuliano di San Gallo, which still exists. In the Riassunto del Catasto di Ser Piero da Vinci, 1480, Leonardo is not mentioned; it is evident therefore that he was living elsewhere. It may be noticed incidentally that in the Catasto di Giuliano Gondi of the same year the following mention is made of his four eldest sons:

Leonardo mio figliolo d’età d’anni 29, non fa nulla, Giovannibatista d’età d’anni 28 in Gherardinopolis, Filichioso d’età d’anni 24 a Napoli, Simone d’età d’anni 23 in Ungheria.

He himself was a merchant of gold filigree (faciamo lavorare una bottiglia d’arte di seta . . . facciamo un pocho di trafico a Napoli). As he was 59 years old in 1480, he certainly would not have been alive at the death of Leonardo's death to Giuliano da Vinci at Florence (see p. 284), he says at the end "Datemene risposta per i Gondi" (see Uzielli, Ricerche, passim).

Most of the other names on the list are those of well-known Florentine families.

1452. See No. 844, note, p. 130.

1453. In July 1506 Pope Julius II gave Donna Lucrezia della Rovere, the daughter of his sister Luclina, in marriage to the youthful Marcantonio Colonna, who, like his brothers Prospero and Fabrizio, became one of the most famous Captains of his family. He gave to him Frascati and made him a present of the palazzo he had built, when Cardinal, near the church of Santi Apostoli which is now known as the Palazzo Colonna (see Gregorovius, Gesch. der Stadt Rom. Vol. VIII, book XIV 1, 3. And Conti, Mem. Colonnii p. 251).

1454. Much of No. 1444 is repeated in this memorandum.

2. Vasari states that Leonardo invented mechanical birds which moved through the air. Compare No. 703.
Cerca in Firenze della ......

Search in Florence for ......

Penna da rizzare, pietra,—stella,—
Tignere la uesta, la tazza d’Alfier,—
Liberier, la Meteora,—
Lattantio de va a casa de Dalde,—
Libro di maestro cassetta,—
Pao Infermieri,—
Stualetti, calze e suciellino,—
scarpe,
Lacca, —
Garzone pe’ mon—
delli,...
Gramatica di la valuta del
Lorzo de’ Medici,—
Giovanni del del
Sodo per ......
Sansaunio, valuta del ......
Pier di Cosimo, per l’alie,—
Filippo e Lorenzo,—ri giga,—ochiali,—
ri fare la ......
libro di Maso,—
catena di Michelagnolo,—multiplicazione di radici,—di corda e arco,—mappamondo de’ Benci,—calzetti,—vesta dal gabellotto,—ordovano,—libri di mercato,—acque del Cronaca,—acque del Tanaglino,—... le berrette,—
specchio del Rosso vederlo fare,—di che n’ò 9/6,—Meteora d’Aristotele,—
casse di Lorzo di Pier Francesco,—maestro Piero dal Borgo,—legare il mio libro,—
mostra al Serigatto il libro,—e fatti dare la regola dell’orologio, anello,—
oce muscato,—gemma,—squadra,—
Giovà Batista a la piazza de’ Mozz,—
Giovanni Benci il libro mio, e’ diaspri,
ottone per li ochiali.

Pen for ruling, stone,—star,—
To have the vest dyed, Alfieri’s tazza,—
The Libraries, the book on celestial phenomena,—
Lactantius of the go to the house of Dalde,—
The Pazzi,
Book from Maestro small box,—
Paolo Infermieri,—
Boots, shoes and small gimlet,—
hose,
Lac, An apprentice for ......—
models,
Grammar of Lorenzo the amount of the
renzo de’ Medici, ...
Giovanni del Sodo ...
for ......—the broken
Sansovino, the ...
Piero di Cosimo[16], the wings,—
Filippo and Lorenzo [17], —A ruler,—
Spectacles,—to do the ...... again,—Tomaso’s book,—Michelagnolo’s chain,—The multiplication of roots,—Of the bow and strinch,—The map of the world from Benci,—Socks,—The clothes from the custom-house officier,—Cordova leather,—Market books,—waters of Cronaca,—waters of Tanaglino ... —the caps,—Rosso’s mirror; to see him make it,—1/3 of which I have 9/6,—on the celestial phenomena, by Aristotle [36],—boxes of Lorenzo di Pier Francesco [37],—Maestro Piero of the Borgo,—To have my ‘book bound,—Show the book to Serigatto,—
and get the rule of the clock [41],—ring,—nutmeg,—gum,—the square,—Giovan’ Batista at the piazza de’ Mozz,—Giovanni Benci has my book and jaspers,—brass for the spectacles.

Br. M. 1528]

1455.

7. 36. Metaora. See No. 1448, 25.
17. Filippo e Lorenzo; probably the painters Filippo Lippi and Lorenzo di Credi. L. di Credi’s pictures and Vasari’s history of that painter bear ample evidence to his intimate relations with Leonardo.

37. Lorenzo di Pier Francesco and his brother Giovanni were a lateral branch of the Medici family and changed their name for that of Popolani.

Possibly this refers to the clock on the tower of the Palazzo Vecchio at Florence. In February 1512 it had been repaired, and so arranged as to indicate the hours after the French manner (twelve hours a.m. and as many p.m.).
Bernardo da Ponte . . . Val di Lugano . . . many veins for anatomical demonstration.

Paolo of Tavechia, to see the marks in the German stones.

Giacomo came to live with me on St. Mary Magdalen’s [1] day, 1490, aged 10 years. The second day I had two shirts cut out for him, a pair of hose, and a jerkin, and when I put aside some money to pay for these things he stole 4 lire the money out of the purse; and I could never make him confess, though I was quite certain of the fact–Thief, liar, obstinate, glutton.

The day after, I went to sup with Giacomo Andrea, and the said Giacomo supped for two and did mischief for four; for he brake 3 cruets, spilled the wine, and after this came to sup where I . . . .

Item: on the 7th day of September he stole a silver point of the value of 22 soldi from Marco [6] who was living with me, 4 lire this being of silver; and he took it from his studio, and when the said Marco had searched for it a long while he found it hidden in the said Giacomo’s box 4 lire.

1456. This fragmentary note is written on the margin of a drawing of two legs.

1457. This note occurs on a pen and ink drawing made by Leonardo as a sketch for the celebrated large cartoon in the possession of the Royal Academy of Arts, in London. This cartoon is commonly supposed to be identical with that described and lauded by Vasari, which was exhibited in Florence at the time and which now seems to be lost. Mr. Alfred Marks, of Long Ditton, in his valuable paper (read before the Royal Soc. of Literature, June 25, 1882) “On the St. Anne of Leonardo da Vinci”, has adduced proof that the cartoon now in the Royal Academy was executed earlier at Milan. The note given, which is written on the sheet containing the study for the said cartoon, has evidently no reference to the drawing on which it is written but is obviously of the same date. Though I have not any opening here for discussing this question of the cartoon, it seemed to me important to point out that the character of the writing in this note does not confirm the opinion hitherto held that the Royal Academy cartoon was the one described by Vasari, but, on the contrary, supports the hypothesis put forward by Mr. Marks.


6. Marco, probably Leonardo’s pupil Marco d’Oggiono; 1470 is supposed to be the date of his birth and 1540 of his death.

Che stava con meo. We may infer from this that he left the master shortly after this, his term of study having perhaps expired.

11. festa accadearno, Giacono s'accostò alla scarsella d'uno di loro, la qual era i sul letto con altri panni, e tolse quelli diniari che detro trovò.


14. pajo di stiualerti', esso Giacomolo infra uno meze me la rubò, e vendè la a uno conciatore di scarpe per 20 soldi, de' quali danari secondo che lui proprio mi confessò, ne coprò anci cofetti;

15. Ite ancora a di 2 d'apriate, lasciato Gia- Atonio uno graffio d'argieto sopra uno suo disegno, esso Giacomolo gli lo rubò, il qual era di ululà di solidi 24 lire 1 S 4.

18. Il primo anno;

20. vi matello, lire 2,

21. camice, lire 4,

22. 3 gibononi, lire 6,

23. 4 paja di calze lire, 7 S 8

24. vestito foderato, lire 5

25. 24 paja di scarpe, lire 6 S 5

26. vna barelatic, lire 1

27. strigle lire, 1.

A di penultimo di settembre;

2. gioia, a di 27 di settembre, tornò maestro Tommaso, lavorò per se insino a di penultimo di febbraro; a di 18 di marzo 1493 venne Julio tedesco a stare meco; Lucia—Piero—Leonard.


On the last day but one of September; Thursday the 27th day of September Maestro Tommaso came back and worked for himself until the last day but one of February. On the 18th day of March, 1493, Giulio, a German, came to live with me,—Lucia, Piero, Leonardo.

On the 6th day of October.


Leonardo here gives a detailed account not only of the loss he and others incurred through Giacomo but of the wild tricks of the youth, and we may therefore assume that the note was not made merely as a record for his own use, but as a report to be forwarded to the lad's father or other responsible guardian.
1493.
2 A di primo di novembre facemmo 3 cò- 
2 to; Giulio restava a rimettere mesi 4 e 
2 maestro Tommaso mesi 9; maestro Tom- 
2 nasso fece di poi 6 cadelliere 9, di 10 ; 
2 Giulio in cierte molii 7 di 15; lavorò poi per se in-
8 sino a di 27 di maggio, e lavorò 9 per me 
2 uno martincello insino a di 18 10 di luglio, 
2 poi per se insino a di 7 11 d'agosto, e 
 questo uno mezzo di per una donna; 12 di 
2 poi per me in 2 serrature 13 insino a di 
20 d'agosto.

1460.

On the 1st day of November we settled 
accounts. Giulio had to pay 4 months; 
and Maestro Tommaso 9 months; Maestro 
Tommaso afterwards made 6 candlesticks, 
10 days' work; Giulio some fire-tongs 
15 days work. Then he worked for himself 
till the 27th May, and worked for me at a 
lever till the 18th July; then for himself till 
the 7th of August, and for one day, on the 
fifteenth, for a lady. Then again for me at 
2 locks until the 20th of August.

1461.

1 A di 23 d'agosto lire 12 da Pulisona; 1 
a di 14 di marzo 1494 1venne Galeazzo 
a stare con meco 4 e patto di dare 5 lire 
il mese 5 per le sue spese, pagàdo ogni 14 
6 di de' mesi.
2 Dettemi suo padre fiorini 2 di Reno; 
3 A di 14 di luglio ebbi da Galeazzo 
fi'orini 2 di Reno.

1462.

On the 23rd day of August, 12 lire from 
Pulisona. On the 14th of March 1494, 
Galeazzo came to live with me, agreeing to 
pay 5 lire a month for his cost paying on 
the 14th day of each month.
His father gave me 2 Rhenish florins.
On the 14th of July, I had from Galeazzo 
2 Rhenish florins.

1463.

On the 15th day of September Giulio began 
the lock of my studio 1494.

Saturday morning the 3rd of August 1504 
Jacopo the German came to live with me 
in the house, and agreed with me that I should 
charge him a carlini a day.

1464.

On the 26th of September Antonio broke 
his leg; he must rest 40 days.

1464. This note refers possibly to Beltraffio.
E. 18]

Parti da Milano per Roma a di 24 di settembre 1513 có Giovâ, Francesco de Melsi, Salai, Lórezò e il Fâfoia.

C. A. 67 a; 202 a]

A di 3 di gienajo.

2 Benedetto venne a 17 d’ottobre; 3 è stato con meco due mesi e 13 di 4 dell’anno passato, nel qual têpo à meïritato li 38 e S 18 di 8; 6 ne à avuto lire 26 e S 8, resta a 7 avere per l’anno passato lire 12 S 10.

3 Joatti venne a di 8 di settembre 9 a 4 ducati al mese, è stato con me 10 mesi: 3 e di 24; à meïrito. li. 11 59 S 14 e 8, ne à avuto li2 re 43 S 4; 13 restà a auere lire 16 14 per 10 di 8.

15 Benedetto grossoni 24.

C. A. 260 a; 793 a]

1 Già Maria 4
2 Benedetto 4
5 Gian Pietro 3
6 Salai 3
7 Bartolomeo 3
8 Gherardo 4.

1465. 1. addì. 2. settebre. frà ciesscho.

1466. Written from left to right. 1. gienaro. dottore a di 4 elm. 3. asstato cho mecho. 4. dellano. têpo ame. 5. vitato li 38 e. 6. annotato. 8. joatti (?) venne. settebre. 9. stato come. 11. ahm ann li.

1467. 1. a servant. 2. li. 3. liberando. 5. gian petro.

1465. 2. Giovanni; it is not likely that Leonardo should have called Giovanni’Antonio Beltraffio at one time Giovanni, as in this note and another time Antonio, as in No. 1464 while in No. 1458 L. 16 we find Giovanni’Antonio. And in No. 1436, L. 6 Beltraffio. Possibly the Giovanni here spoken of is Leonardo’s less known pupil Giovan Pietrino (see No. 1467, 5).

3. Francesco de’ Melzi is often mentioned, see Nos. 1350.


4. Lorenzo. See No. 1351, L. 10 (p. 408). Amoretti gives the following note in Mem. stor. XXIII: 1505. Martedì—era a di 14 d’aprile. Venne Lorenzo a store con mecho: disse essere d’età d’anni 17 a di 15 del detto aprile’ebbi scudi 25 d’oro dal chamerlengo di Santa Maria nuova. This, he asserts is derived from a MS. marked S, in quarto. This MS. seems to have vanished and left no trace behind; Amoretti himself had not seen it, but copied from a selection of extracts made by Oltrocchi before the Leonardo MSS. were conveyed to Paris on the responsibility of the first French Republic. Lorenzo, by this, must have been born in 1487. The sculptor Lorenzo was born in 1490. Amoretti has been led by the above passage to make the following absurd observations:

Cotesto Lorenzo, che poi gli fu sempre compagno, almeno sin che stette in Italia, sarebb’egli Lorenzo Lotto bergamasco? Sappiamo essere stato questo valente dipintore uno de’ bravi scolari del Vinci (?).

Il Fâfoia, perhaps a nickname. Cesare da Sesto, Leonardo’s pupil, seems to have been in Rome in these years, as we learn from a drawing by him in the Louvre.

1466. This seems to be an account for two assistants. The name of the second is scarcely legible. The year is not given. The note is nevertheless of chronological value. The first line tells us the date when the note was registered, January 3d, and the KKK
observations that follow refer to events of the previous month 'of last year' (dell'anno passato). Leonardo cannot therefore have written thus in Florence where the year was, at that period, calculated as beginning in the month of March (see Vol. I, No. 4, note 2). He must then have been in Milan. What is more important is that we thus learn how to date the beginning of the year in all the notes written at Milan. This clears up Uzielli's doubts: A Milano facevi cominciato l'anno ab incarnazione, cioè il 25 Marzo e a sostituito, cioè il 25 Dicembre. Ci sembra probabile che Leonardo dovesse presto giungere lo stile che era in uso a Firenze. (Nicerch, p. 84, note.)

1465. 5. See No. 1465, 2.
1469. The late Marchese Girolamo d'Adda published a highly valuable and interesting dissertation on this passage under the title: Leonardo da Vinci e la sua Libreria, note di un bibliofilo (Milano 1873. Ed. di solt 75 esemplari: privately printed). In the autumn of 1880 the Marchese d'Adda showed me a considerable mass of additional notes prepared for a second edition. This, as he then intended, was to come out after the publication of this work of mine. After the much regretted death of the elder Marchese, his son, the Marchese Gioachino d'Adda was so liberal as to place these MS. materials at my disposal for the present work, through the kind intervention of Signor Gustavo Frizzoni. The following passages, with the initials G. d'A. are prints from the valuable notes in that publication, the MS. additions I have marked*. I did not however think myself justified in reproducing here the acute and interesting observations on the contents of most of the rare books here enumerated.


La seconda edizione è di Bologna, 1438, ristampata a Parisi nel 1533, e poi nuovamente nel 1533. Paolo Ranzolo la volgarizza in italiano e la pubblica di nuovo in Verona coi tipi del Paganini, sempre in fol, 1453 (le stampe di formato più piccolo), e Luigi Magrèt la traduce in lingua francese nel 1555 a Parisi.


6. D’Acerba (da acerbus, amabile), il noto poema di Francesco Stabili, astrologo nascita dell’Alghieri. Numerose edizioni del secolo XV e XVI. È una vera enciclopedia in versi, ripiena di idee ardirissime e che volsero all’infelice pensionare il volgo nel 1347. In questo poema trovansi delineate le origini di molti trovati moderni, ed in particolare della circolazione del sangue, due secoli prima del Michèl Serveto. La prima edizione di Brescia Ferrandus s. a. in fol. non si conosce che un solo esemplare nella Spenceriana. V. Dibdin. (G. d’A.)


11. "Donatini latino & italic: Impressam Venetii im-
perii Johannis Baptisitae de Sexa anno 1499, in-4º".—
"El Panterio de Duchi in lingua volgare [da Malermi
Venedi nel M.CCCC.LXXVI], in-fol. 7. n. (G. d'A).
12. Compare No. 1210, 48.—La versione di Girolamo
Sparraffico: "Il libro di Justino posto diligentemente
in materna lingua. Venda alle spese [sic] di Johane de
Colonia & Johane Chertiff...1477," in-fol.—"Marzilii
Ficini, Theol-
ogia platonica, sive de animarum immortalitate, Florentina,
per Ani. Macabinum 1482," in-fol., ovvero qualche
versione latina di questo stesso libro, ma. (G. d'A).
13. Forse "la Historia Tragica Guidonis", ed il "man-
puslo" di "Guido da Montaerchellii, ma più probabilmente
"Guido d'Arezzo," il di cui libro: "Micrologus, seu discri-
zione arsia musicae" potenza da Leonardo avviso ma.; di
questi non esistono in molte biblioteche, e fu poi impresso
nel 1584 dal Gruberi.
14. "Vulgarize dei sonetti di Basillo Floren-
tino, impresso nel secolo XV. La prima e più rara e
recettata: "Inimicissimo li sonetti, ecc. [Christoforo
Arnoldi], in-4º senza numeri, richiamati a segnare, del
1475, e forse anche del 1473, secondo Merelli e Dibutti,
ma. (G. d'A).
15. "Versione latina dei "Doctrinale de Sapience"
di Guy de Roy, e forse anche l'originale in lingua
francese.
— Di Pacci Luigi, bruciò nell'edizione: "Florentiae 1479"
in-4º si dice: "Il Dracillo composto in rima octava per
Lucio Pulvis," Altre ed., del secolo XV, "Florentiae Mi-
comini 1481, in-4º, Firenze, apiù S. Jacobo de Ripoli, 1483,
in-4º e "Antoni de Francesco, 1487," in-4º e Francesco
di Giacopo 1489," in-4º ed altre ancora di Venezia e senza
alcuna nota ecc. (G. d'A).
16. "De soni è visaggi del cavalieri "Mandeville," gentil-
imento inglese. Scrive il suo libro in lingua francese.
Fu stampato ripetutamente nel secolo XV in francese, e
inglese ed in italiano, e in tedesco; del secolo XV ne
annunziano forse più di 27 edizioni, di cui ne conosciamo
8 in francese, quattro in latino, sei in tedesco e molte altre
in volgare. (G. d'A).
17. Il Piansena (Bartolomeo Sacco) la versione italiana
"de la honesta voluptate, & volutudine (e de li obbiami
Veneti) senza nome di tipografia) 1487," piccolo in-4º
gotic. (G. d'A)—Compare No. 844, 21.
18. Il Manganello: Satura accuratissima viva contro
e donne ad imitazione della Sesta di Giovanni Mangano.
Non è soltanto il titolo del libricino, ma anche il
nome dell'autore che era un "milanese". Di questo li-
berale rara, che sembra impresso a Venezia dallo
Zappino (Nicola d'Arscote detto il), senza data, ma di
primissimi anni del secolo XVII, e forse più antico, come
vedremo in appresso, non se ne conoscono fra biblioteche
pubbliche e private che due soli esemplari in Europa.
(G. d'A).
19. "Crónica deiderro", sembra si dia meglio inten-
to "cronico diiderro"... ed in questo stato intenderebbe la
"cronica de Isidoro" tanto in volgare a quel tempo "Comencia
la Cronica de Sancio Isidoro menone con alcune addestran
cuse del texto & istorie de la Biblia & del livro de Paulo
Orso ... Impresso in Ascoli in casa del recensore
missar Pasquali ... per mano di Guglielmo de Luis de
Alamnnia M.CCCC.XXXVII, in-4º di 157 ff. È il
primo libro impresso a Ascoli e l'edizione principe di
questa cronica in oggi assai rara. Non lo è meno l'edizion
di Osvald Del Fruili, 1480, e quella ben anche di
Aquilina, 1482, sempre in-4º. Vedasi Passer, Hain, Brunet
E. Dechamps. (G. d'A).
20. "Le pietole di Ovidia tradotte in prosa. Napoli
Sixt. Rizzinger," in-4º, apparte: "Epistole volgare
1459, in-4º a due col., impr. nei titoli (sic) di Biunna
pre: "Baptista de Forfengo," (in ottave) "E il libro
de l'Epistole di Ovidia in rima volgare per mezzire
Domino de Monticelli Iacchana, Breaca Forfengo," in-4º
set., in rima volgare, 1491, ed anche la version di Luca
Pulci, Firenze, Machinoni, 1481, in-4º. (G. d'A).
21. See l. 4.
to di Colle" di cui molteplici edizioni dei secolo XV. (G. d'A)
NOTES ON BOOKS AND AUTHORS.


S. K. M. III. 877]


1471. Nonius Marcellus, Festus Pompeius, Marcus Varro.

Map of Elephanta in India which Antonello Merciaio has from maestro Maffeo;—there for seven years the earth rises and for seven years it sinks;—Enquire at the stationers about Vitruvius.

1472. See 'On Ships' Messer Battista, and Frontinus 'On Acqueducts'[2].

1473. Anaxagoras: Every thing proceeds from every thing, and every thing becomes every thing, and every thing can be turned into every thing else, because that which exists in the elements is composed of those elements.

Five books out of this list are noted by Leonardo in another MS. (Tr. 3): donato, — lapidaria, — pírio, — abacho, — margante.

1470. Nonius Marcellus and Sextus Pompeius Festus were Roman grammarians of about the fourth century A.D. Early publications of the works of Marcellus are: De proprietate sermonis, Roman (about 1470), and 1471 (place of publication unknown). Compendium doctrinae ad filium, de proprietate sermonum. Venice, 1476. Brunet, Manuel du libraire (IV, p. 97) notes: Le texte de cet ancien grammairien a été réimprimé plusieurs fois à la fin du XV siècle, avec ceux de Pompeiius Festus et de Frontinus Varro. La plus ancienne édition qui réunisse ces trois auteurs est celle de Parme, 1480 ... Cols de Venise, 1483, 1490, 1498, et de Milan, 1500, toutes in-fol., ont peu de valeur.


2. Vitruvius de Arch, et Frontinus de Aquedoctibus. Florence, 1513.—This is the earliest edition of Frontinus.—The note referring to this author thus suggests a solution of the problem of the date of the Leicester Manuscript.

23 Facietie di Poggio,
24 De chironàtia,
25 Formulario di pistole.

2. Vedi de nau messer Battista e Fron- tin d' acquidotti.

4. effitto.

26. Acqueducts'
27. Ships'.

A. 3565; 1168.a]

Anasagora; ogni cosa vié da ogni cosa, —ed ogni cosa si fa ogni cosa, e ogni cosa torna in ogni cosa, perché ciò ch'è nelli eleménti è fatto da essi eleménti.

sidero. 23. pugio. 1470. 5. marchio. 1471. dellofamellis dipdia chella. 1472. 1. meser batista. 1473. 2. anasaghorn. 2. chosa vié. 3. chogni ... ogni chossi. 4. effitto.

23. Tre edizioni delle facie di del Poggio abbiamo in lingua italiana della fine del secolo XV, tutte senza data. "Facie di Poggio fiorentino tradutte de latino in vulgare ornatiissimo," in-4°, segn. a- e in caratteri romanì; l'altro: "Facie tradotte di latino in vulgare," in-4°, caratteri gotici, etc. (G. D'A.)

24. *Dis Kunst Cyromantia et. in telosco. 26 fi. di testo e figura il tutto eseguito su tavole di legno verso la fine del secolo XV da Giorgio Schaffi. D'IbRé, Hénonon, Sothybey e Chitto ne diedero una lunga descrizione; i primi tre accompagnati da fac-simili. La data 1448 che si legge alla fine del titolo si riferisce al periodo della composizione del testo, non a quella della stampa del volume benche tabellario. Altri molti libri di Chironania si conoscono di quel tempo e sarebbe opera vana il citarli tutti. (G. D'A.)

MISCELLANEOUS NOTES.

1474. The Archimedes belonging to the Bishop of Padua.

1475. Archimedes gave the quadrature of a polygonal figure, but not of the circle. Hence Archimedes never squared any figure with curved sides. He squared the circle minus the smallest portion that the intellect can conceive, that is the smallest point visible.

1476. If any man could have discovered the utmost powers of the cannon, in all its various forms and have given such a secret to the Romans, with what rapidity would they have conquered every country and have vanquished every army, and what reward could have been great enough for such a service! Archimedes indeed, although he had damaged the Romans in the siege of Syracuse, nevertheless did not fail of being offered great rewards from these very Romans; and when Syracuse was taken, diligent search was made for Archimedes; and he being found dead greater lamentation was made for him by the Senate and people of Rome than if they had lost all their army; and they did not fail to honour him with burial and with a statue. At their head was Marcus Marcellus. And after the second destruction of Syracuse, the sepulchre of Archimedes was found again by Cato [25], in the ruins of a temple. So Cato had the temple restored and the sepulchre he so highly honoured.
Whence it is written that Cato said that he was not so proud of anything he had done as of having paid such honour to Archimedes.

1474. See No. 1421, l. 3. 6. chimenide. 10. cio meno l. 11. tanta. 12. immaginare coe q"u"to.
1475. 1. data. 3. rato. 6. chimenide. 10. cio meno l. 11. tanta. 12. immaginare coe q"u"to.
1474. See No. 1421, l. 3. 6. chimenide. 10. cio meno l. 11. tanta. 12. immaginare coe q"u"to.
1475. Compare No. 1504.
1476. Where Leonardo found the statement that Cato had found and restored the tomb of Archimedes, I do not know. It is a merit that Cicero claims as his own (Tusc. V, 23) and certainly with a full right to it. None of Archimedes' biographers—none of the diligent Mazzechelli, mentions any version in which Cato is named. It is evidently a

slip of the memory on Leonardo's part. besides, according to the passage in Cicero, the grave was not found 'nella ruine d'un tempio'—which is highly improbable as relating to a Greek—but in an open spot (H. Möller-Strübinger).—See too, as to Archi-
medes, No. 1417.

Leonardo says somewhere in MS. C.A.: Archi-
tronito è una macchina di fino rame, inversion d'Archim-
edes (see 'Saggio', p. 20).
Aristotele, Book 3 of the Physics, and Albertus Magnus, and Thomas Aquinas and the others on the rebound of bodies, in the 7th on Physics, on heaven and earth.

Aristotle says that if a force can move a body a given distance in a given time, the same force will move half the same body twice as far in the same time.

Aristotle says that every body tends to maintain its nature.

Avicenna will have it that soul gives birth to soul as body to body, and each member to itself.

Avicenna on liquids.
1484. Rugiero Bacone fatto in istanpa.
Roger Bacon, done in print.

C. A. 1398; 4198

Cleomete filosofo.
Cleomedes the philosopher.

Tr. 4]

CORNELIO CELSO.

Il somo bene è la sapienza; il somo male è il dolore del corpo; iperochè, essendo 3 noi composti di 2 cose, cioè d'anima e di corpo, 4 delle quali la prima è migliore, la peggiore è il corpo; la sapienza è 5 della miglior parte; il sommo male è della peggiore parte e pessima; Ottima cosa è nell'animo la sapienza, così è pessima 6 cosa nel corpo il dolore; 7adunque, sicome il sommo male è l' corporale dolore, così la sapienza è dell'animo 8 il somo bene, cioè dell'uomo sagio, e nissvna altra cosa è da coparare a questa.

Demetrio solea dire non essere differetia; dalle parole e voci dell'inperiti igno-
rati, 2 che sia da suoi e strepiti cavati dal ventre ripieno di superfluo vetro; 3 e questo nò senza cagio dicèa, iperochè lui nò reputava esser differetia da qual parte 4 costoro maddassino fuora la voce, o dalle parti inferiori o dalla bocca, 5 che l'una e l'altra era di pari valimento e sustàtia.

Demetrius was wont to say that there was no difference between the speech and words of the foolish and ignorant, and the noises and rumblings of the wind in an inflated stomach. Nor did he say so without reason, for he saw no difference between the parts whence the noise issued; whether their lower parts or their mouth, since one and the other were of equal use and importance.

1484. 1. Rugieri bacho. 1485. 1. filosofo.
1486. 2. ella sapienza...iperochè. 3. corpillo il'anima e migliore del corpo. 4. peggiore...chorpo. 5. somo...pegior. 7. somo...chioro. 8. delonaggio c'èvina...chosa e da a questa coparare.
1487. 1. differetia...evcco. 2. chesia da suoi estrepti. 3. ecquesto...iperochèllui...differetia. 4. parte...bocha. 5. chel...luna ellaiistra.

1484. The earliest printed edition known to Brunet of the works of Roger Bacon, is a French translation, which appeared about forty years after Leonardus's death.

1485. Cleomete. A Greek mathematician of the 17th century B.C. We have a Cyclic theory of Meteorica by him. His works were not published before Leonardo's death.

1486. Aulus Cornelius Celsus, a Roman physician, known as the Roman Hippocrates, probably contemporary with Augustus. Only his 'eight Books 'De Medicina', are preserved. The earliest editions are: Cornelius Celsus, de medicina libr. VIII., Milan 1481 Venice 1493 and 1497.

NOTES ON BOOKS AND AUTHORS.

S. K. M. III. 93[4]

Maestro Stefano Caponi, medico, sta alla piscina, à Euclide 'de pòderibus'.

K. 2 2a]

5° Euclide. 2Prima definizione: 1parte è quantità di quantità 3minore della maggiore, cioè che, moltiplicata per alcuno numero, ricopro il suo tutto con precisione; 2Parte propriamente detta è quella che, moltiplicata, cioè che, moltiplicata per un suo numero, ricopra il suo tutto con precisione; 3Parte comune aggregatua è quella, la quale, quantunque volte si piaccia più o meno del suo tutto, ove è necessario che coll’ajuto d’altra quantità diessa si faccia il suo tutto, e perciò è detta aggregatua. 15Seconda definizione. 1La multiplicità è maggiore della minore, quando la minore misura quella; 3Di sopra diinimmo il minore estremo, e qui si dà il maggiore; La parte relativamente è detta al tutto, e in questi due estremi sta tutta la relazione di quegli, e chiamasi multipli.

K. 2 2a]

relativamente è detta al tutto, e in questi due estremi sta tutta la relazione di quegli, e chiamansi multipli.


Dice Hippocrates che la origine della nostra semenza diventa dal ciebro e dal polmone e testicoli di nostri genitori, dove si fa l’ultima decorzione; e tutti li altri mèibri porgono per sudatio ne la loro sostanza a esso seme, perché non si dimostra alcuna via, che a essa semenza peruenire possino.

1488. 3. pescina. 4. a becalos.
1489. 2. 3° definizione is written on the margin. 3. magore mocosia. 4. chella. 5. gore. 6. dita eque. 7. che moltiplicatias con. 10. cunere agregatia cupeauc. 12. pia [ma fa] più. 13. chellaiaeto. 14. rifacca. 15. pero e detto aggregatia. 16. 3° definizione is written on the margin. La multipli e magore. 19. diasino. 2o. ecei si dà il maggiore.
1490. 2. questi dueestremi. 4. multipli.
1491. 1. ioprate chella. 2. nostra senza. 3. testiculi di nostri. 4. dovessi. 5. echi. 6. estremo. 7. dimostra alcuna.

1491. The works of Hippocrates were printed first after Leonardo’s death.

VOL. II.

L.L.L.
MISCELLANEOUS NOTES. [1492—1495.

Ash. II. 4]

Lucretius in his third [book] 'De Rerum Natura'. The hands, nails and teeth were (165) the weapons of ancient man.

They also use for a standard a bunch of grass tied to a pole (167).

Tr. 2]

Ammiano Marcellino afferra, essere abbruciati 27 ceto mila volumi di libri nella pugnia Alessandrina al tepo di Giulio Cesare.

W. XXIII.

Dicese Mondino che li muscoli che alzano li diti del piede stanno nella parte siluistrea della coscia, e poi si aggiunge che il dosso del piede non a muscoli, perché la natura li volle fare legieri aciciochessi fossero facili al movimento, perché se fossero carnosi, sarebbero più gravi; e qui la sperienza mostra...

G. 8a]

Del' erroro di quelli che vsano 3 la pratica sanza scienza;—3 vedi primo 4 la poetica 5 d'Oratio.

Mondino says that the muscles which raise the toes are in the outward side of the thigh, and he adds that there are no muscles in the back [upper side] of the feet, because nature desired to make them light, so as to move with ease; and if they had been fleshy they would be heavier; and here experience shows...

Of the error of those who practice without knowledge;—[3] See first the 'Ars poetica' of Horace [5].

1492. Lucretius, de rerum natura libri VI; were printed first about 1473, at Verona in 1486, at Brescia in 1495, at Venice in 1500 and in 1515, and at Florence in 1515. The numbers 165 and 167 noted by Leonardo at the end of the two passages seem to indicate pages, but if so, none of the editions just mentioned can here be meant, nor do these numbers refer to the verses in the poems of Lucretius.

1493. Ammiano Marcellini historiarum libri qui sunt XIII, published at Rome in 1474.

1494. 'Mundini anatomia. Mundinus, Anathomia sic. Mundini præsentantiumurorum doctorum alii studii ticiensis sic eura diligentissime emendata. Impressa Papiae per magistrum Antonium de Cervano 1478,' in fol.; ristampata: 'Bonomiae Johan. de Noordlingen, 1482,' in fol.; 'Padova per Matthheum Cardinalis de Vindischgraet, 1484,' in 4°; 'Lipsia, 1493,' in 4°; 'Venezia, 1494,' in 4° e in 1498,' con fig. Queste figure per altro non sono, come si è preteso, le prime che fossero introdotte in un trattato di Anatonia. Nel 'fasciculus Medicinalis' di Giovanni Ketham, che riproduce l'Anatomia del Mundinus, impressa pure a Venezia da J. e G. de Gregoriis, 1491, in-fol., contengono intagli in legno (si vogliono disegnati non già inchiudere Andrea Montega) di grande dimensione, e che furono più volte riprodotto negli anni successivi. Quest edizione del 'fasciculus' del 1491, tra fra nostri libri e potrebbe benissimo essere il volume d'Anatonia notato da Leonardo. (G. d'A.)

1495. A 3—5 are written on the margin at the side of the title line of the text given, entire as No. 19
NOTES ON BOOKS AND AUTHORS.

S. K. M. III. 34

Eredi di maestro Giovà Ghiringallo anno opere del Pelacano.

B. 8a

Catapulta, come dice Nonio e Plinio, è vno strùmèto ritrovato da quelli ecc.

Ash. II. 12a

O ritrovato nele Storie degli Spagnioli the heirs of Maestro Giovanni Ghiringallo have the works of Pelacano.

I have found in a history of the Spaniards that in their wars with the English Archimedes of Syracuse who at that time was living at the court of Ecliderides, King of the Cirodastri. And in maritime warfare he ordered that the ships should have tall masts, and that on their tops there should be a spar fixed of 40 feet long and one third of a foot thick. At one end of this was a small grappling iron and at the other a counterpoise; and there was also attached 12 feet of chain; and, at the end of this chain, as much rope as would reach from the chain to the base of the top, where it was fixed with a small rope; from this base it ran down to the bottom of the mast where a very strong spar was attached and to this was fastened the end of the rope. But to go on to the use of his machine: I say that below this grappling iron was a fire which, with tremendous noise, threw down its rays and a shower of burning pitch; which, pouring down on the [enemy's] top, compelled the men who were in it to abandon the top to which the grappling-iron had clung. This was hooked on to the edges of the top and the base of the top to support the cord which went from the grappling iron, was cut, giving way and drawing in the enemy's ship; and if the anchor—was cast...

1496. 1. maestro jovà. 2. ghiringallo ano. 3. itachano.

1497. Plinio, see No. 945.

1498. Archimedes never visited Spain, and the names here mentioned cannot be explained. Leonardo seems to quote here from a book, perhaps by some questionable mediaeval writer. Prof. C. Just writes to me from Madrid, that Spanish savants have no knowledge of the sources from which this story may have been derived.

6. Compare No. 1115.

Theophrastus on the ebb and flow of the tide, and of eddies, and on water.

Tryphon of Alexandria, who spent his life at Apollonia, a city of Albania (163).

Messer Vincenzo Aliprando, who lives near the Inn of the Bear, has Giacomo Andrea's Vitruvius.

Vitruvius says that small models are of no avail for ascertaining the effects of large ones; and I here propose to prove that this conclusion is a false one. And chiefly by bringing forward the very same argument which led him to this conclusion; that is, by an experiment with an auger. For he proves that if a man, by a certain exertion of strength, makes a hole of a given diameter, and afterwards another hole of double the diameter, this cannot be made with only double the exertion of the man's strength, but needs much more. To this it may very well be answered that an auger of double the diameter cannot be moved by double the exertion, because the superficialies of a body of the same form but twice as large has four times the extent of the superficialies of the smaller, as is shown in the two figures a and n.

The Greek philosophers had no opportunity to study the phenomenon of the ebb and flow of the tide and none of them wrote about it. The movement of the waters in the Euripus however was to a few of them a puzzling problem.
G. 95 a]
Del la □ a del circolo, e chi fu il primo che la trovò a caso.

3Vitruvio, misurando le miglia colle molte intere rivoluzioni 4delle rote che movono i carri, distese nel suoi stadi molte line 5circuferentia del circolo di tali rote; Ma le imparrò dalli anima li motori di tali carri; Ma nò conobbe quello essere il mezzo a dare il □ e la e quadrilatero rettilineo, a equale al circolo.

Ash. II. 103]
Virgilio dicie era lo scudo bianco e sanza laude, perché apresso a li Attici le ure laude cofernate da testimoni da . . .

B. 58 a]
J Vitolone sono 805 - conclusioni in prospettiva.

Br. M. 79 b]
Vitolone in Sà Marco.

1504. Vitruvio, see also Nos. 1113 and 343.
10. Compare No. 1475.

1505. The end of the text cannot be deciphered.


Proviene dal Convento di San Marco e lo aveva trascritto frate Leonardo Scruberi fiorentino, dell'ordine dei predicatori che fu anche bibliotecario della Medicea pubblica in San Marco (See Indagini Storiche . . . per cura di G. d'A. Parte t., p. 97).
NOTES ON BOOKS AND AUTHORS. [1508—1513.]

K. [124]
Come Xenofonte pro*pone il falso.
Se a cose diseguali si leuano cose diseguali, le quali sieno nella medesima proporzione ccc.

B. [4—]
Inventories and accounts (1509—1513). A di 28 d’aprile ebbi da Marchesino lire 103 e S. 12.

1508.
How this proposition of Xenophon is false. If you take away unequal quantities from unequal quantities, but in the same proportion, &c.

1509.
On the 28th day of April I received from the Marchesino 103 lire and 12 dinari.

1510.
On the 10th day of July 1492 in 135 Rhine florys in dinari of 6 soldi l. 112 S. 16 in dinari of 5½ soldi l. 29 S. 13 9 in gold and 3 scudi l. 53 l. 811 in all.

1511.
A di · primo · di febraio · lire 1200.

1512.
The hall towards the court is 126 paces long and 27 braccia wide.

1513.
The narrow cornice above the hall lire 30. The cornice beneath that, being one for each picture, lire 7, and for the cost of blue, gold, white, plaster, indigo and glue 3 lire; time 3 days. The pictures below these mouldings with their pilasters, 12 lire each. I calculate the cost for small, blue and gold and other colours at 1½ lire. The days I calculate at 3, for the invention of the composition, pilasters and other things.

1508. Xenophon's works were published several times during Leonardo's lifetime.

1509. Instead of the indication of the year there is a blank space after d’aprile.—Marchesino Stange was one of Lodovico il Moro’s officials.—Campare No. 1388.
1514.

Ite per ciascuna volta sola lire 7
2 di spesa tra azzurro e oro lire .. 3½
3 di tepo giorni 4.
4 per le finestre lire 1 2/3.
5 il cornicione sotto alle finestre S 16 il braccio
6 item per 24 storie romane lire 14 l'una
7 i filosofi lire 10
8 i pilastri vn 6cia d'azzurro soldi 10
9 in oro soldi 15
10 sono lire 2 e 1/2.

Item each vault 7 lire
outlay for blue and gold 3½
time, 4 days
for the windows 1 2/3
The cornice below the windows 16 soldi per braccio
item for 24 pictures of Roman history 14 lire each
The philosophers 10 lire
the pilasters, one ounce of blue 10 soldi
for gold 15 soldi
Total 2 and 1/2 lire.

1515.

Groda di sopra lire 30
2 gròda di sotto lire 7
3 le storie l'una per l'altra lire 13.

The cornice above lire 30
The cornice below lire 7
The compositions, one with another lire 13

1516.

Salai lire 6...3 soldi 4...6 soldi 10 in
7 vna ca' tena;
9 14 di marzo 6 avuto lire 13 10 S 4,
resta lire 16.

Salai, 6 lire...4 soldi...10 soldi for a chain;
— On the 14th of March I had 13 lire S. 4;
16 lire remain.

1517.

Quate braccia è alto il pià delle
2. 123 braccia
3. Quàt'è larga la sala?
4. Quàt'è larga la ghirlanda?
5. 30 ducati.
6. A di 29 di gienaro 1494.
7. Panno per calze lire 4 S 3
8. soppanò S 16
9. fattura S 8
10. Salai S 3
11. anello di diaspri S 13
12. pietra stellata S 11
13. Caterina S 10

How many braccia high is the level of
the walls—
123 braccia
How large is the hall?
How large is the garland?
30 ducats.
On the 29th day of January, 1494
cloth for hose lire 4 S 3
lining S 16
making S 8
to Salai S 3
to a jasper ring S 13
a sparkling stone S 11
to Caterina S 10
to Caterina S 10.
INVENTORIES AND ACCOUNTS.

1518.

La rota  lire 7
labro  li 10
scudo  li 4
carelo  li 8
poli del'albero  li 2
letto e teljio  li 30
canale  li 10.

1519.

Petrosemolo  parti 10
metà  parte 1
serpill  parte 1
aceto  e sale poco;
canavaccio 2 pezzi per Salai.

1520.

Parsley  10 parts
mint  1 part
thyme  1 part
Vinegar  and a little salt two pieces
of canvas for Salai.

1521.

Ficina  all'ospedale,
2 ducati 2, 3 fave,  melica bianca,  melica
rossa,  panico,  miglio,  fagioli,
fave,  piselli.

1522.

Spese per la sottostratura di Caterina.

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 libbre di cera</td>
<td>S27</td>
</tr>
<tr>
<td>per lo cataletto</td>
<td>S8</td>
</tr>
<tr>
<td>palio sopra il cataletto</td>
<td>S12</td>
</tr>
<tr>
<td>portaturo e portata di croce</td>
<td>S4</td>
</tr>
<tr>
<td>per la postatura del morto</td>
<td>S8</td>
</tr>
<tr>
<td>per 4 preti e 4 cherici</td>
<td>S20</td>
</tr>
<tr>
<td>canpana, libri, spuga</td>
<td>S2</td>
</tr>
<tr>
<td>per li sottostratori</td>
<td>S16</td>
</tr>
<tr>
<td>all'atiano</td>
<td>S8</td>
</tr>
<tr>
<td>per la licetië ali ufitiali</td>
<td>S1</td>
</tr>
</tbody>
</table>

Total: S105

For the 3 lbs of tapers 27 S
For the bier 8 S
A pall over the bier 12 S
For bearing and placing the cross 4 S
For bearing the body 8 S
For 4 priests and 4 clerks 20 S
Bell, book and sponge 2 S
For the gravediggers 16 S
To the senior 8 S
For a license from the authorities 1 S

Total: S106

The doctor 2 S
Sugar and candles 12 S

Total: S120

1518. 17-7 R. 6. etelaro.
1519. 1. petrose milo parte. 3. srpilo pa. 4. aceto pene essale. 5. canavaccio 2 prisi.
1520. 1. piscin damozania(0) allospedadi. 4. meliga. 5. meliga. 8. fagioli.
1521. 1. sottostratura. 2. in libr. 3. cataletto. 4. sopra castilect. 7. cenici. 8. libr. 9. sottostratori. 10. alliziano. 11. in medico. 13. zucchero.

1519. This note, of about the year 1494, is the ear-liest mention of Salai, and the last is of the year 1513 (see No. 1456, 3). From the various notes in the MSS. he seems to have been Leonardo's assistant and keeper only, and scarcely himself a painter. At any rate no signed or otherwise authenticated picture by him is known to exist. Vasari speaks some-what doubtfully on this point.

1520. This note enables us to fix the date of the Manuscript, in which it is to be found. In 1495 the 4th of September fell on a Friday; the contents of the Manuscript do not permit us to assign it to a much earlier or later date (Compare No. 1522, and Note).

1522. See Nos. 1384 and 1517.
1523.

La cappa di Salai a di 4 d'aprile 1497.
1 braccia di panno argiitino l. 15 S 4
2 velutto verde per ornare l. 9 S
3 bindelli l. S 9
4 magliette l. S 12
5 manifattura l. S 5
6 bindello per dinanzi li S 5
7 pùta
8 "
ecco di suo grossoni 13 li 26 S 5
9 Salai ruba li soldi.

Salai's cloak, the 4th of April 1497.
4 braccia of silver cloth l. 15 S 4
green velvet to trim it l. 9 S —
binding l. — S 9
loops l. — S 12
the making l. 1 S 5
binding for the front l. — S 5
stitching here are 13 grossoni of his l. 26 S 5
Salai stole the soldi.

1524.

Lunedì cóprai braccia 4 di tela, lire 13 S 14 2 e " in 17 di ottobre 1497.

On Monday I bought 4 braccia of cloth lire 13 S 14 2, on the 17th of October 1497.

1525.

Ricordo come a di 8 d'aprile 1503 io Leonardo da Vinci prestat a Vate mimiatore ducati 4 d'oro in oro; portògli Salai e li dette in sua propia mano; disse rendermiele infra lo spatio di 40 giorni;
1 Ricordo come nel sopradetto giorno io ródei a Salai ducati 3 d'oro, i quali disse volersene fare un paio di calze roseate co sua fornimet, e li restai a dare ducati 9, posto che lui ne de'dare a me ducati 20, cioè 17 prestai li a Milano e 3 a Venezia;
2 Ricordo come io diedi a Salai braccia 21 di tela da fare camice, a S. 10 il braccio, le quali li diedi a di 20 d'aprile 1503.

Memorandum. That on the 8th day of April 1503, I, Leonardo da Vinci, lent to Vante, miniature painter 4 gold ducats, in gold. Salai carried them to him and gave them into his own hand, and he said he would repay within the space of 40 days.

Memorandum. That on the same day I paid to Salai 3 gold ducats which he said he wanted for a pair of rose-coloured hose with their trimming; and there remain 9 ducats due to him—excepting that he owes me 20 ducats, that is 17 I lent him at Milan, and 3 at Venice.

Memorandum. That I gave Salai 21 braccia of cloth to make a shirt, at 10 soldi the braccio, which I gave him on the 20th day of April 1503.

1526.

La mattina di Sèo Pietro a di 29 di giugno 1504 ò tolsì ducati 10, de' quali ne diedi uno a Tomaso, mio famigli, per spèderè;

On the morning of San Peter's day, June 29th, 1504, I took 10 ducats, of which I gave one to Tommaso my servant to spend.

1525. With regard to Vante or Attavante, the miniature painter (not Nanni as I formerly deciphered this name, which is difficult to read; see Zeitschrift für Bild. Künst, 1879, p. 155), and Vasari, Lives of Frate Giovanni da Fiesole, of Bartolommeo della Gatta, and of Gherardo, miniaturist. He, like Leonardo, was one of the committee of artists who, in 1503, considered the erection and placing of Michel Angelo's David. The date of his death is not known; he was of the same age as Leonardo. Further details will be found in 'Notizie di Attavante miniaturist, e di alcuni suoi lavori' (Milanese's ed. of Vasari, III, 231—235).
1504.

On Monday morning 1 florin to Salai to spend on the house.
On Thursday I took 1 florin for my own spending.
Wednesday evening 1 florin for the workman to spend.
Saturday morning 1 florin to Tommaso.
Monday morning 1 florin less 10 soldi.
Thursday to Salai 1 florin less 10 soldi.
For a joker, 1 florin.
For a joker 2 florins.
To the hosier, 1 florin.
To Salai, 1 florin.
Friday morning, the 19th of July, 1 florin, less 6 soldi. I have 7 fl. left, and 22 in the box.
Tuesday, the 23rd day of July, 1 florin to Tommaso.
Monday morning, to Tommaso 1 florin.
[Wednesday morning 1 fl. to Tommaso.]
Thursday morning the 1st day of August 1 florin to Tommaso.
Sunday, the 4th of August, 1 florin.
Friday, the 9th day of August 1504, I took 10 ducats out of the box.

On the 9th day of August, 1504, I took 10 florins in gold[2]. . . . [3] On Friday the 9th day of August fifteen grossoni that is fl. 5 S 5 . . . . given to me 1 florin in gold on the 12th day of August[4] . . . . on the 14th of August, 32 grossoni to Tommaso. On the 18th of the same 5 grossoni to Salai. On the 8th of September 6 grossoni to the workman to spend; that is on the day of our Lady's birth. On the 16th day of September I gave 4 grossoni to Tommaso: on a Sunday.

1504.

In the original, the passage given as No. 1463 is written between lines 2 and 3 of this text, and it is possible that the entries in lines 3 and 4 refer to the payments of Jacopo Tedesco, who is there mentioned. The first words of these lines are very illegible.

7. Al fattore. Il Fattore, was, as is well known, the nick-name of Giovanni Francesco Penni, born in Florence in 1456, and subsequently a pupil of Raphael's. According to Vasari he was known by it even as a boy. Whether he is spoken of in this passage, or whether the word Fattore should be translated literally, I will not undertake to decide. The latter seems to me more probably right.
INVENTORIES AND ACCOUNTS.

1528.

A di d'ottobre 1508 ebbi scudi 30; 13 ne prestai a Salai per copiere la dota alla sorella, e 17 ne restò a me.

On the day of October, 1508, I had 30 scudi; 13 I lent to Salai to make up his sister's dowry, and 17 I have left.

C. A. 1894; 964a]

Ricordo de'danari che io ho avuto dal re per mia provvisione dal luglio 1508 insino aprile prossimo 1509: prima scudi 100, poi 70, e poi 50, e poi 120, e poi 200 fiorini a 48. S. per l'uno.

Memorandum of the money I have had from the King as my salary from July 1508 till April next 1509. First 100 scudi, then 70, then 50, then 20 and then 200 florins at 48 soldi the florin.

C. A. 76a; 223a]

Sabato a di 2 di marzo ebbi da Scia Maria Nova 1 ducati 5 d'oro, restò ve ne 450, de' quali 2 ne detti il medesimo di a Salai, che me li aveva prestati.

Saturday the 2nd day of March I had from Santa Maria Novella 5 gold ducats, leaving 450. Of these I gave 2 the same day to Salai, who had lent them to me.

C. A. 1531; 718a]

Giovedi, a di 8 di givgnio tolsi grossoni 17 S 18; giovedì detto da mattina a Salai per spendere S 22.

Thursday, the eighth day of June, I took 17 grossoni, 18 soldi; on the same Thursday in the morning I gave to Salai 22 soldi for the expenses.

W. XXXII.

A Salai grossoni 4, e 1 braccio di velutto 5 lire, e 1/2, saperse S 10, maglie d'argento; Salai S 14 per bindelli; fattura della cappa S 25.

To Salai 4 grossoni, and for one braccio of velvet, 5 lire, and 1/2; viz. 10 soldi for loops of silver; Salai 14 soldi for binding, the making of the cloak 25 soldi.

C. A. 176; 676]

Detti a Salai lire 93. S 6; 3 o ne avuti lire 67, 'resta dare 26. S 6.'

I gave to Salai 93 lire 6 soldi, of which I have had 67 lire and there remain 26 lire 6 soldi.

1529. Compare No. 1350 and 1561.


1532. Compare No. 1533.
A Salai 2 dozen of laces 42
2 dozen of stringe 8
3 in fogli 3 d. 8
4 in piaco di scarpe 14
5 in veluto 14
6 in pajo di scarpe 21
7 in barbiere 11
8 to Paolo per una 20
9 per dire la ventura 6

To Salai
2 dozen of laces 42
for papers 3 d. 8
a pair of shoes 14
for velvet 14
a sword and knife 21
to the barber 11
to Paolo for a 20
For having his fortune told 6

On Friday morning, bread 3 d
one florin to Salai to wine 3 d
spend; 3 soldi re- grapes 3 d
cieved mushrooms 3 d
fruit 3 d
[6] bran 3 d
at the barber's 3 d
for shoes 3 d

On Thursday morning one florin.

On Saint Ambrose's day from the morning to Thursday 36 soldi.

To Ser Matteo; first 20 grossoni, then on 13 occasions 3 f. and then 61 grossoni, then 3, and then 3 f. 46 soldi 12 grossoni.

For paper 18
for canvas 30
for paper 10 d. 19
Total 73
1540.

20 pounds of German blue, at one ducat the pound lire 80 S d
60 pounds of white, S
the pound lire 15 S d
1½ pound at 4 S the pound lire 6 S d
2 pounds of cinnabar at S 18 the pound lire 1 S 16 d
6 pounds of green at S 12 the pound lire 3 S 12 d
4 pounds of yellow at S 12 the pound lire 2 S 8 d
1 pound of minium at S 8 the pound lire 0 S 8 d
4 pounds of . . . . . . at S 2 the pound lire 0 S 8 d
6 pounds of ochre at S 1 the pound lire 0 S 6 d
black . . . . at S 2 the pound for 20 lire 2 S 0 d
wax to make the stars
29 pounds at S—the pound lire 0 S 0 d
40 pounds of oil for paint-
ing at 5 soldi the pound lire 10 S 0 d
Altogether lire 120 d 18
without the gold. 18

1541.

Two large hatchets and one very small one, 8 brass spoons, 4 tablecloths, 2 towels,
15 small napkins, 2 coarse napkins, 2 coarse
cloths, 2 wrappers, 3 pairs of sheets, 2 pairs
new and 1 old.

1542.

Bed 7 0 S
ring 7 0
crockery 2 5
gardener 1 2
. . . . . . 2 8
porters 2 1
glasses 1
fuel 3 6
a lock 1

1540. 1–14. Written from left to right. 1. libra, libre throughout for libbra; libbra dazurro. 2. biacca S. [6] 9 o la libbra.
1541. 1. scure grande . . chuchini. 2. tovaglie . . guardanape 14 "15" tovagliolini 2 tovaglie canava. 3. nove e 1 vecchio.
1542. 5. mainard"o". 8. inferi da focho.
Peltro novo, 3 paji di lèzuola 3 pairs of sheets
di 4 teli l'uno, each of 4 breadths,
scodellini, 2 lenzoli piccoli 2 small sheets,
sco delle, 2 tovaglie e 1/4 2 tablecloths and 1/4,
piattegli grandi 2 large dishes,
piattegli mezzani 16 matìli 2 dishes medium size,
piatteletti 8 camicie 16 coarse cloths,
velo novo 9 pannetti 8 shirts,
3 scodellini 2 sciugatoj 9 napkins,
4 scodelle 3 small bowls,
3 quadrotti 4 bowls,
tovaglie 2 small bowls,
tovaglie 2 small bowls,
tovaglie 2 small bowls,
tovaglie 1 large bowl,
matili 1 platter,
matili 4 candlesticks,
candellieri 4 candlesticks,
1 candelliere piccolo 1 small candlestick.

C. A. 132 a; 402 a

Hose S 40
straw S 60
wheat S 42
wine S 54
bread S 18
meat S 54
eggs S 5
salad S 3
the Barber S 2 d 6
horses S 1

cavalli S 1.

C. A. 262 a; 87 a

Domenica
meat S 10 d
wine S 12 d
bran S 5 d 4
herbs S 10 d
buttermilk S 4 d 4
melon S 3 d
bread S 3 d 1

Sunday


S 9 8

Monday S 9 8

D. 6 d
wine S 12 d
bran S 9 d 4
buttermilk S 4 d 4
herbs S 8 d

1543. 1. para. 3. piccolo. 6. piatteleci. 8. sciugato. 12. 1. 13. 1. 15. piccolo.
1544. 7. hova.
1546. 1547. 
INVENTORIES AND ACCOUNTS.

1546.
Miseracione divina sacro sancte Romane ecclesie tituli n. cardinalis wulgarit non cupatus venerabili religioso fratri Johanni Mair d'Nustorf4 ordinis praedicatorum provintie teutonie (¿) conventus Wienensis capellano 6 nostro commensali salutem in dio semipernam Religionie zelus rite ac in [ferte?] 5 honestas aliarumque laudabilius probitatis et virtutum merita quibus apud nos fide digno commendationis testimonio Magistri videlicet ordinis felicis recordationis Leonardi de 7 Mansuetis de Perusio sigillo suo . . . us dans tibi ad . . . opera virtutum comen(salem) 8 locum et tempus success(ores) cujus similitur officium ministerius qui praecessorius sui donum (¿) confirmavit et de novo dedit aliarumque plurima [laudatis] qui opera tua laudant 10 nos inducent ut tibi (¿) reddamus ad gratiam liberalius hinc est quod nos cupientes.

W. XII.
Johannes Antonius di Johannes Ambrosijs de Bolate; 2 Chi perde il tempo e virtù non aquisita; 3 quanto più pensa l' animo più s' attristita; 4 Virtù non ha in potere lo auere; chi lascia onore per acquistare auere; 5 Non vale fortuna a chi non s' affatica; 6 Colui si fa felice, che Christum vestiga; 7 perfetto dono nò s' à sanza gran pena; 8 Passano nostri triumfi, nostre pompe; 9 la gola e l' sonno e l' otioste e piume Anno dal mondo ogni virtù sbandita, 10 tal che dal corso suo quasi smarita; Nostra natura è vinta dal costume; 11 Ormai convien così che tu ti spoltri; Disse il maestro che segiando in piuma, 15 in fana non si viene, nè sotto coltri, Sanza la qual chi sua vita consuma 13 tal usstigia in terra di se lascia, Qual fumo in aria o nel l' acqua la schiuma.

1546—1566. All these texts are written in the ordinary way from left to right.
1547. 1. Ambrosius. 3. pensse . . . satrista. 4. lassa honorre . . . aquistare haute. 5. safatica. 6. colay'. 7. perfecto donaças. 8. passano. 9. elliotiœ . . . del. 10. chorko . . . ismariar . . . chostume. 11. chonvien chosi chettuti spoltri . . . maestro chessiegando, 12. si yen messetto choltui. 12. chissua . . . chonsuma. 13. usstigia . . . lascia . . . onellacu lasschiuma.

1546. The meaning of this document, which is very difficult to decipher, and written in unintelligible Latin, is, that Leonardo di Mansuetis recommends the Rev. Mair of Nustorf, chaplain at Vienna, to some third person; and says also that something, which had to be proved, has been proved. The rest of the passages on the same leaf are undoubtedly in Leonardo's hand. (Nos. 483, 661, 519, 578, 392, 582, 887 and 894.)

1547. From the last sentence we may infer that this text is by the hand of a pupil of Leonardo's. — On the same sheet are the notes Nos. 1175 and 715 in Leonardo's own handwriting.
<table>
<thead>
<tr>
<th>Date</th>
<th>Expenses</th>
</tr>
</thead>
</table>
| 29th May 1504 | From Lionardo Vinci, 15 gold ducats, to spend on clothes and good beef.
|            | From Mona Margarita, 62 ducats, to remake the ring.                      |
| Sunday     | Bread: 6 d, Wine: 9 d, Meat: 7 d, Soup: 2 d, Fruit: 3 d, Candles: 3 d, Flour: 2 d |
| Monday     | Bread: 6 d, Meat: 9 d, Wine: 6 d, Fruit: 4 d, Soup: 1 d, Salad: 1 d |
| Tuesday    | Bread: 6 d, Meat: 11 d, Wine: 7 d, Fruit: 4 d, Soup: 2 d, Salad: 1 d |

1548. La mattina de santo Zanobio a dì 29 de maggio nel 1504 ebbi da Lionardo Vinci ducati 15 d’oro, e cominciai a spendere.

1549. On the morning of Santo Zanobio, I had 15 gold ducats and began to spend them.

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1548. 1. matina, 2. ebi, 3. magari, 4. arefere, 5. bonove, 6. hose, 7. veleto, 8. sounghi.

1548. 1549. On the same sheet is the text No. 1015 in Leonardo's own handwriting.
### 1550

| A Mona Margarita | 5 | 2a Tomaso | S 14 |
| 3a mona Margarita | 5 | di S 2 |
| el di di san Zanobi | 5 |
| resta ...... | d 13 S 2 d 4 |
| di ...... mona Margarita | 9d 14 S 5 d 4 |

To Monna Margarita S 5
to Tomaso S 14
ton the day of San Zanobi d 5 S 2
left ...... after payment d 13 S 2 d 4
altogether d 14 S 5 d 4

### 1551

Il lunedì a di 13 di febbraio prestai lire S 7 a Lionardo per spendere 2 venerdì d 7.

On Monday, the 13th of February, I lent lire S 7 to Lionardo to spend, Friday d 7.

### 1552

Stephano Chigi, Canonico ..., serv
vant of the honorable Count Grimani at S. Apostoli.

### 1553

Essendomi sollecitato; d'amor non ne
che elvnque ... Bernardo di Simone; Sil
vestro di Stefano; Bernardo di Jacopo; Fran
isco di Matteo Bonciani; Antonio di
vier Giovanni Ruberti; Antonio da Pistoia ...; Antonio; chi tempo è e tempo aspett
perde l'amico e' danari.

Having become anxious ..., Ber
ardo di Simone, Silvestro di Stefano, Ber
ardo di Jacopo, Francesco di Matteo Bon
iani, Antonio di Giovanni Ruberti, Antonio
da Pistoia ...; Antonio; He who has time
and waits for time, will lose his friends and
his money.

### 1554

Reverend Maestro, Domino Giovanni, I
spoke to Maestro Zacaria as a brother about
this business, and I made him satisfied with
the arrangement that I had wished; that is,
as regards the commission that I had from
the parties and I say that between us there
is no need to pay money down, as regard
the pictures of the ...

### Notes

- **1550**: This note is followed by an account very like the one given as No. 1549.
- **1552**: Compare No. 674, 21-23.
1555. Delle cose vedute infra la nebbia quella parte che sarà più uisibile, e tanto meno quâto só più remote.

1556. Teodorecus Rex ‘semper Augustus.

1557. Προμυμάσα: o ἀνάρωτος Ἀθῆνας.
‘ Aut Hesperia sola dicis et significat Italia; aut addis ultima et significat Ispania; Umbria par Tuscie.

1558. Πάντων ἀντιαμφιλίων δοδ εὐθεια ἐπισταριστταί; ‘προμυμάσα: o ἀνάρωτος Ἀθῆνας τοῖς θεοῖς δέχομαι.

1559. Canonica di . . . . a di 5 di Luglio 1507.

C. A. 754; 250.] 1555. Of things seen through a mist that which is nearest its farthest limit will be least visible, and all the more so as they are more remote.

C. A. 946; 278.] 1556. Teodoricus Rex Semper Augustus.

C. A. 1301; 397.] 1557. Either you say Hesperia alone, and it will mean Italy, or you add ultima, and it will mean Spain. Umbria, part of Tuscany.

C. A. 1940; 490.] 1558. my dearly beloved mother, sisters and cousin I herewith inform you that thanks to God I am . . . . . about the sword which I bring it to Maso at the piazza . . . . . and I will settle the business of Piero so that . . . . .

C. A. 1646; 490.] 1559. Canonica of . . . . on the 5th of July 1507; my dearly beloved mother, sisters and cousin I herewith inform you that thanks to God I am . . . . . about the sword which I bring it to Maso at the piazza . . . . . and I will settle the business of Piero so that . . . . .

C. A. 1646; 490.] 1560. Ut bene respondet Naturae ars docta! dedisset
Vincius, ut tribuit cetera· sic animam.
Noluit ut similis magis haec foret: altera sic est:
Possidet illius Maurus amans animam.

1555. 1. prte. 2. etremi . . ettanto.
1556. Teodorecus R.
1557. 3. sig “cas” ispaniç.
1559. 1. canonica i) didio(i) adj. 2. diletta . . sorele . . chome. 4. istro’ta’zi . . maso della violé.

1557. The notes in Greek, Nos. 1557, 1558 and 1562 stand in close connection with each other, but the meaning of some words is very doubtful, and a translation is thus rendered impossible.

1559. Amoretti, Mem. Stor. XXIV, quotes the first three lines of this letter as by Leonardo. The character of the writing however does not favour this hypothesis, and still less the contents. I should regard it rather a rough draft of a letter by young Melzi. I have not succeeded in deciphering completely the 13 lines of this text. Amoretti reads at the beginning Canonica di Vaprio, but Vaprio seems to me a very doubtful reading.

1560. These three epigrams on the portrait of Lucrezia Crivelli, a picture by Leonardo which must have been lost at a very early date, seem to have been dedicated to Leonardo by the poet. Leonardo used the reverse of the sheet for notes on geometry.
Hujus quam cernis nomen Lucretia, Divi
Omnia cui larga contribuere manu.
Rara huc forma data est; pinxit Leonardus, amavit
Maurus, pictorum primus hic, ille ducum.

Naturam, ac superas hac laesit imagine Divas
Pictor: tantum hominis posse manum haec doluit,
Illae longa dari tam magnae tempora formae,
Quae spatio fuerat deperitura brevi.

Egidius Romanus de formatione corporis humani in vtero matris.

2 A Mons. le Vintie,-des chevaux (?)
de l'escuyer du Roy...; laissez payement
continuer a Ms. 5 Lyonard Paintre du Roy.
Amboise.

Memoria a maestro Lionardi di avere
. . . . lo stato di Firenze . . .

Memorandum to Maestro Lionardo to have . . . the state of Florence.

To remind your Excellency that Ridolfo Manini brought to Florence a quantity
of crystal besides other stones such as are . . .

1563. 1. a m "r o" Lyonard dihavere p'eto la noblo stato.
1564. 1. vra ELL"nia". 2. Manini [porte] condusse . . som l. 3. cristillo impore (t) altre.
LEONARDO’S WILL.  

1565.

XVI C. 6 de Ciuitate Dei, se Antipodes.

Be it known to all persons, present and to come that at the court of our Lord the King at Amboise before ourselves in person, Messer Leonardo da Vinci painter to the King, at present staying at the place known as Cloux near Amboise, duly considering the certainty of death and the uncertainty of its time, has acknowledged and declared in the said court and before us that he has made, according to the tenor of these presents, his testament and the declaration of his last will, as follows. And first he commends his soul to our Lord, Almighty God, and to the Glorious Virgin Mary, and to our lord Saint Michael, to all the blessed Angels and Saints male and female in Paradise.

Item. The said Testator desires to be buried within the church of Saint Florentin at Amboise, and that his body shall be borne thither by the chaplains of the church.

Item. That his body may be followed from the said place to the said church of Saint Florentin by the collegium of the said church, that is to say by the rector and the prior, or by their vicars and chaplains of the church of Saint Denis of Amboise, also the lesser friars of the place, and before his body shall be carried to the said church this Testator desires, that in the said church of Saint Florentin three grand masses shall be celebrated by the deacon and sub-deacon and that on the day when these three high masses are celebrated, thirty low masses shall also be performed at Saint Gregoire.

Item. That in the said church of Saint Denis similar services shall be performed, as above.

Item. That the same shall be done in the church of the said friars and lesser brethren.

Item. The aforesaid Testator gives and bequeaths to Messer Francesco da Melzo, nobleman, of Milan, in remuneration for services and favours done to him in the past, each
sato, tutti et ciascuduno li libri, che il dicto Testatore ha de presente et altri Instrumenti et Portracti circa l’arte sua et industria de Pictori.

Item epso Testatore dona et concede a sempre mai perpetuamente a Battista de Vilanis suo servitore la metà zoé mediëtà de uno iardino, che ha fora a le mura de Milano et l’altra metà de epso iardino ad Salay suo servitore nel qual iardino il prefato Salay ha edificata et constructa una casa, la qual sarà e resterà similmente a semprevai perpetudine al dicto Salay, soi heredi et successori, et ciò in remuneratione di boni et grati servitii, che dicti de Vilanis et Salay dicti suoi servitori lui hano facto de qui inanzi.

Item epso Testatore dona a Maturina sua fantescha una veste de bon pan negro foderata de pelle, una socha de panno et doy ducati per una volta solamente pagati; et ciò in remuneratione similmente de boni servitii a lui facti epsa Maturina de qui inanzi.

Item vole ch’ale sue exequie siano sexanta torchie, le quali saranno portate per sexanta poveri, ali quali saranno dati danari per portarle a discrezione del dicto Melzo le quali torzi saranno divise nelle quattro chiesie sopradicte.

Item el dicto Testatore dona ad ciascuduna de dicte chiesie sopradicte diece libre cera in candele grosse che saranno messa nelle dicte chiesie per servire al di che se celebraranno dicti servitii.

Item che sia dato ali poveri del ospedale di Dio alli poveri de Sancto Lazaro de Amboisys, et per ciò fare sia dato et pagato alli Tesorieri d’epsa confraternità la summa et quantità de soysante dece soldi tornesi.

Item epso Testatore dona et concede al dicto Messer Francesco Melzo presente et acceptante il resto della sua pensione et summa de’ danari qual a lui sono debiti del passato fino al di della sua morte per il recevior, ovvero, Tesaurario general M. Johan Sapin, et tutte et ciaschuduna summe de’ danari che ha recepito dal p.° Sapin de la dicta sua pensione, e in caxo chel decede inanzi al prefato Melzo, e non altramente li quali danari sono al presente nella possessione del dicto Testatore nel dicto loco de Cloux come el dice. Et similmente el dona et concede al dicto de Melze tuci et ciaschuduni suoi vestimenti quali ha al presente ne lo dicto loco de Cloux tam per remuneratione de boni et and all of the books the Testator is at present possessed of, and the instruments and portraits appertaining to his art and calling as a painter.

Item. The same Testator gives and bequeaths henceforth for ever to Battista de Vilanis his servant one half, that is the moiety, of his garden which is outside the walls of Milan, and the other half of the same garden to Salai his servant; in which garden aforesaid Salai has built and constructed a house which shall be and remain henceforth in all perpetuity the property of the said Salai, his heirs and successors; and this is in remuneration for the good and kind services which the said de Vilanis and Salai, his servants have done him in past times until now.

Item. The said Testator gives to Maturina his waiting woman a cloak of good black cloth lined with fur, a . . . . . of cloth and two ducats paid once only; and this likewise is in remuneration for good service rendered to him in past times by the said Maturina.

Item. He desires that at his funeral sixty tapers shall be carried which shall be borne by sixty poor men, to whom shall be given money for carrying them; at the discretion of the said Melzo, and these tapers shall be distributed among the four above mentioned churches.

Item. The said Testator gives to each of the said churches ten lbs. of wax in thick tapers, which shall be placed in the said churches to be used on the day when those said services are celebrated.

Item. That alms shall be given to the poor of the Hotel-Dieu, to the poor of Saint Lazare d’Amboise and, to that end, there shall be given and paid to the treasurers of that same fraternity the sum and amount of seventy soldi of Tours.

Item. The said Testator gives and bequeaths to the said Messer Francesco Melzo, being present and agreeing, the remainder of his pension and the sums of money which are owing to him from the past time till the day of his death by the receiver or treasurer-general M. Johan Sapin, and each and every sum of money that he has already received from the aforesaid Sapin of his said pension, and in case he should die before the said Melzo and not otherwise; which monies are at present in the possession of the said Testator in the said place called Cloux, as he says. And he likewise gives and bequeaths to the said Melzo all and each of his clothes which he at present possesses at the said place of Cloux, and all in
grati servitii, a lui facti da qui inanzi, che per li suoi salarii vacationi et fatiche chel potrà avere circa la executione del presente Testamento, il tutto però ale spese del dicto Testatore.

Ordina et vole, che la sunna de quartocento scudi del sole che ha in deposito in man del Camarlingo de Nova nela città de Fiorenza, siano dati ali soi fratelli camali residenti in Fiorenza con el profito et emolumento che ne po essere debito fino al presente da prefati Camarlinghi al prefato Testatore per casone de dicti scudi quartocento da poi el di che furono per el prefato Testatore dati et consignati ali dicti Camarlinghi.

Item vole et ordina dicto Testatore che dicto Messer Francesco de Melzo sia et remana solo et in sol per il tutto executore del Testamento del prefato Testatore, et che questo dicto Testamento sortisa suo pleno et integro effecto, et circa ciò che è narrato et dacto havere tenere guardare et observare epso Messer Leonardo de Vinc Testatore constituuto ha obbligato et obliga per le presente epsi soy heredi et successori con ogni soy beni mobili et immobili presenti et advenire et ha renunciato et renuncia per la presente expressamente ad tuete et ciaschaduna le cose ad ciò contrarie. Datum nelo dicto loco de Cloux ne la presencia de magistro Spirito Fleri Vicario nela chiesia de Sancto Dionisio de Ambosia, M. Guglielmo Crousant prete et capellani, magistro Cipriane Fulchini, Fratre Francesco de Corton et Francesco de Milano religioso del convento de fratri minori de Ambosia, testimoni ad ciò ciamati et vocati ad tenire per il iudicio de la dicta Corte in presentia del prefato M. Francesco de Melze acceptante et consentiente il quale ha promesso per fede et sacramento del corpo suo per lui dati corporalmente ne le mane nostre di non mai fare venire, dire, ne andare in contrario. Et sigillato a sua requesta dal sigillo regale statuito a li contracti legali d'Amboysia, et in segno de verita.

Dat. a di XXII de Aprile MDXVIII avanti la Pasqua.

Et a di XXII d'epso mese de Aprile MDXVIII ne la presentia di M. Guglielmo Borian notario regio ne la corte de Baliagio d'Amboysia il prefato M. Leonardo de Vinc ha donato et concesso per il suo testamento et ordinanza de ultima volontà supraddicta al dicto M. Baptista de Vilanis presente et acceptante il dritto de laqua remuneration for the good and kind services done by him in past times till now, as well as in payment for the trouble and annoyance he may incur with regard to the execution of this present testament, which however, shall all be at the expense of the said Testator.

And he orders and desires that the sum of four hundred scudi del Sole, which he has deposited in the hands of the treasurer of Santa Maria Nuova in the city of Florence, may be given to his brothers now living in Florence with all the interest and usufruct that may have accrued up to the present time, and be due from the aforesaid treasurer to the aforesaid Testator on account of the said four hundred crowns, since they were given and consigned by the Testator to the said treasurers.

Item. He desires and orders that the said Messer Francesco de Melzo shall be and remain the sole and only executor of the said will of the said Testator; and that the said testament shall be executed in its full and complete meaning and according to that which is here narrated and said, to have, hold, keep and observe, the said Messer Leonardo da Vinci, constituted Testator, has obliged and obliges by these presents the said his heirs and successors with all his goods moveable and immovable present and to come, and has renounced and expressly renounces by these presents all and each of the things which to that are contrary. Given at the said place of Cloux in the presence of Magister Spirito Fleri vicar, of the church of Saint Denis at Amboise, of M. Guglielmo Crousant priest and chaplain, of Magister Cipriane Fulchini, Brother Francesco de Corton, and of Francesco de Milano, a brother of the Convent of the Minorites at Amboise, witnesses summoned and required to that end by the indictment of the said court in the presence of the aforesaid M. Francesco de Melze who accepting and agreeing to the same has promised by his faith and his oath which he has administered to us personally and has sworn to us never to do nor say nor act in any way to the contrary. And it is sealed by his request with the royal seal apposed to legal contracts at Amboise, and in token of good faith.

Given on the XXIIIrd day of April MDXVIII, before Easter.

And on the XXIIIrd day of this month of April MDXVIII, in the presence of M. Guglielmo Borian, Royal notary in the court of the bailiwick of Amboise, the aforesaid M. Leonardo de Vinci gave and bequeathed, by his last will and testament, as aforesaid, to the said M. Baptista de Vilanis, being present and agreeing, the right of water which
the King Louis XII, of pious memory lately deceased gave to this same de Vinci, the stream of the canal of Santo Cristoforo in the duchy of Milan, to belong to the said Vilanis for ever in such wise and manner that the said gentleman made him this gift in the presence of M. Francesco da Melzo, gentleman, of Milan and in mine.

And on the aforesaid day in the said month of April in the said year MDXVIII the same M. Leonardo de Vinci by his last will and testament gave to the aforesaid M. Baptista de Vilanis, being present and agreeing, each and all of the articles of furniture and utensils of his house at present at the said place of Cloux, in the event of the said de Vilanis surviving the aforesaid M. Leonardo de Vinci, in the presence of the said M. Francesco Melzo and of me Notary &c. Borean.
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<td>III. SUBTERRANEAN WATER COURSES.</td>
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<td>IV. ON RIVERS.</td>
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1083. A. 57a.
1084. C. A. 212b; 626b.
1085. Leic. 10a.
1086. Leic. 27a.
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1091. Leic. 31a.
1092. C. A. 321b; 971a.
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1106. F. 50a.
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1117. B. 81a.
1119. C. A. 7a; 19a.
1120. Ash. II. 5b.
1122. Mz 3a. (6)
1123. Mz 12a. (10)
1124. Mz 9b. (13)
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1126. C. A. 372b; 1156b.
1127. Ash. II. 4a.
1128. Tr. 48.
1131. B. 4a.

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1136. Tr. 75.
1137. S. K. M. II. 43a.
1138. Tr. 40.
1139. H. 93a.
1140. W. XXIX.
1141. Tr. 78.
1142. C. A. 58a; 180a.
1143. C. A. 75a; 219a.
1145. Tr. 65.
1146. Tr. 70.
1147. Tr. 45.
1148. Tr. 51.
1149. C. A. 85a; 247a.
1150. S. K. M. III. 80b.
1151. L. 18a.
1152. M. 58a.
1153. C. A. 151a; 449a.
1154. Mz 1a.
1155. E. 86.
1158. G. 95b.
1159. C. A. 75a; 219a.
1160. L. 82a.
1161. G. 8a.

II. MORALS.

1162. B. M. 156b.
1163. C. A. 704a; 207a.
1164. H. 33b.
1165. C. A. 75b; 219b.
1166. G. 89a.
1167. C. A. 365b; 1141b.
1168. Mz 8a (12).
1169. S. K. M. III.; 38b.
1170. C. A. 75a; 219a.
1171. C. A. 111a; 345a.
1172. C. A. 223b; 671b.
1173. Tr. 32.
1174. Tr. 68.
1175. W. XII.
1176. Ash. I. 1b.
1177. C. A. 284b; 885b.
1178. W. An. II. 203a (24).
1180. C. A. 153b; 455b.
1181. Tr. 57.
1182. Tur. 17b.
1184. F. 96b.
1185. C. A. 108b; 338b.
1186. W. XIII.
1187. S. K. M. II. 77a.
1188. B. 36b.
1189. Tr. 2.
1190. E. 31b.
1191. H. 70b.
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1197. H. 12b.
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1199. L. 90a.
1200. C. A. 75b; 219b.
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1203. C. A. 64b; 197b.
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III. POLEMICS.—SPECULATION.

1205. G. 47a.
1207. C. A. 75b; 219b.
1208. F. 5b.
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1211. C. A. 187b; 562b.
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1213. W. An. II. 242b. (N)
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1222. H. 6a.
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1395. S. K. M. II. 20 a.
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1400. S. K. M. II. 63 a.
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1479. C. A. 284 b. 865 b.
1480. C. A. 121 a. 375 a.
1481. K. 3 b.
1482. W. 151 b.
1483. F. 0 o'.
1484. B. M. 71 b.
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1488. S. K. M. III. 93 a.
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1494. W. XXIII.
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1501. K. 3 b.
1502. L. 53 b.
1503. L. 53 a.
1504. G. 95 a.
1505. Ash. II. 10 b.
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1509. B. 4 a.
1510. Ash. I. 1 a.
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1557. C. A. 94 b. 271 b.
1558. C. A. 121 b. 376 b.
1559. C. A. 130 a. 397 a.
1560. C. A. 164 b. 490 b.
1561. C. A. 170 b. 513 b.
1562. C. A. 175 a. 526 a.
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1564. C. A. 334 b. 1076.
1565. C. A. 399 b. 993 a.
APPENDIX

I.

THE HISTORY OF THE MANUSCRIPTS.

1. Leonardo by his will expressly devised all his MSS. and drawings to his younger friend Francesco Melzi, who carried them back to Milan. Four years after Leonardo’s death Alberto Benedetto wrote from Milan to Alfonso d’Este, Duke of Ferrara: “Et perché ho fatto menzione de la casa de Melzi, avviso a V. Ex. che un fratello di questo che ha giotiro fu creato de Leonardo da Vinci, et herede et ha molti de suoi secreti, et tutte le sue opinioni ... Crede che gli habbia quelli libricini de Leonardo de la Noto-mia, et de molte altre belle cose.” See G. Cam- pori, Nuovi Documenti.

When Vasari visited Milan — probably in 1566—he saw Leonardo’s MSS. in Francesco Melzi’s possession, and wrote as follows: Leio-nardo ... di brutti caratteri scrisse lettere, che sono fatte con la mano mancina a rovescio; e chi non ha pratica a leggere, non l’intende, perché non sì leggono se non con lo specchio. Di queste carte della notomia degli uomini n’è gran parte nelle mani di messer Francesco da Melzi gentiluomo milanese, che nel tempo di Leonardo era bellis-simo fanciullo e molto amato da lui, così come oggi è bello e gentile vecchio, che le ha care e tiene come per reliquie tali carte, insieme con il ritratto della felice memoria di Leonardo: e chi legge quegli scritti, par impossibile che quel divino spirito abbi così ben ragionato dell’arte e de muscoli e nervi e vene, e con tanta diligenza d’ogni cosa. Come anche sono nelle mani di ... pittor milanese, alcuni scritti di Leonardo, pur di caratteri scritti con la mancina a rovescio, che trattano della pittura e del modo del disegno e colorire. Costui non è molto che venne a Firenze a vedermi, desiderando stampar questa opera, e la condusse a Roma per dargli esito; nè so poi che di ciò sia seguito. (Ed. Sansoni, IV. 37).

In another place Vasari mentions that he himself possessed some drawings by Leonardo.

Lomazzo, the Milanese painter, writes, in 1590 (Idea del Tempio della pittura, 2nd Ed., p. 15):

Ma sopra a tutti questi scrittori è degno di memoria Lionardo Vinci, il qual insegnò l’Ana-tomia dei corpi umani, e dei cavalli, ch’io ho voluta appresso a Francesco Melzi, designata divinamente di sua mano. Dimostrò anco in figura tutte le proporzioni dei membri del corpo umano; scrisse della prospettiva dei lumi, del modo di tirare le figure maggior del naturale, e molti altri libri ... Ma di tante cose niuna se ne ritrova in stampa; ma solamente di mano di lui, che in buona parte sono pervenute nelle mani di Pom- popo Leoni, statuari del Cattolico Rè di Spagna, che gli ebbe dal figliuolo di Francesco Melzi, e n’è venuto di questi libri ancora nelle mani del Sig. Guido Mazzuta, Dottore virtuosissimo, il quale gli tiene molto cari.

2. In the short anonymous biography of Leon-ardo which, as it seems to me, must have been written somewhat earlier than Vasari’s Vite (published by Milanesi, Arch. Stor. Ital. XVI) the MSS. are mentioned in these terms: (Leo-nardo) tornossene a Milano et dipoi in Francia al servizio del re Francesco, dove portò assai de sua disegni, de quali ancora ne lasciò in Firenze nello Spedale di S. Maria Nuova con altre mas-
The History of the Manuscripts.

serisie et la maggior parte del cartone della sala del Consiglio, del quale è il disegno del gruppo de cavalieri che oggi in opera si vede rimasto in Palazzo... e lasci per testamento a messer Francesco da Melzi, gentile hom milanese, tutti i donari contanti, panni, libri, scritture, disegni et instrumenti et ritratti circa la pittura et arte et industria sua che qui si trovaro, e fedeo executore del suo testamento.

These references to them, which are the oldest known, may be supplemented by some information which I owe to the kindness of Signor Enrico Stevenson, Scrittore in the Library of the Vatican. MS. 71 Boncompagni (previously Albani 511), XVIth century, contains the catalogue of MSS. belonging to 'Sangallo'. In this catalogue a MS. volume, Tome XXXIX, is thus described: Opinione di Leonardo da Vinci nel dipignare prospettive, ombre, lontanane, alteze, bassesse d'apresso o da lontano, et altro.

It seems therefore doubtful whether after the death of Francesco Melzi, about 1570, the Melzi family still possessed Leonardo's literary bequest intact, or at any rate, were the sole possessors of it. We have fuller information at the beginning of the XVIIth century, for Leonardo's MSS. had by that time become famous and were sought after as relics and curiosities. Guido Mazenta, who is mentioned by Lomazzo as possessing MSS.by Leonardo, was the brother of the author of an interesting memoir entitled: Alcune memorie de fatti da Leonardo da Vinci a Milano e de suoi libri del P. D. Gio. Ambr. Mazzentí, Milanes, Cherico Regio minore di S. Paolo altrin detti Barnabiti. An exact translation of this into French has been given by M. Eugène Piot in the Cabinet de l'Amateur (1863, p.61–63). I quote from it the following passage relating to the history of the MSS.

Ala mort de Melzi... les manuscrits restèrent dans sa villa de Vaprio, où ses héritiers, qui avaient des goûts et des occupations bien différents, négligèrent à ce point ces trésors qu'il fut facile à Lélio Gavardí, qui enseignait les humanités dans cette famille, d'en prendre tout ce qu'il voulu et de porter treize de ces volumes a Florence, dans le dessin de les offrir au grand-duc. Mais ce prince tomba malade et mourut à son arrivée, et il vint à Pise chez Manuce. Je lui fis haute de son bien mal acquis, et il en convint. Mes études étaient faîtes, je dus partir: il me prisa de reporter les volumes à Milan, ce dont je m'accomplit de bonne foi, en consignant le tout au chef de la famille, le Dr Oratio Melzi, qui fut très-ennuyé de l'embarras que j'avais voulu prendre, et qui m'en fit don en me disant qu'il avait du même peintre beaucoup d'autres dessins qui devaient abandonnés dans des caisses sous les toits de sa villa. Ces livres restèrent donc entre mes mains, et, plus tard, entre celles de mes frères. Ceux-ci en firent un usage au peu trop grand, râconnèrent à ceux qui les voyaient avec quelle facilité je les avais obtenus, de sorte que beau-coup de personnes retournèrent chez le docteur Oratio et en tirèrent des dessins, des modèles anatomiques, et beaucoup de précieuses reliques de l'atelier de Léonard. Pompeo Leoni fut un de ses chassateurs; son père avait été évêve de Michel Ange Buonarotti, et lui même était au service du roi d'Espagne, pour qui il a fait tous les bronzes de l'Escarial. Pompeo prit au Dr Melzi offices, magistratures, siège dans le sénat de Milan, s'il pouvait reprendre les treize volumes et les lui donner pour les envoyer au roi Philippe, grand amateur de ces sortes de curiosités. Excité par de telles espérances, Melzi voulut chez mon frère, le prie à genoux de lui rendre les manuscrits qu'il m'avait donnés; c'était son collège au collège de Milan, bien digne de sa compassion et de son amitié; sept volumes lui furent rendus. Des six qui restaient à la maison, un fut offert au cardinal Frédéric Borromeé; il est aujourd'hui conservé dans la bibliothèque Ambrosienne; c'est un in-folio, couvert de velours rouge, qui traite très philosophiquement de la lumière et des ombres, au point de vue de la peinture, de la perspective et de l'optique. Un autre fut donné à Ambroise Figini, noble peintre de cette époque, qui le laissa à Hercole Bianchi avec le reste de son cabinet. Presé par le duc Charles-Emmanuel de Savoie qui désirait en posséder, j'en obtins de l'amitié de mon frère un troisième que je l'envoyai à cette Altesse. Après la mort de mon frère, les trois autres sont parvenus entre les mains de Pompeo Arétin, qui, avec ceux qu'il avait re-ceilli, en sépara les feuillets pour en former un gros volume qui passa à son héritier Polidoro Calchi, et fut vendu ensuite à Galéas Arconati pour trois cents ducats. Cet homme généreux le conserva dans sa galerie remplie de mille choises précieuses; il a dû plusieurs fois rési—

1 The Italian MS. by Mazenta was until 1882 in the possession of the firm of booksellers A. Firmin-Dlidot, of Paris; but I was constantly forbidden to examine its contents. It has lately passed into the possession of an antiquary in Paris. The following interesting passage is again taken from M. Piot's translation, which adequately takes the place of the original: Sei osservazi6 dimentichen anche qualsi chosen historiche, et egli se met sotto nos yeux les antiques catacrae dont les Plomades se servaient en Egypte pour repianire et distribuir les eaux bienfaisantes du Nil; les belles inventions relatives à la navigation de la mer de Nocmled, au moyen de lacs et de fleuves, dont il est question dans les lettres de Trajan et de Plutarque; mais je crois que ce curieux génie prenait plaisir à déguiser sous ces noms ceux de Milan et de Nuvoucon (7).
ster aux prières du duc de Savoie et d’autres prénoms qui le lui demandaient: il en a refusé plus de six cents ducats.

3. The MSS. in the possession of the brothers Mazenta, had, it would seem, been gradually reduced to three. Guido Mazenta whose name is to be seen in the MS. given by him to Cardinal Borromeo (see Bibl. No. 2), died in 1613.

In 1636, Count Galeazzo Arconati—who is named in Mazenta’s report—presented twelve MS. volumes by Leonardo to the Ambrosian Library at Milan. The explicit deed of gift may be seen, translated into French in the Cabinet de l’Amateur, 1861, pp. 53—59. In the catalogue of these MSS. the binding is more particularly described than the contents. The following twelve MSS. were included in this gift. 1. the Codex Atlanticus (Bibl. 38), 2. a MS. now lost, but described as follows:

Le deuxième est un livre in-folio ordinaire, de la grandeur du papier coupé ordinaire. Il est relié en bois couvert de cuir rouge, orné de frises et de fleurs d’or. Le volume est entièrement composé de feuillets de velin et commence par ces paroles, écrites en rouge: TAVOLA DELLA PRESENTE. Suivent huit feuillets sans pagination. Elle commence au suivant, qui a un ornement en tête qui dit: Eccellentiss s. princiipe, etc., et la pagination suit jusqu’au cent vingtième feuillet, quatre-vingt-sept pour le text, trois blancs et le reste des dessins divers colorisi, le premier desquels est intitulé: Sfera solida, et le dernier: Piramis laterata exagona vacua; au fond du feuillet est un texte grec qui exprime la même chose.

3. Le troisième est un livre in-quarto, relié en velin, sur le dos duquel on lit les paroles suivantes: DI LEONARDO DA VINCI; il est de cinq feuillets justes, mais le premier manque; sur le second il y a quelques erreurs noires, feuillets et fruits colorisés. Dans l’intérieur du volume, au feuillet 49, on a inséré cinq feuillets de dessins variés, armes de l’est pour la plupart, et à la fin un autre petit volume (volumetto) de diverses figures de mathématiques et d’oiseaux, de dix-huit feuillets, qui a été couso dans la même reliure en velin.

Bibl. 3, 4. Ash. II and B. The appendix (volumetto) is now lost; the last mention of it occurs in Venturi’s Essay (1796). Compare No. 1465, Note 4.

4. MS. of 114 leaves (see Bibl. 5, 6, Ash. I and A).

5. Le cinquième est un autre livre semblable, in-quarto, couvert, comme le précédent, de cinq-ou-quatre feuillets. Sur le premier sont dessinées diverses têtes bonusfons, et sur le dernier quatre colonnes de texte, écrites à rebours. Il est marqué sur le dos LEONARDO DA VINCI.

This description corresponds with the MS., Bibl. 28 Tr. 6.

6. MS. see Bibl. 25, E.
7. MS. see Bibl. 22, F.
8. MS. see Bibl. 26, G.
9. Three MSS. bound in one vol.; see Bibl. 8—10, H1, H2, H3.
10. Two small MSS. bound in one, see Bibl. 13, 14.
11. MS. see Bibl. 18, L.
12. MS. see Bibl. 27, M.

In 1674 Count Orazio Archinti presented to the same Library a MS. by Leonardo, consisting of three small note-books in one Vol.; Bibl. 32—34.

In 1799, Stefano Bonsignori made a short catalogue of the MSS. in the Ambrosian Library at Milan. It includes 1. MS. C A, see Bibl. 28; 2. MS. B and Ash. II, see Bibl. 3, 4; 3. MS. Ash. I and A, Bibl. 5, 6; 4. MS. D, Bibl. 31, 5. MS. E, Bibl. 25; 7. MS. G, Bibl. 26; 8. MSS. H1, H2, H3, Bibl. 8—10.

The descriptions of the others are too vague and slight to admit of our indentifying by them any MSS. now existing: 6. Miscellanea; idrostatica, etc. É è in-8 piccolo, in cartone rustico. 9. Miscellanea. Moto, machine, macchinette da far or cristal, etc. É è in-16, legato in pergamen. 10. Miscellanea in-16, in cartone rustico. 11. Miscellanea. Abbozzi informi, moto ecc. É è in-16, pergamen (see Dossi, degli scritti ... di Leonardo da Vinci. Milano 1871, pp. 21—24). It will be observed that one MS. fewer is here named than in the deed of gift from Count Arconati; on the other hand a MS. D, not previously mentioned, is now included. The fifth MS. of Arconati’s list is evidently wanting in this list. The volume given to the Ambrosian Library by Cardinal Borromeo in 1603 (Bibl. 2, C) seem also to have been omitted. It is evident then that we cannot exactly determine how many of these MSS. were to be found in the Ambrosian Library in the year 1796. At the suggestion of Bonaparte the Directory of the French Republic conveyed many works of art from Italy into France. So much as this is, at any rate certain: in August 1796 the Codex Atlanticus was in the Bibliothèque Nationale: and “Douce petits MSS. de Leonardo da Vinci, sur les sciences” were in the Institut National (Institut de France). The authors of the catalogue of the pictures and MSS. removed from the Ambrosian Library—Peignon, commissaire de guerre and le Citoyen Tinet, agent des Arts’ (dated Milan, May 24, 1796) either do not mention Leonardo’s MSS. at all, or—which is more probable—include them under the following somewhat vague designation “Le Carton des ouvrages de Leonardo d’avinci”. It is certain, on the other hand, that in 1815 the commissary of the
Austrian government demanded the restoration to the Ambrosian Library of thirteen (or fourteen?) MSS., being the number stated in Venturi's Essay written in 1796. (Venturi says in his essay: Les Manuscrits sont au nombre de quatorze, parceque le Volume B contient un appendice de dix-huit feuillets qu'on peut seperer et considerer comme le quatorzième volume).

However, only the Codex Atlanticus found its way back again; the other twelve MSS. remain in the possession of the Institut de France. These facts cover all that is known of the history and fate of the volumes now on the continent, that is to say in France and Italy.

I am unfortunately not in a position to give so full an account of the vicissitudes of such of Leonardo's MSS. as are now in England. Of the MS. volume at Windsor, W. L. (Bibl. 36) Chamberlain tells us (Orlaire -Designs, London, 1812): It is one of the three volumes which became the property of Pompeo Leoni that is now in his Majesty's possession. It is rather probable than certain that this great curiosity was acquired for King Charles I. by the Earl of Arundel, when he went an Ambassador to the Emperor Ferdinand II. in 1636, as may indeed be inferred from an instructive inscription over the place, where the volumes are kept, which sets forth that James King of England offered three thousand pistols for one of the volumes of Leonardo's works. And some documents in the Ambrosian Library give colour to this conjecture. This volume was happily preserved, during the civil wars of the last century, among other specimens of the fine arts, which the munificence of Charles I. had amassed with a diligence equal to his taste. And it was discovered soon after his present Majesty's accession, in the same cabinet, where Queen Caroline found the fine portraits of the court of Henry VIII. by Hans Holbein, which the King's liberality permitted me lately to lay before public.

Chamberlain, apparently misled by the well-known inscription in the Ambrosian Library seems to assume that Lord Arundel must have derived the Leonardo MSS. in his possession from Arconati, and not from Spain; but Mr. Alfred Marks of Long Ditton, has lately disproved this clearly in two contributions to the Athenaeum, Nos. 2626 and 2645. John Evelyn in his Memoirs (Vol. I. p. 213 ed. 1818) tells us that when travelling in Italy in 1646 he received from Lord Arundel, then sick at Padua, where he died in the course of this year, advice as to what he should try to see. Afterwards, visiting the Ambrosian Library, Evelyn writes:

"In this room stands the glorious (boasting) inscription of Cavallero Galeazo Arconati, valuating his gift to the librarte of several drawings by Da Vinci, but these we could not see, the keeper of them being out of town and he always carrying the keys with him, but my Lord Martial, who had seen them, told me all but one book are small, that an huge folio contain'd 400 leaves full of scratches of Indians [sketches of engines?] &c., but whereas the inscription pretends that our King Charles had offer'd 1,000 l. for them, my Lord himselfe told me that it was he who treated with Galeazo for himselfe in the name and by permission of the King, and that the Duke of Feria, who was then Governor, should make the bargain: but my Lord having seen them since did not think them of so much worth."

The leaves of the Codex Atlanticus are numbered up to 393; hence it is probable that in giving this description Lord Arundel had this single MS. in his mind. The MS. W. L. at Windsor which, with the MS. C. A. formerly belonged to Pompeo Leoni now consists of only 234 folio leaves. Arconati (see above) mentions, it is true, one collection only of MSS. i.e. MS. C. A. as being in the hands of Pompeo Leoni; but it can hardly be doubted that the MSS. and drawings W. L. were also in his possession, since Leoni's name is given in the inscription on the old binding of the two volumes in the same way.

"Pompeo Leoni of Arezzo, Court sculptor to King Philip II. of Spain, died in Madrid A.D. 1610, as we learn from Carducho 'Dialogos de la Pintura' (1633). Part of his property was publicly sold at Madrid; some works which had belonged to it being afterwards purchased by Charles the First when, as Prince of Wales, he visited Spain in 1623."

From the Spanish portion of Pompeo's collection thus sold came, in all probability, the two volumes of Leonardo's of which Carducho speaks as being then in the possession of Don Juan de Espina: "Alii vi dos libros dibujados y manuscritos de mano del gran Leonardo de Vinchi, de particular curiosidad y doctrina" ("two
books," may we say? "one of sketches, one manuscript"), which the Prince of Wales had in vain sought to purchase. The contents of these volumes Carducho unfortunately describes only in very general terms. In Mr. Sainsbury's 'Original Unpublished Papers illustrative of the Life of Rubens,' we find evidence that Lord Arundel was subsequently in treaty for these very books, or, perhaps, for one of them only. On p. 294 will be found a note of Endymion Porter's "of such things as my Lord Ambassador St' Francis Cottington is to send out of Spain for my Lord of Arondell; and not to forget the booke of drawings of Leonardo de Vinze wh is in Don Juan de Espinas hands." This is of the date 1629, when Sir Francis was for the third time setting out for Spain as ambassador. His negotiations for the book were unsuccessful, for on January 19th, 1636—37, we find (p. 299) Lord Arundel writing from Hampton Court to Lord Aston, then Ambassador to Spain,—"I beseech you be mindful of D. Jhon. de Spinias booke, if his foolish humor change." There can, I think, be little doubt that, on the change of Don Juan's "foolish humor," a priceless treasure, the object of so many fruitless attempts, at last rewarded the persistence of the great English collector" (A. Marks).

Here, beyond a doubt, only the MS. W. L. is meant, for this, as being a collection of Leonardo's most important drawings, must be regarded as exceptionally precious. But did Lord Arundel ultimately get this Manuscript. We cannot say more than that this seems probable; and for this reason: Hollar engraved drawings of Leonardo's which are now in Windsor and inscribed them "W. Hollar fecit 1646 ex collectione Arundeliana," — drawings which most probably were included in this W. L. collection before it was divided.

On the other hand it can be positively shown that Lord Arundel possessed the MS. Br. M., Bibl. 23, which was no doubt purchased by him for a relatively small sum in consideration of the smaller artistic interest of the drawings, and for the same reason it is quite intelligible that no mention should be made of it in the correspondence at the time. But whether the MS. W. L. was purchased by Charles II. when Lord Arundel's collections were sold in Holland, or whether Charles I. had previously acquired it after his journey to Spain as Prince of Wales in 1623—when he, in person, purchased some works of art from among Leoni's collection, is not known. So much as this alone is certain, that it has now for a very long period belonged to the Royal collections.

Though Chamberlain's statement as to the acquisition of Leonardo's MSS. and drawings in the Windsor Library is, as we have seen, probably inaccurate, we may still give credit to his information as to the finding of them by Queen Caroline in Kensington Palace, for he— as Royal Librarian at the time—must certainly have been acquainted with the facts. His statement is moreover confirmed by Walpole (Anecdotes of painting I. 84: Soon after the accession of the late King, Queen Caroline found in a bureau at Kensington, a noble collection of Holbein's original drawings for the portraits of some of the chief personages of the court of Henry VIII.).

This, however, is by no means the earliest information we possess regarding Leonardo's MSS. and drawings in the possession of Royalty. In the MS. Department of the British Museum I found an old inventory from which I give the following extracts: List of the drawings || in ye Cabinet in || His Maj'\^{s} Lower || Apartment || in this is marked what \ has been Delivered for || her Maj'\^{s} use || Page 28. A list of the Books of drawings and Prints in the bureau in His Majesty's great Closet at Kensington.

No. 3. By Hans Holbein those fram'd & hang at Richmond.

No. 5. Prints by Hollar; delivered to her Maj' Aug. 1735 and by her lent to Lady Burlington, since put in Volumes and laid in ye Library at Kensington.

No. 6. Drawings by Leonardo de Vinci.

No. 13. Drawings by Leonardo di Vinci;—these mark'd with a cross were delivered for her Maj'\^{s} use in ye year 1728.

The oldest inventory in Windsor Castle—is only of the beginning of the present century. On p. 23 we find: "Leonardo da Vinci, Tom. I." and a list follows of the drawings, comprised on 41 pages. For instance: page 1 His own portrait, profile, red chalk (a well known drawing in the present collection). Only a few can be identified, for the descriptions are very brief. On p. 26 we come to "Leonardo da Vinci, Tom. II." which is also a list of drawings comprised on 40 pages. It begins: page 1, the last Supper, the Architecture is varied in the painting at Millan where an open door is represented behind our Saviour, black chalk. NB. This Drawing was not in the Vol. compiled by Pompeo Leoni, but in one of the Volumes in the Buonfiluolo Collection bought at Venice. (By the way I mention that the drawing in question, still at Windsor, is not an original drawing, but an old copy). This gives us an incidental clue to a second source whence the treasures of the Windsor collection have been derived. Nothing more, however, is known concerning the Buonfiluolo collection.
APPENDIX.

On p. 29 of the Inventory we come to a catalogue of the contents of a third Vol. of 205 sheets, in which 549 drawings are named and shortly described, for instance:

No. 22 2 Heads, of Judas and one of the Apostles for the last supper at Milan.
     41 1 Mechanical Powers
     NB. All the Leaves from 41 to 142, except those few marked otherwise, are full of very copious and accurate studies in Anatomy which were done with the assistance of Marc Antonio della Torre &c.

143 1 Manuscript—Here ends the Anatomical study.

As the reader will have observed, the number of leaves in the MS. W. L. does not correspond to that in either of these three Volumes. There can be no doubt that, at that time most of the drawings had been taken out of it. Recently most of the finest drawings in the Royal collection have been mounted on card-board and arranged in four portfolios, while some of the MS. leaves remain in the folio W. L. (Bibl. 36), and others are mounted on old thin card board, more particularly the texts W. P., Bibl. 15, and W. An. I, Bibl. 1; others again are not mounted nor even—at the present date—arranged. Their large number rendered it necessary that they should be classified according to their contents and the probable date of their being written, with a view to this present publication. I therefore sorted them under the following heads: W. H., Bibl. 16; W. An. II., Bibl. 17; W. M., Bibl. 19; W. An. III., Bibl. 24; W. An. IV., Bibl. 35; W., Bibl. 37. The loose leaves in the Windsor collection are numbered consecutively (from 1—249) without any reference to their connection, while the Roman numbers refer to those sheets which are mounted. By this means reference to the originals is facilitated.

It will be noticed that Anatomical writings preponderate greatly, and they are the portion which Vasari most admired, when he had the opportunity of seeing Leonardo's MSS. in Melzi's house.

II.

BIBLIOGRAPHY.

The Manuscripts are arranged here in the same chronological order as shown in Vol. I. pp. 5—7. The numbers of the sheets are generally not by the author, but in a more modern handwriting. The few instances when these numbers

A = Acqua (Water).
Ar = Architecture.
F = Forza (Force).
Fo = Fortezza (Fortress).
Ge = Geometry.
M = Moto, colpo (on movement &c.).
Ma = Mathematics.

are by Leonardo will be found mentioned in the lists. The bindings are in parchment, if not otherwise stated. The following abbreviations have been introduced in the description of the contents (the Italian words are headings used by Leonardo):

Mn = Machines.
O = Optics.
P = Peso (Weight).
Ph = Physics.
V = Volatili (Flight of Birds).
+ = blank pages.

I. W. An. I.

1 a 1370, notes on the skull | 1 b 805 | 2 a, notes on the skull | 2 b + 3 a on the skull and on the teeth | 3 b, 4 a on the skull | 4 b +

2. C.

Inscribed in golden letters on the front cover: • VIDI • MAZENTÆ • PATRITII • MEDIOLANENSIS • LIBERALITATE • AN. M-D-C-III. Inside the cover: C and [O].—On the first sheet (by an unknown hand): Autographum Leonardi Vincii | cujus in ejusdem rebus gestis meminit | Raphael Trichet Frenes | agit autem de lumine et umbra.—First sheet verso: O.—Second sheet marked [J, G.] and O. The following sheets are numbered 1—30, by an unknown hand. These sheets disagree with Leonardo's own numbers, here given in brackets(). He seems to have counted the sheets backwards. They are on the back of the sheets, but some are
3. B.

BIBLIOGRAPHY.

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wanting: 1a 254 | 1b (15) 253 | 2a 221 | 2b (14) 220 | 3a 219 | 3b (12) 218 | 4a 217 | 4b (12) 216 and Pl. VI, 3 5a 352, 215, and Pl. VI, 2 5b (11) moto, voce, forza e moto | 6a del moto dell'aria e dell'acqua | O | 6b (10) forza e peso, colpo | 7b colpo, peso e forza; 213, A | 7b (6) M, 39, P, 12 lines, 160, F | 8a 131; O | 8b 259, 180, 260 | 9a O | 9b O | 10a 262, 141 and Pl. II, 2. 3. 10b | 11b O | 12a 258, 229 | 13b 289 | 13a 290 | 13b 267 | 14a 256 | 14b (16) 255 | 15a M, A | 15b (1)

720, 1458, 727 | 16a de ochio, M | 16b (19) O | 17a O | 17b (18) O | 18a, 303 | 18b and 19a O | 19b | 1334, 1380 | 20a and 20b O | 21a 174 | 21b (17) 257 | 22a A, M, O | 22b (8) P | 23a 251 | 23b (7) A | 24a 250 | 24b (6) A | 25a A | O | 25b (5) M, A | 26a A | 26b (4) 931, acqua et terra | 27a O | 27b (3) 53, O | 28a M | 28b (2) F | 29a inscribed by an unknown hand: le carte sono di n° 28 cioè Ventotto. 29b [G] 30a O | 30b +

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3. B.

Binding in pig-skin; marked B inside the front-cover. On the first sheet is a short, indistinct note in Spanish, probably by P. Loni, stating that Leonardo wrote backwards. The following sheets are numbered by very large numbers from 3—90 (see the facsimile Pl. LXIX, 2): 3a. Drawings in water colours, representing some birds | 3b 329, 346, 638, 675, 1188, F | 4b 2159, 1193, Pl | 4b a Ab, 1212 Ma | 5a Fo | 5b and 6a Mn | 6b Mn | natura de’ spechi | 7a and 7b Mn Fo | 8a 1497 | 8b 10a Arms | 10b da passare un fiume, Ge | 11a Mn | 11b Pl. XXIV, No. 2 and No. 3, Mn | 12a Pl. LXXXVIII, No. 6 and No. 7, 751 | 12b Ge, Ar | 13a Mn, sketch of flowers | 13b and 14a Ge and sketches of flowers | 14b camino | 15a Pl. XCIII, No. 1, Fo | 15b Pl. LXXVII, No. 1 and 2, 742, 743 | 16a Pl. LXXVII, No. 3, 741 | 16b Fo, Me | 17a Ge | 17b Pl. LXXX | 18a Vol. II, p. 47, Fig. 1, and Fig. 2 Mn | 18b Pl. LXXXVIII, No. 2, 755, 756 | 19a Fo | 19b 752, Ar | 20a A Mn | 20b A 511 | 21a Pl. LXXXVII, No. 3 and No. 4, Fo | 21b Pl. XXXVIII, Nos. 1—5 | 22a Pl. XCIII, No. 2, Mn | 23a construction of bridges | 23b Pl. XXXX, No. 2 | 24a Pl. XCVI, No. 2, 757 | 24b Mn Fo | 25a A | 25b Pl. XC | 26a A Mn | 26b Mn | 27a Pl. Cl, No. 5, 788 | 27b arms, drawing of a small figure | 28a Ge, spechi | 28b 762, Pl. Cl. II, No. 3 | 29a Ge, strade che vanno attraverso a nava argine d’u fiume | 29b Mn | 30a Ar, Fo | 30b 32a arms 32b on passing a river Pl. ClII, No. 2. 33b and 44a Mn | 34b Vol. II, page 44, Fig. 3 | 35a Mn | 35b Vol. II, page 45, Fig. 1, Ar | 36a Pl.

LXXIV, No. 2, 746, Mn | 36b Fo | 37a Pl. LXXVIII, Nos. 2 and 3 | 37b Pl. LXXIX, No. 1, 745 | 38a 745 Note | 39b canals | 39a Pl. LXXVIII, No. 1, 761 | 39b Pl. XCII, No. 1, 753 | 34a nomi d’arme da offendere, Ge | 40a a bressia alla minera del fero sono madiaci d’u pezo cioè senza corame ecc.; arms | 41a—46b arms | 47a Ar | 47b Mn | 48a and 48b Fo | 49a and 49b Mn | 50a Fo | 50b 1381, Mn | 51a and 51b Mn | 52a Pl. XCVII | 52b Fo, Mn | 53a camino | 54a d’alzare acqua, bombardata | 54b A Mn | 55a Vol. II, p. 44 Fig. 2 and p. 56 Fig. 1 | 55b modo di misurare alteze | 56a same subject, modo chome si debbe riparare a una furia di soldati | 56a Pl. XCII, No. 2 and No. 3, and Vol. II, p. 45 Fig. 2 | 57a Pl. XCV, No. 2 | 57b Vol. II, p. 51, Diagram, rivellino | 58a 1506, 1023, Ar, lupanario | 58b Fo | 59a Mn | 59b Fo | 60a Pl. LXXXVII, No. 3, 750 | 60b on passing a river | 61a 1080, A | 61b 1094, 1099 | 62a Pl. LXXXV, No. 13, on passing a river | 62b 1100 | 63a F. P. | 63b 1081 | 64a A Mn | 64b Stivali da acqua, Mn | 65a—67a Mn | 67b and 68a A | 68b schale docipie 1p for lo chellastiano l’altra per i provisionati | 69a—70a Fo | 70b Mn, Pl. CIII, No. 1 | 71a Pl. CII, No. 2 | 71b—73b | 74a 75b flying machine | 75a Vol. II, p. 56 Fig. 1, 75b—77b Mn | 78a Fo | 78b—81a | 81b 1117 | 82a Mn | 82b 1088 | 83a Mn | 84—87 wanting 88a Mn | 88b flying machine | 89a Mn | 89b Vol. II, p. 54, Fig. 1, Ar | 36a Pl.

4. Ash. II.

16 sheets, small numbers; sheets 1 and 16, and 2 and 15 forming originally one sheet, are tinted in blue on the inside and have drawings of arms, drawn with the silverpoint; the outside is left blank. On sheets 3a and 14a are three drawings in water colour, apparently not by Leonardo. They represent instruments. 4a 1127
4b 1155, Fo | 5a Fo | 5b Fo | 1120, Mn | 6a Ni 6b Pl. LXXXV, No. 1—11, Vol. II, p. 45

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Fig. 3, p. 74 first lines | 7a 756, Pl. XCI, No. 1 | 7b Fo | 8a Vol. II, p. 56
Fig. 2, p. 57 Fig. 3 and 4 | 8b Pl. XCI, No. 2, 754 | 9a Mn | 9b arms | 10a arms and ships | 10b 1505, arms and a nude youth, resting his left hand on a sword | 11b ships | 11b 1492, arms 1500 | 12a cars, 1089 | 12b 1498
13b 1204 | 14 columns of names | 13b 1382

Sketches of insects, a caricature &c.
Bound in parchment, marked A outside and inside the cover. The numbers of the sheets 1-64 are in Leonard's handwriting.

1 a 1510, 686, Drawing of knots, 1183
1 b knots, 1176, Ge 267, 580, 589, 516
2 b 551, 484, 515, 284 28 283, 132, 547, 203 2 b 574 and Pl. XXXI, No. 4, the head on the right, 245, 133 4 568, 565, 528, 540, 561, 439 4 b 536, 504, 607 5 a 602 5 595, 182, 166 6 a 584, 592, 164
6 b 573 and Pl. XXXI, No. 4 the head on the left, 368, 112, 585, 522 7 a 367, 364, 555 7 b 520, 491 8 a 571, 492, 494 8 b 487, 489, 587 9 a 572, 507, 495 9 b 496, 532, 502, 285 10 a 295, 500, 486 10 b 458, 655 11 a 656, 592 11 b 531, 500 12 a Pl. XLI, No. 1, 142, 344, 34, 92 12 b 99, 538, 102, 558 13 a 508, 23, 294, 591 13 b 119, 125, 199 14 b 552, 559, 122, 550 14 b 606, 594 15 a 552, 567, 176, 567 II. 13-22, 361 15 b 566, 659, 562, 513, 600 16 a 654

APPENDIX.

5. Ash. I.

6. A.

7. S. K. M. III.

Marked 32 on the first sheet by an unknown hand: 1 a 1459 1 b 1384 2 a 3 Ph 3 b 1496, del moto delle corde 4 a 84 pulliches 8 b Ge 9 a Ar 9 b 10 a Vol. II, p. 89

The last two diagrams 10 b 1189 1 a Mn 11 b + 12 a P 12 b + 13 and 14 are wanting 15 a + 15 b, 16 a 16 b 1491 17 a 1179 17 b Ph 18 a 19 a P 19 b 651 20 a P 20 b 23 a Ge 23 b 342 24 2 Mn 24 b + 25 a 498 25 b 1118 26 a knots 26 b Ge 27 a Mn 27 b + 28 a and 28 b Ge 29 a 1341 29 b Mn 30 a 1385 30 b Ar 31 b cielo della gravita 32 a aquaforte

41 b 535, 653 17 a 298, 145, 604 17 b 582, 14, 291, 391, 389 18 a 483, 661, 519, 578, 392, 583 18 b 1546, O 19 a 887, 849, 565, 576, 588, 557 19 b 1542, 709, 509 20 a 139, 140 20 b 138 21 a 48, 236, 205, 533 21 b Pl. III, No. 2, 149 22 a Pl. III, No. 1, 275, 148 22 b Pl. II, No. 1, 61, 40, 546 23 a Pl. VI, No. 4, 224 23 b 173 24 a a diagram without text 24 b Pl. IV, No. 3, 173 25 a Pl. IV, No. 2, 169 25 b 203, 239, 485, 541, 537, 534 25 b 171, 352 25 b a diagram without text 26 a Pl. XXXVIII, No. 2, 579 26 b P 27 a Ma 27 b Ge 27 b 67 27 a Ge 28 a + 28 b 517, 147, 202 29 a Pl. XXXI, No. 2 572 29 b 560, Pl. XXVIII, No. 6, 390, Ph 30 a 31 a P 31 b 506 32 a M 32 b O, 68.

41 b 545 42 a O, 527 42 b 525, P A 43 a acoustics, 706, A 43 b 48 b M P 48 b 792, P 49 a P 49 b 786 50 a 790, 779 50 b Ma, 780 51 a 781, Mn 51 b 52 b P M 53 a 795, 793, 776 53 a M P 54 is wanting 55 a M P O 55 b 929, 967, 941 56 a A 968, 944 56 b 945 Ph 57 a Ph, 1083 57 b M 55 a A 56 b A, 934, 940, 943 59 a 61 a A, 61 b M O 61 b P 62 a Pl. 62 b 311, two heads of horses, P 63 a 372, Pl. VII, No. 1 a 63 a A 64 a 898, 889 A 64 a O 214, 249, 873. The following blank sheet has the marks S on the front, and S b and the number 4, on the reverse. They are by an unknown hand. — A splendid edition of the whole volume was published in 1881 by A. Quantin, Paris. It contains photographs of all the texts. M. Charles Revain-Mollon, the editor, has added to the facsimile the transcript of the Italian, a French translation, notes and an elaborate index.

7. S. K. M. III.
The three small Note books H 1 H 2 H 3 are bound in one Volume. From the dirty state of the sheets at the beginning and at the end of each division it becomes apparent that Leonardo had used them separately. The cover is in parchment and is twice marked H on the outside and once inside, and Q on the back of the first sheet. Inside the back cover is the mark Q 3, and on the last sheet but one N N 48, meaning probably the number of sheets originally belonging to H 1. MSS H 2 and H 3 are numbered throughout. The sheets of H 3 are also numbered in a—70, below the text and in a reversed position. The numbers here given are above the text, as 47 a A 47 b.

869 b 48 a Ma 48 b dimmi semai, sketch of a man’s head in profile 49 a, 49 b Mn 50 a 670 b 50 b, 51 a notes 51 b 689 b 52 a 999 52 b 736 53 a 1264, 690 53 b—55 a Mn 55 b Sketch reproduced with No.1112 56 a, 56 b P 57 b A, 1462 b 58 b M. sketch of a horse 58 a sketch of horses and oxen drawing a car 58 b 1460 59 a—60 b Mn 61 a 831 Mn 61 b 69 b Mn 70 a 691 b 70 b 1191 71 a 1192 71 b—73 a Mn 73 b Pl. LXXXV, No. 16, 768 b 74 a il cielo dell’ ocho fia for del’ abaco 74 b—76 a Mn 76 b 1514 77 a 1513 77 b, 78 a + 78 b terminations of Latin verbs 79 a—80 a slight sketches 80 b, 81 a Mn 81 b 1515 82 a Sketch of a car drawn by horses 82 b—84 a Mn 84 b, 85 a—86 c drawings of gear 85 a 27 85 b, 86 b, 86 c, 86 d, 88 a, conjunction of the Latin verb 88 b 644 89 a sum, eram &c. 1356 b 89 b 1543 90 a—92 b amo, amas, amat &c. 93 a amor, amari &c. 1139 b 93 b 94 a, 94 b, 94 c, legione còtene 6063 persone 94 b 1516.


See introductory note to No. 8. — The first sixteen sheets are numbered twice, 1—16 being also written below the texts, but in reversed order. 1 a 232 b 1 b 692 a 2 a b A Mn 3 a a sketch 3 b 1265 4 a—11 a A 11 b knots, A 12 a knots, Mn 12 b 1197, a sketch of ornaments 13 a 693 b 13 b a 14 a A 14 b 1390, 1220 M 15 a M 15 b 694, 1316 16 a A 16 b 1517 b 17 a A, 1010 Note 17 b Pl. CX, No. 2, 1024 a 18 a 152 b 18 b Mn 19 a, 19 b A 20 a A, 464 b 20 b A 21 a A, 22 a A, 22 b Mn 23 a 228 a, 23 b Mn 23 a 24 a Mn 24 b—25 b A Mn 26 a, 26 b A P 27 a Pl. XXXIII, No. 3, 377 27 b M Mn 28 a A 28 b 206, 105, 163 29 a A 29 b A, 304 b 30 A 30 b A, padigl i di legni a vigne vin 31 a M 31 b molino 32 a A 32 b A P 33 a 91, 1518 b 33 b M 34 a—35 b A 36 a Mn 36 b—37 a canale 38 a 828, 31 38 b Mn 39 a, 39 b A 40 a a sketch of a barrel on a car, A 32 40 a 671 41 a M A 41 b 845 42 a ricordi quanto comò lacciare il dallegare prima della spier i e poi la ragione 42 b 134 43 b 1014 43 b 33 44 a P 44 b P A 45 a A 46 a 1391 46 b 620, yhs maria 1493, and by an unknown hand the mark Y 46.


See introductory note of No. 8. — The text is upside-down on the first 28 sheets. 1 a amo, amas amat &c., 1026 b 1 b + 2 a abamab &c., A 2 b, 3 a + 3 b 4 a forms of amo 4 b SK 5 a 1220 b 12 b 1221 6 a 1222 6 b 1223 7 a 1224 7 b 1225 8 a 1226 8 b 1227 9 a 1228 9 b 1229 10 a 1230 10 b 1231 11 a 1232 11 b 1233 12 a 1234 12 b 1235 13 a 1236 13 b 1237 14 a 1238 14 b 1239 15 a 1240 15 b, 16 a + 16 b 1194 17 a 1241 17 b 1242 18 a 1243 18 b 1244, 643 16 a 1245 19 b 1246 20 a 1247 20 b 1248 21 a 1249 21 b 1250 22 a 1251 22 b 1252 23 a

BIBLIOGRAPHY.
APPENDIX.

11. S. K. M. II.

The two MSS. S. K. M. I* and S. K. M. II* are bound in one volume; the sheets are separately numbered on the top of each front sheet, but the two volumes are placed in the binding in reversed position, so that the two parts begin at the opposite ends of the volume. 1 Vol. II, p. 62 sketch | 1b 666, 697 | 2a 685 | 3a 137, Ma | 3b Ma | 4a 1519 | 4b + | 5a M | 5b, 6a + | 6b M | 7a 1392, M | 7b M | 1393, 8a Mn | 8a + | 9a Ge | 9b Mn | 10a sketch of flower | 11b O | 11b Pl. LXXXV, No. 15, Vol. II, p. 74 below | 1a 1394, 1377, sketch of a head | 12b Ar | 13a knots | 13b Mn | 14a 372 | 14b | 15a Mn | 15b Fo | 16a M | 16b 103, P | 17a Ph | 17b, 18a Mn | 19b 998 | 20a 1395, 376, Pl. XXIII, No. 2 | 20b, 21a P | 21b sketch | 22a 1396 | 22b — 23b sketches | 24a 1196 | 24b — 25b sketches | 26a + | 26b Ma | 27a 1397 | 27b + | 28 is wanting | 29a + | 29b right sketch of a woman seated, holding a child in her lap | 30a + | 30b sketch | 31a P | 31b + | 32, 33, 34 are wanting | 35a V | 35b 1381 | 36a M | 36b Ma | 37b acoustics | 37b M | 38 — 42 are wanting | 43a + | 43b 1291 | 44a 1290 | 44b knots | 45, 46, 47 are wanting | 48a — 49a knots | 49b + | 50a sketch of a head | 50b, 51a + | 51b, 52a Ge | 52b 1398 | 53a 1399 | 53b, 54a Ge | 54b Mn | 55 is wanting | 56b + | 56b sketch | 57a — 59a Ma | 59b sketch of a head | 60a + | 60b, 61a Ma | 62a Ge | 62a + | 62b Ge | 63a 97, 1400 | 63b — 64b Ma | 65a — 66b Ma | 67a Ar | 68a Mn | 68b 1401 | 69a 1313, 1402 | 69b + | 70, 71, 72 are wanting | 73a + | 73b M | 74a P | 74, 75a + | 75b 1493 Mn | 76a Ge | 76b 154 | 77a — 78a Ge | 78b 667, 1404 | 79a Ma | 80a Mn | 80b knots. — On the same sheet are the marks K K 62 and 25 by an unknown hand.

12. S. K. M. II.

See preliminary Note of No. 11. — The numbers of the sheets are in Leonardo's handwriting and begin from the end, going backwards. The first sketch or cover sheet has no number. 1520, M, 612 | 1a 36 | 1b Ge | 2a — 26a P | 26b — 28a de confraggrieta | 28b — 42b P | 43a 1137 | 43b 66a P | 66b 787 | 67a P, 1206 | 67b 784 | 68a — 69a permutum motile | 71b Ar | 72a 793 | 72b — 75b P | 76a — 86a Mn | 86b Sketch Vol. I, p. 201 and Vol. II, p. 99 below | 87a — 88b Mn | 89a 793 Note | 89b Mn 90a — 93b peso — 94a centro del mondo, A | 94a 1952 | 95a 733, 627, 1523 | 95b mechanicas potissimum in fine incipieundis, this note is not in Leonardo's handwriting, but by a later hand.

13. I.

This and M S I* are bound in one volume. The mark I is outside and Q and Q 3 inside the cover. 1a magister M* jachomo (this note is not in Leonardo's handwriting). 1b 1524,704 1a 4 Latin and Italian vocabulary | 4a also has the note simon de calima tintore | 8a Vol. II, p. 68 Fig. 1 and 2 | 8b — 10b Mn | 11a 1405 | 11b M | 12a — 14a A | 14b Ma | 15a 1298 | 15b 1299 | 16a 1300 | 16b 1301 | 17a 1302 | 17b 1303 | 18a 1304 | 18b 1305 | 19a 1306 | 19b — 24a A | 24b 932 | 25a Ge | 25b — 31a A | 31b M | 32a second Latin declination | 32b + 36a A | 36b — 38a M | 38b — 43a M | 44a — 47a M | 47b sketches of knots and shells | 48a sketch of a dog's head | 48b contrapeso | 49a ornamental design of two cornucopias | 49b sketch | 50a — 56b M | 57a, 58a A, 59b + | 59a 679 | 59b + | 60a A | 66b — 61a Mn | 62a Pl. LXXXV, No. 13, 62b P | 63a acoustics | 63b + | 64a — 66b M | 66b — 70a A | 70b — 71a 1406 | 71b, 72a M | 72b 1407 | 73a — 74a A | 74b M | 75a A | 75b — 78a Latin vocabulary | 78b + | 79a, 79b A | 80a — 81b voces d'echo — 82a 1160 | 82b M 1477 | 83a — 86a M P | 86b uterque, utraque &c. | 87a 1408 | 87b aliis, alia &c. | 88a qui que quod | 88b Mn | 89a — 90a amo, amas &c. | 90b 572 | 91a 673, 1326 | 91b numbers. — The two following sheets bear only the marks Q 3 and Q.
14. I.

See No. 13 preliminary note. — 1—12 a
Ge | 1 b 394 | 13 a, 13 b Ge | 14 a, 14 b M
15 a 1140 Note | 15 b—17 a Ge | 17 b 241
18 a 1151 242 | 18 b Ar | 19 a sketch | 19 b
37 a | 20 a 38 | 20 b—23 a Mn | 23 b da forare
cristalli | 24 a—25 a sketches of shields | 25 b
—27 b Mn | 28 a 1409 | 28 b—32 a Mn | 32 b
1017 | 33 a O | 33 b Ge | 34 a 1018 | 34 b—

37 a Mn | 37 b Pl. XXVIII, No. 5, 188, 452 | 38 a O | 38 b, 39 a sum, es, est &c. | 39 b
1318 | 40 a quis vel qui que quod vel quid &c. | 40 b—42 b Mn | 43 a O | 43 b—46 a
Mn | 46 b sketch | 47 a 1092 Note | 47 b
sketch | 48 a 463 | 48 b Mn. — The Marks I. 48 and · 20 are by an unknown hand.

15. W. P.

Most of these researches are written on loose sheets of unequal size. The dimensions of each sheet are here given in brackets: 1 a (21/2 × 30 cm) 324 | 1 b 322 a (21/2 × 26/2) 310, 337, Pl. VII, Nos. 1 and 2 a | 2 b sketch of a horse’s legs, measurements and notes.
3 I a (13/1 × 14/1 cm) Pl. XI, 318 | 3 II a
(17 × 15 cm) Pl. VII, No. 4, 327, 321
3 II b | 3 II b + | 4 a (21 × 12/2 cm) Pl. XIX, No. 1, 347 | 4 I b 325 | 5 a (44 × 32 cm) 341
I I | 4—, 317 II | 1—13, 625, 341 II 5—8, 317
II | 14—17, Pl. XXXV, No. 1, 348 II 16—55.
II | 15—15, Pl. XVII, No. 2, 336, 348 II
10 | 797, 348, 56—68 | 5 b Vol. II, p. 44
Fig. I and p. 47 Fig. 3 | 61 a (21/2 × 16
Cm) Pl. VIII, No. 2, 332 | 6 I b 333 | 6 II a
(22 × 14/1 cm) Pl. XIV, No. 2, 334 | 6 II b
Pl. XVI, No. 1, 335 | 7 a (40 × 28 cm) 1410
314, 338, 328, Pl. XIII, 326, 330, Pl. XIV
No. 1 | 7 b 349, Pl. XX, 339, Pl. XVI, No. 2,
342 | 8 a (28 × 20/2 cm) Pl. XV, 333, 345
323 | 8 b | 9 a (27 × 20/2 cm) | 9 b+ | 10 a,
10 b (22 × 16 cm) Mn | 11 a (29/2 × 20 cm) Pl.
LXIII, 684 | 11 b 685 | 12 a Pl. X, 316.
— Sheets 9—12 which treat on different subjects are only added here, because in the Windsor Collection they form a set with Sheets 1—8. The thin cards, on which these sheets are mounted have a broad ornamental border in water colours.

16. W. H.

With regard to these studies see Vol. II, p. 4.
The sheets are numbered 46—68, differing in size, and many not mounted are coloured in various tints: Compare also Lomasio, Trattato dell’arte della pittura I chap. 20, IV, 23 and Idea del tempio della pittura chap. 16. — Vasari also mentions these studies. 64. 716 | IV. 717.

17. W. An. II.

The sheets forming this treatise are all of the same size and originally formed a small book. At present the sheets are separated. The old numbers and marks which are to be found on most of the sheets are here given in brackets after the new numbers: 36 (21) 797 | 36 b muscles of the leg | 37 a 814. Pl. CVIII, No. 4 | 37 b the veins on the head &c. | 38 a (0) 38 b veins of the leg | 39 b veins on the leg and on the spine | 39 b 801 | 40 a nervi, matrice | 40 b +
41 a (7) Delli muschioni che movi la labri della bocha | 41 b nervi, matrice | 42 a (10) nervi
42 b veins of the leg | 43 a (8) Delli muschioni che movi la linghia | 43 b muscles of the foot
843 | 44 a (3) veins of the arm | 44 b veins | 74 a
(12) veins of the womb | 74 b muscles on the arm of the ape (scimmia) and of man (omo) | 75 a (2), 75 b muscles of the leg | 76 a dello vito di mesolevri | 76 b Pl. CVIII, No. I, 809 | 77 a (21) muscles of the leg | 77 b, 78 a
(11) veins of the leg | 78 b veins of the hand
84 a (10) 84 b the chest | 85 a the lungs | 85 b
alber di tutti i nervi | 86 a (13) arteries | 86 b
veins of the arm | 87 a (14) the lungs, 87 b the heart | 125 a—127 a (4) blood-vessels | 127 b the spine | 128 a (5) the mouth and the lips | 128 b
matrice di uacchla | 156 a, 156 b genitals | 173 a
(16. 17—two sheets, not separated) intestines
827 | 173 b 816 | 178 a, 178 b intestines | 183 a
veins on the neck | 183 b veins | 201 a (M)
bones | 201 b 2125 | 202 a (-B) 1412, 838 | 202 b
839 genitals, | 203 a 1178. 375, Pl. XXXII,
No. 1 | 203 b 357, Pl. XXII, No. 1 | 204 a (3)
stomacho | 204 b vene, vegato | 205 a della
forza de’ macciolli | 205 b misenterio | 206 a
(l)polimone | 206 b vessichia, 817 | 242 (N)
1214 | 242 b 1213.

QQQ
18. L.

This volume is in the original covers; it is a thin card of light blue colour. It is marked L. on the outside and Qc inside: 0 1 1414, 1432, 1102 1 1003, 1415 1 1416 2 a 1417, 648, knights kneeling 2 b Ma 3 sketch of a head 3 4 a knights kneeling 4 b A 5 a a note 5 b knots 6 a 1034 6 b 1035 7 a 7 b Fo 8a colografia 8 b Ma 9a 10a plans 10 b 1036 11 a 11 b 12 a Mn 12 b 13 a 13 b A O 14 A O 14 b notes 15 1019 15 b 1037, Pl. CXIV, No. 1 16 a P Ar 16 b Fo 17 a A 17 b P 18 a, 18 b Mn 19 b Fo 19 b Pl. CX, No. 3, left side 1038 20 a Pl. CX No. 3, right side 765 20 b Ma 21 a 1054 21 b 23 a Ma 23 b Mn 24 a Fo 24 b 26 a Mn 26 b P 27 a Mn 27 b P, 378 28 a Mn 28 b knots 29 b Fo 29 b Mn 30 a A 30 b Mn 1418 31 a 33 a A 33 b Mn 1039 34 a 36 a Mn 36 b 1040, Pl. CX, No. 4 37 a Ar 37 b Ma 38 a 39 a Ar 39 b Mn 40 a 1041 40 b, 41 a Mn 41 b 35 42 a 44 b M 45 b Ma 45 b Ar 46 a Fo 46 b 1042 47 a 1043 47 b A 48 a, 48 b Ar 49 a 52 b Mn 53 a M 1503 53 b 1504 54 a 60 b V 61 a Ar 61 b 62 b V 63 a 65 b Fo 66 a 1109, Pl. CX, No. 1 66 b 1044 67 a 1045 68 a, 68 b Ar 69 a P A 69 b 71 a Mn 71 b a sketch 72 a 1046 72 b 1325 73 a Ge 73 b, 74 a Ar 74 b, 75 a Fo 75 b 307 M 76 a 981 77 a 1047 77 b 226 78 a 1048 A 78 b 1049 79 a 488, citadella 79 b Ge 80 a voice 80 b drawing of a draped figure, very like the one on Pl. XXVIII, no 7 81 a Ge 81 b sketch of trees 82 a 1047 Note 82 a and 83 a Vol. II, p. 244, sketch 83 b, 84 a outline sketch of mountains 84 a P 85 a Mn 85 b P 86 a Ge 86 b Mn 87 a 449 87 b 393 88 a sketch 88 b 1050 89 a sketches 89 b Mn 90 b 1199 91 a 1307 92 a 623, M 92 b Mn 93 a Ma 93 b voco bolo lombardo &c 94 a 1523 94 b 1474, 1052 O 1053, 1198, 1419, and, by an unknown hand; Le carte sono 94 cioè noua quart.

19. W. M.

See Vol. II, p. 224 and No. 1051 Note. As to the Maps in MS. W. L. see No. 36. The following maps are on separate sheets 1. Pl. CXIII, The original is somewhat larger (19 13/1 in); the whole is executed in water colours. The rivers are in blue 2. Pl. CXIV, (15 1/1 XI, in) 3. Part of the Arno, in water colours (39 22) Pl. CXII. 4. Map of a part of Tuscany, in water colours (40 27), including Livorno, Pisa, Luccha, Volterra. 5. Central Italy (45 23) within the limits of Corneto, Rimini, Pesaro, washed in Indian ink. 6. Study for the Map Pl. CXIII, washed in Indian ink; the names are written in Leonardo's ordinary writing (28 21).

20. S. K. M. I.

This small MS. is bound in one Volume with MS. S. K. M. I.². On the first sheet is the note, written in German: Leonardo da Vinci ber große Maler aus der italienischen Schule 1482 zu Vinci gehört, trat 1502 als Kriegsbaumeister in die Dienste Herzogs Valentin Borgia, und starb 1519. — This volume and the two others now in the Forster Library of the South Kensington Museum, London, were given to Mr Forster by Lord Lyttton, who is said to have bought them at Vienna for a low sum. The title of the treatise on sheet 1 is given in 1374, Note; no other subject is discussed on the 38 sheets which form this MS. 1 b 1374 jo voglio abbassare la grosera d'una tavola a data grosseza sanza mvtatione di sua largheza, domando quanto cresce in sua lucezza &c. 4 a, 6 a, 8 b, 11 a, 12 a, 16 b are blank. — On the last sheet 39 a is the mark 46.

21. S. K. M. II.

See introductory note to No. 20. — At the end of this Note book is the mark B B 14. This MS. has the pages numbered 1—28. — 1—4 Mn 5 635, 649 6 Mn 7 385 8 650, 636 9 Mn 10 Mn A 11—15 Mn A 16 de poderibus, modo di misurare vn alteza 17—28 Mn A.
BIBLIOGRAPHY.

22. F.

The cover of thin grey card is original. It has the mark F inside and outside. o' 1421.

1292 | 1 a 1375 | 848 | 1 b Ge | 2 a A | 2 b 2 | 3 A | 3 b, 4 A | 4 b libro 10 delle varie profonda e globosa... dell'acque, 880 | 5 a libro 9, dell'acqua che passa per un bottino, 879 | 5 b gii, 1208 | 6 a 881 | 6 b fuso e refuso | 7 a-8 A | 8 b 882 | 9 g, 9 b A | 10 A | 11 b, 10 g, 11 b | 12 a-12 b | A | 18 b 302 | 18 b-21 b | A | 2 a 244, Pl. XLI, 3, 4 | 22 b 861 | 23 a 5, 273 | 23 b-24 b | A | 25 a ochiale di cristallo &c., 25 b 867 | 26 a P | 26 b A | 27 | 939 | 27 b 1422 | 28 a-30 a O | 30 b A | 31 a-34 a O | 34 b Libro 32 del moto che fa il fuoco | 35 a Libro 42 delle pioggie, 474 | 35 b-37 a O | 37 b 1338 | 38 a A | 38 b-40 a O | 40 b A | 41 b 838, V | 42 a A, anatomy | 42 b-46 b A | 47 b 1330 | 47 b-48 b A | 49 b P | 4 b O, 50 a 1106 | 50 b, 51 a Ge | 51 b, 52 a M | 52 b, 53 a A | 54 a-55 A | 55 b Ge, cells | 56 a 866, 567 | 56 b aquisitis | 57 a 912 | 57 b-59 b | Ge | 60 a 913, 870 | 61 a M, 1087 | 61 b-64 b O | 65 b-67 a A | 65 b dell’arco celeste | 68 a, 1107 | 68 b A | 69 a P | 69 b-72 a A | 73 a 942 | 73 b Ph | 74 a, 74 b M | 75 b 228 | 75 a M | 76 a O | 76 b 1010 | 77 a A | 77 b 877 | 78 a, 78 b | 79 a dell’animali che an l’ossa di fori &c. | 79 b delle ossa de pesci che si trovà ne’ pesci petrificati | 80 a nichè e loro necessaria figura | 80 b de nichè ne’moti | 81 a-82 a A | 82 b prova che la spera dell’acqua è perfettamente tonda | 83 a 377, G | 83 b | 84 a 903 | 84 b 904 | 85 a 905 | 85 b-86 b O | 87 a aria | 87 b 822 | 88 b 923 | 88 b-90 a | 90 b 924 | 91 a-92 b A | 93 a 893 | 93 a, 94 a A | 94 b 874, O | 95 a A, 95 b-806 | 96 a chemical materials | 813 | 96 b 1184, 626, chemical materials | O’ carte 96 à questo Libro sàza la coperta, 1483, 1471 li. 1-3, 1528, 884, 698, 1471 li. 4, 5.

23. Br. M.

Bound Volume in the MSS. Department of the British Museum, numbered Ph. CLXV. D and 263 Arundel Collection. This collection takes its name from Thomas Howard, twenty-third Earl of Arundel, whose MSS. were originally divided between the Royal Society and the College of Arms, but in 1831 those which had been in the possession of the Royal Society were acquired for the British Museum. — On the second sheet is the note: "Soc. Reg. Lond (ex dono Henr. Howard) Norfolcensis." — This volume has been partly made up from loose sheet of unequal size and quality of paper. Only the first sheets can be assigned to the date indicated at the end of Vol.: 1 a 4, M | 1 b-18 b | Ph | 19 b 906 | 19 b-23 b Ge | 24 a, 24 b man tice | 25 a A, 875 | 25 b, 26 a A, 27 a 152, 26 b A, 26 b, 26 b, 28 a 982 | 31 b P | 3 b 86 | 33 a-34 A | 35 a 925 | 35 b 926 | 36 a A | 37 b-42 A, M | 42 b 1314, 1297, 1541 | 43 a V M | 43 b M | 44 a 350 | 44 b 54 | 45 a 928 | 45 b-47 b Ma Ph | 48 a 145 | 49 b-50 b Ge, Mn | 50 a O | 57 a O | 57 b-61 a O, Ge | 62 a 109 | 62 b Ge | 63 a-63 b | 64 a | 64 a O | 64 a | 65 a-77 b Ph Ma | 71 b 1484 | 72 a centro della gravita | 78 a + | 78 b 898 | 79 a P | 79 b | 1507 | 80 a-93 a Ph Ma | 93 b 207 | 94 a | 94 b 896 | 95 a A | 95 b O | 96 a V | 96 b-102 b Ph Ma | 103 b 997 | 103 b-112 a Ph O | 112 a, 113 a + | 113 b 458 | 114 a | 114 b 459, 435 | 115 a + | 115 b 227, 116 a-119 a P | 119 b + | 120 a l’universo non à cosa minor ne piva bassa che’l suo ciestro | P | 120 b A | 121 a bastioni | 121 b Ma | 122 a 927 | 122 b + | 123 a-124 b P | 125 a + | 125 b sailis | 126 a P, architectural drawing Vol. II. p. 68 Fig. 3 | 126 b V, A | 127 a-128 b P M | 129 a + | 129 b 1333, V | 130 a A, aria | 131 b 1216 | 131 b 45 a | 132 a | 132 b 1452 | 133 a, 133 b Ma | 134 a, 134 b V | 135 a, 135 b A, M | 136 a 1130 | 136 b-137 Mn | 138 a 789, 772 and Pl. CVI | 138 a + | 139 a 645 | 139 b fiamme | 140 a | 140 b M | 141 a + | 141 b 778 and Pl. CV | 4-7 | 142 a Ge | 142 b + | 143 a-145 b | 146 a | 146 b V, P | 146 b + | 147 a A | 147 b | 148 a 1458 | 148 b 1459 | 149 a 1015 | 149 b 1550 | 150 a + | 150 b 1435 | 151 a | 152 a-154 b M Ma | 155 a 1339 | 155 b | 1218 | 156 a 1217 | 156 b 994, 1129, 1162 | 157 a Pl. CVI 770 | 157 b Pl. CV 775, 771 | 158 a 777, 773 | 158 b 785 | 159 a Ma | 159 b | 157 a 160 a-164 a Ma Ph | 160 b V | 160 b-168 a A | 169 a 905, 305 | 169 b + | 170 a chemical materials | 170 a 181, 165 l. 1-5, 172, 127, 125 Mn 5-6, 9, 96, 17 a 171 a 170, 136, 143, 125, 171 b 1010, 76, O | 172 a + | 172 b 477 | 475, 474, 173 687 | 173 a 916 | 174 a 672 | 174 b P, M | 174 b 871 | 175 a | 860, 1128 and Pl. CXXI | 175 b A | 176 a | 977, 857 | 176 b-187 b Ph Ma | 188 a 231 | 188 b-190 a Ph Ma | 190 b 916 | 191 a 928, 1156, 1454 | 191 b Mn | 192 a + | 192 b 1455, 763 | 193 a + | 193 b-202 a Ph Ma | 202 b | 1420 | 203 a-211 a Ph Ma | 211 b 266 | 212 a
APPENDIX.

24. W. An. III.

Among the numerous anatomical drawings in the Windsor Collection there is one set which appears to have formed originally a Volume by itself. Here the paper is of a thin greyish blue colour and of a rather rough surface. Leonardo seems to have made use of it exclusively for this particular treatise. All the sheets are of the same size. Each of them is marked by a Roman capital letter, as shown here in brackets. Sheet 217 bears the date 1513. — 115 (B) on veins 115 (E) spine and shoulders 117 (E) blood-vessels 118 (B) blood-vessels 118 (O) blood-vessels.

25. E.

The cover of this grey card is the original binding. The outside bears the mark E. B is written inside the cover. The compiler of the treatise on painting in the Vatican library (Urbino 1270) which was published by Manzi in 1817, and by Ludwig in 1888 gives a few passages from this MS, of which he correctly notes the corresponding number of pages, to which the mark B is added. o' 915, 479 1 a 1465, 1064, 1020 P 1 b Ge, P 2 a del cognoscere la parte settenzionale della calamita, M 2 b 211 3 a de condensazione, 360, 238 3 b 117, 467 4 a 56, Ge 4 b audios, 935 5 a A 5 b, 6 a, P 6 b 366, 470, 403 7 a 5 b, 8 a Ge 8 b 1155, Ma 9 — 11 a Ge 11 b Mn, 12 a 330 12 b 14 d strumenti aquatici 14 b per fare l'arco 15 a 230, 156, 380 15 b goma 253 a 1366 253 b sketch of a child's head, drawn with the silverpoint 254 a — 255 a + 255 d 256 b Mn 263 a + 263 b 1079 264 a 268 Ph . Mn 269 a 1074 and Pl. CXV 269 b 1076 270 a sketches 270 b 744, 747, 1075, 1077 271 a 1551 271 b 1463, 1527 A 272 a 1372 272 b 1535 273 a sketches 273 b 1004 274 a 1552, 1005 274 b 275 a + 275 b canals 276 — 277 a del vello 277 b 473 278 a sketch of a river 278 b 1144 279 a Ge 279 b 1476, 914 280 a — 282 a. Ge Ph 282 b, 283 a + 283 b centro della gravità, and sketches.

26. G.

The cover of this grey card is the original binding. Inside and outside the cover is the mark G. The numbers of the sheets are in Leonardo's handwriting. O' 1377, le carte sono di numero giusto 96 cioè Nuantasei eccetto che manca il 7 et il 18 col suo compagno 31. This note is by an unknown hand 1 1933 1 li pedali della alberi anno superfcie. . . 1 b 1057 2 a Mn 2 b 426 3 a 425 3 b 118, 872, 427 4 b 428 4 b 429 II. 11 — 17, 406, 429 II. 12 — 14 5 a 405, Mn 5 b
The cover of thin grey card is the original binding, marked M outside the cover. o' 1425
1 = 3 b. Ge = 4. 699, Pl. LX, No. 2. = 4
700. Pl. LX, No. 3. = 5 a. 701, Pl. LX,
No. 4. = 5 b. Ge on the earth. = 6 b.
Ge = 8 a. 1426 = 8 b. Ma = 36 b. = 53 a.
P = 53 b. 1427 = 54 a. 54 b. bombardia, passa-
volanti = 55 a. 373 = 55 b. = 56 a. ponte
56 b. Mn = 57 = 58 a. M = 58 b. = 1285, 1152

M.

Marked S inside the cover and on the first sheet. At the beginning of the Volume is the following note: 1783 • 5. Gennaro • Questo Co-
dicetto di Leonardo da Vinci era del Signor Don Gaetano Caccia Cavaliere Nourease, ma
domiciliato in Milano, morto l'anno 1752 alli
9 di Gennaro sotto la Parocchia di S. Damia-
nino La Scala. Jo Carlo Tulliozzi l'accusato
dal detto Cavaliere intorno l'anno 1750 una-
temente a un quinario d'oro di Giulio Maporiano
a qualche altra cosa che non più mi ricordo
andalo in cambio un orologio d'argento di
ripetizion che io due anni avanti aveva com-
perato usato per sedici ghiacci mache in verità
era ottimissimo, che però questo codiceto mi
viene a costare sei in sette ghiacci. In the MS,
the pages are numbered, not the sheets. 2 1493,
caricature, 1332, 1180, 3 1469 Note, ships
4 1486 = 5 Mn = 6 P Mn = 7 853 At Mn = 8, 9
list of words = 10 + 1 11 1202 = 12 891 = 13
Fo = 14 840 = 15 Pl. XCVIII, No. 1, 758 = 16
Pl. C, No. 3 = 17 Vol. II, p. 61 Fig. x and
2 = 18, 19 + 20 lists of words, 144 = 21 Pl.
C, No. 2 = 22 1429, 177 = 23 = 26 lists of

Italian and Latin words | 27 Mn = 28 863,
168 * | 29 201, 146 = 30 sketch of a male
figure | 31 list of words | 32 1173 | 33 = 34
Mn | 35 = 36 lists of Italian words | 39 1193,
Italian words | 40 Italian words: 41 Pl. C,
No. 4, Vol. II, p. 61 = 42 Pl. LXXVI, No. 1
43 sketch of a building resembling the one given
on Pl. LXXVIII, No. 1 = 44 geometrical
sketch | 45 1147 | 46 Ph = 48 1128 | 49 854,
640, acoustics | 50 list of Italian words | 51
list of Italian words, 1148 | 52 737 | 53 bomb-
arda, 738 = 54 739 | 55 740 | 56 bomb-
arda, 57 1487, 1181, list of Italian words
58 nulla può essere • scripto per nullo ricev-
chere • eccuale cosa dite a me stesso pre-
meta, — list of Italian words | 59 sketch of a
head, fonnello, list of Italian words | 60 list of
Italian words | 61 A, list of Italian words | 62
list of Italian words | 63 Mn = 64 A, list of
Italian words | 65 1145 | 66 list of Italian
words, bombardia | 67 list of Italian words
68 1209, 43, 1174, list of Italian words | 69
acoustics | 70 1146, 1138, list of Italian words
71 M, 539 = 72 list of Italian words | 73 1321,
Martesana

Leonardo
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questo,

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Mn.

494

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Italian

words.

list

water

of

Italian

cover.

the

title

of

earlier

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of

of

of

of

of
The grey card cover is original. The sheets are twice numbered, in Leonardo's handwriting and by a more recent hand. The original numbers are here given in brackets, because they are not consecutive, subsequently they have been altered: 6b, 7a (10 altered in 9) | 7b V | 8a (12 altered in 11) | 1168, V, Ge | 8b, 9a (13 altered in 12) | V | 9b 1124 | 10a (14 altered in 13) | 705 | 10b, 11a (15 altered in 14) | 11b V | 12a (16 altered in 15) | 1123 | 12b V | 13a (17 altered in 16) | V, 1125, 38r | 13b baga, V | o” 1428, and the architectural drawing reproduced Vol. II, p. 67.

Marked D inside and outside the cover of grey card, S inside the back cover. Four blank sheets are at the beginning. This MS. treats of the eye. The following texts are a selection of the headings. 1b Perché la natura non fece equal virtu e potenza nella virtu visiva | 2b perché li razi de’ corpi luminosi si fan’ aliro maggiori quanto son più remoti dal lor nascimento | 2a se l’idolo over simulacro à terminato sito sopra dell’occhio o no . . . come la rettitudine del concorso delle specie si piega nello entrare nell’occhio | 2b come le specie di qualche corpo che per alcuno spiraculo passano all’occhio s’imprennon sotto sopra nella sua popilla e’l senso le vede diritte | 3a come le cose destre no pajono destre alla virtu visiva, se le sue specie non passan per due intersagioni | 3b come le specie si danno alla virtu visiva con due intersagioni per neciesita | 4a perché lo specchio scambia alli simulacri de’li obietti li lati destri ne’ sinistri e li sinistri ne’ destri | 4b che sia vero che ogni parte della popilla abbia uirtu visuia | 5a dell’occhio delle animali nocturni | 5b La popilla dell’occhio si muta in tante varie grandezze quante son le varietà delle chierezze o scurità delle obietti che dianiti se li rappresentano | 6a Il similacro del sole è vinco in tutta la spera dell’acqua che vede ed è veduta da esso sola ma pare diviso in tante parti quanti sono li ochi dell’animali che in diversi siti vedono la superficie dell’acqua | 6b La popilla dell’occhio à virti visuia tutta per tutto e tutta in ogni sua parte | 7b come la popilla piglia li simulacri delle cose antiposte all’occhio solamente dalla luce e non dallo obietto | 7b perché la cosa destra non pare sinistra nell’occhio | 8a 7b dimostrazione perché l’occhio vede adietro a se cose poste nell’alti laterati | 9a dell’occhio[v]mano | 9b perché li corpi luminosi mostrano li lor termini pieni di diritti razi luminosi | 10a delle specie de’li obietti che passano per stretti spiracoli in loco oscuro | 10b delle specie de’li obietti infuse per l’aria.— At the end four blank sheets, two bearing the mark S.

The three MSS K\textsuperscript{1} K\textsuperscript{2} K\textsuperscript{3} are bound in one Volume with a leather cover inscribed LEONARDI || VINCI || in golden letters. The sheets of each M.S. are separately numbered. Inside the cover are the marks K and 13. On the first sheet is the inscription: Commentari autographi || Leonardo Vinci || Pictoris Architecti || cerissimi || quos dono dedit || Bibliotheca Ambrosii || Comes Horatius Archintus || Ingenuarum Artium || studiosissimus || Anno MDCLXXIV || Then follow four blank sheets. 1a A, and the mark 44 | 1b Ma | 2a 1067 | 2b Ge | 3a Dividi il trattato dell’occili in 4 libri &c. | 3b—14a V | 14b sketch of a male figure | 15a + | 15b, 31a Ge ma in black chalk | 31b—48a in ink | 47b has the mark O O 47 | 48b + |

The introductory note No. 32. 1a P | 1b 1308 | 2a 1489 | 2b 1490 | 3a Ma | 3b 148r | 4a—8a Ge | 8b + | 9a—11a V | 11b de humi | 12a Ma | 12b 1508 | 13a Ge | 13b 14a + | 15 is wanting | 16a—17a Ma | 17b, 18a A | 18b + | 19a—27a Ma | 27b 1430 | 28a—32a Ma.
See introductory Note No. 32. 1A la setola del bucc | 3A - 9A Ge | 9A Mn | 10A - 11B
Ge | 12A | 13A - 16A A | 16B A | 17A - 19B A | 20B 1073 | 20B - 21B A | 22B de
muscoli | 22B - 23A A | 23B 115 | 26A 114
26B - 27B A | 26B 808 | 28B, 29B acqua del
navilio | 29B 150X, 824 PII. CVIII, No. 2
30A M | 30B 657 | 31A M | 31B 175, O

34. K.3

The treatise is written on loose sheets of equal size (compare Note No. 24); here the paper is
white in colour. The old marks on some of the sheets are here given in brackets. 157A (B.)
798, 822 | 157B muscles of the spine | 7A
(AA) 810 | 7B + | 80A (Ch) the spine | 80B
busts of two men | 89A (3) bones of the leg | 89B
muscles of the arm and of the neck | 90A (3)
(Ma), 90B, 91A (99) arm and shoulder | 91B
the spine | 129B (P) blood-vessels | 129B pol-
mone | 130A, 130B figuratione della mano
131A albero di uene | 131B + | 132A, 132B
the leg | 134A muscles | 134B + | 141A (17)
ufitto del polmone, Ge | 145A (O) bones of the
foot | 145B muscles of the arm | 146A (P) the
torso | 146B head and hand | 147A, 147B mus-
cles. | 148A (110) the leg | 148B the torso
149A on veins | 149B the spine | 151A nervi,
802 | 151B coitus, 841, 1482, per queste figure si
demonstrerà la cagione di molti percorsi differite
maltatte | 152A embryos, 1432, coitus, 658 | 152B
embryos | 153A | 1433, intestines | 153B embryos,
29, 818 | 154A de utilità strumentale de' membri
154B + | 155A coitus, 155B + | 159A muscles
159B + | 160A (18) torso, the heart | 160B
the face | 162A (-8) Ge | 162B + | 163A the

35. W. An. IV.

The history of this Volume is given on pp. 482,
483. Here as in the MS. C. A. the original sheets
were fixed on the sheets of the volume, but most
of them have been taken out again. The following
references are exclusively to such sheets as are still
to be found undated in this celebrated volume.
The size varies greatly. On the folio No. 124
(containing no drawing at present) is the Spanish
note: ogni falsaana esta y noseucita. The back
of some sheets is covered by the mounting. 132A
886, Ma | 136A Mn | 141A 1436 | 141B 1435
145A A 597, PL. V, 183, B 66, 270, 78, C
276, D 8r, IL. 24 - 53, 120, 8r Il. 15 - 23, IL
54 - 97 | 145B A 288, B 77, C 80, 47, 87, D
79 IL. 1 - 5, 274, 81 Il. 1 - 14, 73, 79 IL. 6 - 12

36. W. L.

The history of this Volume is given on pp. 482,
483. Here as in the MS. C. A. the original sheets
were fixed on the sheets of the volume, but most
of them have been taken out again. The following
references are exclusively to such sheets as are still
to be found undated in this celebrated volume.
The size varies greatly. On the folio No. 124
(containing no drawing at present) is the Spanish
note: ogni falsaana esta y noseucita. The back
of some sheets is covered by the mounting. 132A
886, Ma | 136A Mn | 141A 1436 | 141B 1435
145A A 597, PL. V, 183, B 66, 270, 78, C
276, D 8r, IL. 24 - 53, 120, 8r Il. 15 - 23, IL
54 - 97 | 145B A 288, B 77, C 80, 47, 87, D
79 IL. 1 - 5, 274, 81 Il. 1 - 14, 73, 79 IL. 6 - 12

146A 62, 130 | 146B Ma | 198A 682 | 198B
683 | 199A 199B A | 200A sketch of a road.
200B sketchmaps of the Val Brembana with the
names and distances of the villages from Bergamo
and Ponte San Piero up to the Val Tellina,
and of the Val Trompia between Brescia and
the lago d'Idro. 203A 1438, Ge Mn | 203B
sketch for the map on fol. 212A 212A part
of the Arno river 1437 | 215A sketch-plan of
Florence, 1004 Note, 1016 Note | 21A five
plans, showing the divisions of some fields | 21B
water colour drawing of a villa with gardens
(not by Leonardo) | 224A sketch-map of the Val
di Serio between Bergamo and Ardese, with
numbers showing the distances between the
villages | 224b small map of the same valley, map of the Oglio between Palazzolo and Ponte secco: Pontase—confini d'Italia, sketch-map of rivers between Bergamo and Brescia | 226a sketch of the valley of the Arno | 229a

37. The detached sheets of MSS. in the Windsor Collection chiefly treat on Anatomy. They vary greatly in size, nor is there any consecutive order. The following account of the very rich materials must therefore be confined to general statements. 1a. 387, Pl. XXIV, No. 1 | 1b + 2a Fo | 2b + 3a 379. 297, Pl. XXIII, No. 4 | 3b drawing of a head | 4a Mn, Anatomy | 4b writing by an unknown hand with the date 1443 | 5a A P 1411 | 6a b measurements of a horse | 8a drawing of legs | 8b Gannes de pasqualibus debat dare etc. by an unknown hand; 9a sketch of a head, not by Leonardo; 9b P M, drawing of a horse Vol. II p. 24 above to the left | 10a—35b chiefly small drawings | 36a 797 | 36b legs and muscles | 45a intestines | 45b + 69a Mn, 69b + 70a Pl. LI, No. 1 | 70b + + 71a — 73b mostly sketches | 70a 79a anatomy of the head | 81a 83a anatomy | 83b + | 88a the muscles | 88b + | 92a—99a sketches | 100 standing male figure | 100b + | 101a Pl. XXXVIII, No. 3 | 101b + | 102a (19. 21) Pl. XXVIII. No. 7 | 102b + | 103a standing male figure | 103b + | 104a Pl. VII, No. 5 | 104b + | 105, 111—114 various sketches | 119a 312 Pl. VII, No. 3 | 120a 121a sketches of heads | 122a Pl. CI, No. 3 | 123a a similar drawing | 129a blood-vessels | 129b polmone | 136a—144 anatomy, various notes and sketches | 158a 608, Pl. XXXX No. 2 and 3 | 158b 609 | 165a cuore polmone | 165b drawing of a female head, not by Leonardo | 174a 176b 175—180 anatomy | 185—187 anatomy | 188a Ar | 188b anatomy | 190 Ar, Ph | 190b anatomy | 191a Ge, 1475 | 191b intestines | 194a

plan of Imola | 1051 and Pl. CXVI, No. 1 | 231a map of the river Arno near Florence | 231b whirlpools | 234a sketch of river | 234b map of the valley of the Arno including Florence, Prato, Pistoja, Lucca and Empoli.

W.

195b muscles, the heart | 197a 351, Pl. XIX, No. 2 | 197b sketches | 198a legs | 207—209 Mn Ph | 210a 799 | 210b popella de'animali notturni | 215a 358, Pl. XXII, No. 2 | 215b + | 219a 219b muscles of the arm | 224a veins | 224b + | 231a 477, Pl. XXXVI, Pl. XXXVII | 233a A, 235b + | 235—238a vento, A, P, anatomy | 238b 807 | 239b + | 240a Io 6 for strumento di questo 4b libro a maneggiare 6 cose, cioè polo, subbion, leva, cordia, pes e motore | 240b 365, 269 | 241a 1155, 1358, 844, 1210 | 241b + | 243a 681, Pl. LXII, No. 2 | 243b + | 243a sketches of trees | 244b + | 245a sketch of fire | 245b + | 246a Pl. XL, No. 2 | 246b + | 247a—249a sketches of horses | 250 anatomy.—The following Romans numbers refer to selected drawings with MSS, most of which are mounted on cartons: I Pl. XXXII, 137, 575, 577 | II 170 | III 356, Pl. XXI | IV 389 Pl. XXV | V Pl. XXVI* | VI 456 | VII 475 | VIII 642, IX 688, Pl. XLIV | X 710, 1413, 878 | XI 711, Pl. LXXV | XII 713, 1175, XII* 1547 | XIII 639, 714, 852, 1186 | XIV 715 | XV 717 | XVI Pl. LXXX, No. 4 (reversed in the reproduction) | XVII Pl. LXXXIII, 1103, XVII* 1104 | XVIII CII, No. 1 | XIX Pl. CI, No. 1, 760 | XX Pl. CI, No. 3 | XXX 800, 833 | XXXII 803, 833, Pl. XXXIII, 1494 | XXXIV 833 | XXXV 856 | XXXVI 868 | XXXVII 909 | XXXVIII 1022 | XXXIX 1140 | XXX 1329 | XXXI 1355, Pl. CXXII | XXXII 1532, Vol. II p. 24 the sketch on the right.

The Arabic numbers of sheets not given among the foregoing references will be found inserted in the notices of the various treatises at Windsor Castle, given previously under separate headings.

38. C. A.

This best known and most voluminous Volu- me is composed of loose sheets of various size, each folio containing one or more sheets of original MSS. The mounting is the same as in the Volume W. L. Such sheets as have notes on both sides are not fixed by their back to the folio sheets, but set into a paper frame. The numbering of sheets refers only to the folio. In the interest of identification and in order to facilitate a comparison of the writing on the opposite sides of one and the same sheet, I have introduced here, in addition to the numbers of Leoni’s folio sheets, second numbers which refer to the separate original sheets.—In the following description it seemed to me desirable to refrain from giving detailed accounts of the contents of such sheets, as do not bear upon the various subjects of the present publication, the more so, as the order of the sheets, being quite accidental, throws no light whatever on the connection of the various stu-

RRR
APPENDIX.
39—55.

39. The drawings and MSS. by Leonardo in the Royal Library, Turin, are mounted on card. Card 7 319, Pl. XII | 7 b Mn | 25 Mn | 17 1182 | 11 320 | 1 1369 Note, Pl. I | 5 Pl. XLII | 6 Pl. CXX.

40. Florence, Uffizi Collection of drawings Frame 115 No. 446 663, 1383. A drawing of a machine is on the back.—Drawing of Landscape (28 x 19 1/4, cm) in a portfolio, not exhibited, not mounted or numbered: 1369.

41. Venice, Academy of Fine Arts, Room VIII, Frame IV, 16, 315, Pl. IX, Frame V | 1 a Notes on P | 1 b Pl. XCIV, No. 4, Frame V | 4 a Pl. LV | 4 b Notes on P, Frame V | 9 a Pl. LIV | 9 b Motori de'corpi, notes | Frame VII 3 Pl. XVIII, 343 Frame X, 8, Pl. XLI, 668.—The drawing Pl. LI1II is in a portfolio in the library of the Academy (exhibited in 1883).

42. Among the drawings by Leonardo in the Gallery of the Ambrosian Library there is only one with a M.S. note: 1456.

43. Collection of drawings, made by P. Resta, a large bound volume in the Ambrosian Library contains an anatomical drawing with notes by Leonardo.

44. Munich, Pinacoteca, a drawing with notes on warfare.

45. The collection of drawings made by Val lardi, a large volume in the Library of the Louvre contains a sheet with notes on arms and several drawings by Leonardo, but only two out of these bear on the subjects of this publication: Pl. LXXX and Pl. LXXX, No. 1.

46. Louvre, Collection of drawings, mounted on card (not exhibited) see Vol. I p. 297 and No. 594 Note.

47. Paris, Collection of drawings in the possession of M. Armand; a drawing with M.S. note similar to that at Munich and to that in the Collection of A. Morrison, Esq. London.


50. Collection of A. Morrison, Esq. (see No. 47).

51. Collection of the late Prince Henry of the Netherlands; one sheet containing notes and a diagram, referring to Perspective.

52. The five Manuscript sheets formerly in the possession of Libri (described in his catalogue of the reserved portion), were bought in 1862 by the Marquis of Breadalbane. After his death they came into the possession of the Hon. Mr. Baillie Hamilton, Langton, Berkshire. Here they seem to have mysteriously disappeared, and I have not been able to trace them any further.

53. In the Library of Christ Church Oxford; two mounted drawings preserved in portfolios. The first is marked 4 and has notes on machines, on weight and a sketch of a horseman fighting. The second is reproduced in parts in Vol. I Pl. LIX, Pl. LX, No. 1, Pl. LXI 676, 677.

54. Modena, Archivio Palatino: No. 1348.

55. Treatise of Francesco di Giorgio, MS. in possession of Lord Ashburton, with notes in Leonardo’s handwriting written on the margin, on Fol. 13 b 767, on Fol. 25 a 952, on Fol. 27 b 44. Others on mechanics &c. on Fol. 15 b, 32 a, 41 a and 44 b.
PRINTED

FOR

SAMPSON LOW, MARSTON, SEARLE & RIVINGTON

LONDON

BY

W. DRUGULIN ORIENTAL AND OLD-STYLE PRINTER

LEIPZIG.