The Notebooks of Leonardo Da Vinci Volume 1 1. How by a certain machine many may stay some time under water. And how and wherefore I do not describe my method of remaining under water and how long I can remain without eating. And I do not publish nor divulge these, by reason of the evil nature of men, who would use them for assassinations at the bottom of the sea by destroying ships, and sinking them, together with the men in them. Nevertheless I w
impart others, which are not dangerous because the mouth of the tube through which you breathe is above the water, supported on air sacks or cork. [Footnote: The leaf on which this passage is written, is headed with the words Casi 39, and most of these cases begin with the word 'Come', like the two here given, which are the 26th and 27th. 7. Sughero. In the Codex Antlanticus 377a; 1170a there is a sketch, drawn with the pen, representing a man with a tube in
is mouth, and at the farther end of the tube a disk. By the tube the word 'Channa' is written, and by the disk the word 'sughero'.] The preparation of the MSS. for publication. 2. When you put together the science of the motions of water, remember to include under each proposition its application and use, in order that this science may not be useless.-- [Footnote: A comparatively small portion of Leonardo's notes on water-power was published at Bologna in 1828, un
der the title: "Del moto e misura dell'Acqua, di L. da Vinci".] Admonition to readers. 3. Let no man who is not a Mathematician read the elements of my work. The disorder in the MSS. 4. Begun at Florence, in the house of Piero di Braccio Martelli, on the 22nd day of March 1508. And this is to be a collection without order, taken from many papers which I have copied here, hoping to arrange them later each in its place, according to the subjects of which they may treat
which, I suppose, will be needed by many who desire to have them, and I am writing this with the pen, because thus I can more easily and sooner write this book than by reading it to others. 5. I will not write this book by way of perpetual precepts, because it would be too long a work, and I wish to avoid falling into this fault, in order that the work may be read by many, and
since the intervals are long between one time of writing and the next. [Footnote: 1. In the history of Florence in the early part of the XVIth century Piero di Braccio Martelli is frequently mentioned as Commissario della Signoria. He was famous for his learning and at his death left four books on Mathematics ready for the press; comp. LITTA, Famiglie celebri Italiane, Famiglia Martelli di Firenze.--In the Official Catalogue of MSS. in the Brit. Mus., New Series Vol. I., whe
re this passage is printed, Barto has been wrongly given for Braccio. 2. addì 22 di marzo 1508. The Christian era was computed in Florence at that time from the Incarnation (Lady day, March 25th). Hence this should be 1509 by our reckoning. 3. racolto tratto di molte carte le quali io ho qui copiate. We must suppose that Leonardo means that he has copied out his own MSS. and not those of others. The first thirteen leaves of the MS. in the Brit. Mus. are a fair copy o
f some notes on physics.] Suggestions for the arrangement of MSS treating of particular subjects.(5-8). 5. Of digging a canal. Put this in the Book of useful inventions and in proving them bring forward the propositions already proved. And this is the proper order; since if you wished to show the usefulness of any plan you would be obliged again to devise new machines to prove its utility and thus would confuse the order of the forty Books and also the order of the
diagrams; that is to say you would have to mix up practice with theory, which would produce a confused and incoherent work. 6. I am not to blame for putting forward, in the course of my work on science, any general rule derived from a previous conclusion. 7. The Book of the science of Mechanics must precede the Book of useful inventions.--Have your books on anatomy bound! [Footnote: 4. The numerous notes on anatomy written on loose leaves and now in t
he Royal collection at Windsor can best be classified in four Books, corresponding to the different character and size of the paper. When Leonardo speaks of 'il tur libri di notomia', he probably means the MSS. which still exist; if this hypothesis is correct the present condition of these leaves might seem to prove that he only carried out his purpose with one of the Books on anatomy. A borrowed book on Anatomy is mentioned in F.O.] 8. The order of your book mu
st follow that of the subjects treated of in the preceding one when they are wholly separate. 9. Of supporting the weights [Footnote: 4. Buonarotti's notes on Mechanics are extraordinary for their ingenuity, but, for the reasons assigned in our introduction, they do not find place in this work.] 10. Of useful inventions.--Do not be
ful or pleasing--since the men who have come before me have taken for their every useful or necessary theme--I must do like one who, being poor, comes last to the fair, and can find no other way of providing himself than by taking all the things already seen by other buyers, and not taken but refused by reason of their lesser value. I, then, will load my humble pack with this despised and rejected merchandise, the refuse of so many buyers; and will go ab
out to distribute it, not indeed in great cities, but in the poorer towns, taking such a price as the wares I offer may be worth. [Footnote: It need hardly be pointed out that there is in this 'Proemio' a covert irony. In the second and third prefaces, Leonardo characterises his rivals and opponents more closely. His protest is directed against Neo-latinism as professed by most of the humanists of his time; its futility is now no longer questioned.] 10. INTRODUCTION. I kn
ow that many will call this useless work [Footnote: 3. questa essere opera inutile. By opera we must here understand libro di pittura and particularly the treatise on Perspective.]; and they will be those of whom Demetrius [Footnote: 4. Demetrio. "W i th regar d to the p assage attributed to Demetrius", Dr. H. MÜLLER STRÜBING writes, "I know not what to make of it. It is certainly not Demetrius Phalereus that is meant and it can hardly be Demetrius Poliorcetes. Wh
o then can it be--for the name is a very common one? It may be a clerical error for Demades and the maxim is quite in the spirit of his writings I have not however been able to find any c orresponding passage either in the 'Fragment s' (C. MULLER, Orat. Att., II. 441) nor in the Supplements collected by DIETZ (Rhein. Mus., vol. 29, p. 108)." The same passage occurs as a simple Memorandum in the MS. Tr. 57, apparently as a note for this 'Proemio' thus affording s
ome data as to the time where these introductions were written.] declared that he took no more account of the wind that came out their mouth in words, than of that they expelled from their lower parts: men who des i re noth i ng but mate ri al riches and are absolutely devoid of that of wisdom, which is the food and the only true riches of the mind. For so much more worthy as the soul is than the body, so much more noble are the possessions of the soul th
an those of the body. And oftentimes it has come to my mind that there are many who think that I can do no more than make a mouth and utter words, and that I am of no more worth than those other men who are born with the gift of speaking, but that I know not if the tongue is the index of the mind, I reply that I know not if the tongue is the index of the mind, or if the mind is the index of the tongue, but I know that I am not a man of letters. Foolish folks! do they not know that I might retort as Marius did to the Roman Patricians [Footnote 21: Come Mario disse ai patriti R omani. "I am unable to find for the words here attributed by Leonardo to Marius, either in Plutarch's Life of Marius or in the Apophthegmata (Moralia, p.202). Nor do they occur in the writings of Valerius Maximus (who frequently mentions Mar
ius) nor in Velleius Paterculus (II, 11 to 43), Dio Cassius, Aulus Gellius, or Macrobius. Professor E. MENDELSON of Dorpat, the editor of Herodian, assures me that no su ch passage is the found in th at autho r" (communi cation from Dr. M ULLE R STRU BING). Leonardo evidently meant to allude to some well known incident in Roman history and the mention of Marius is the result probably of some confusion. We may perhaps read, for
Marius, Menenius Agrippa, though in that case it is true we must alter Patriti to Plebei. The change is a serious one. but it would render the passage perfectly clear.] by saying: That they, who de ck themselves out in the labo urs of others will not a l low me my own. They will say that I, having no literary skill, cannot properly express that which I desire to treat of [Footnote 26: le mie cose .... che d'altra parola. This can hardly
be reconciled with Mons. RAVAISSON'S estimate of L. da Vinci's learning. "Leonard de Vinci etait un admirateur et un disciple des anciens, aussi bien dans l'art que dans la science e t il ten alt a passer pour tel me me aux yeux de la posterite." Gaz. des Be aux ar t s. O ct. 1877.]; but they do not know that my subjects are to be dealt with by experience rather than by words [Footnote 28: See Footnote 26]; and [experience] has been the mistress
of those who wrote well. And so, as mistress, I will cite her in all cases. 11. Though I may not, like them, be able to quote other authors, I shall rely on that which is mu c h greate r and more worthy: - -one xperience, the mist ress of t heir Masters. They go about p u fed up and pompous, dressed and decorated with [the fruits], not of their own labours, but of those of others. And they will not allow me my own. They will scorn me as an inve
ntor of things which I have learned by myself without the teaching of others. How many would think that I could do no more than recite by rote the opinions of those who have made a study of the wonderful works of Nature, and would not deem that the man who has had experience for his teacher could have made himself acquainted with those matters which he proposes to demonstrate, and which the tongues of those who speak or write have been compelled to utter for the benefit of men. Many would scorn me as a man without learning, who
re first is something in itself, and the other nothingness.--Folks little indebted to Nature, since it is only by chance that they wear the human form and without it I might class t he m w it h the herd s of be asts. 12. Many will think they may reasonably blame me by alleging that my proofs are opposed to the authority of certain men held in the highest reverence by their in
experienced judgments; not considering that my works are the issue of pure and simple experience, who is the one true mistress. These rules are sufficie nt to ena b l e y ou to make use of your intelligence to recognize that I am a disciple of experience, who is the one true mistress. These rules are sufficie nt to ena b l e y ou
ult, so that in despair you would give yourself up to melancholy. 13. Among all the studies of natural causes and reasons Light chiefly delights the beholder; an g th e great feat ures of Mathematics the certainty of its demonstrations is what preeminently (tends to) elevate the mind of the investigator. Perspective, therefore, must be p
referred to all the discourses and systems of human learning. In this branch [of science] the beam of light is explained on those methods of demonstrati on wh ich m ake Mathematics as Physics and are graced with the flowers of both [Footnote: 5. Such of Leonardo's notes on Optics or on Perspective as bear exclusively on Ma
thematics or Physics could not be included in the arrangement of the libro di pittura which is here presented to the reader. They are however but fe w in number and will be found in my treatises on Mathematics and Physics. 14. Perspective may properly be described as a rational demonstration of the effects which are produced by the sight in the same manner as shadow and light are produced by the light. Perspective is a rational demonstration of the effects which are produced by the sight in the same manner as shadow and light are produced by the light. Though not included in them, nevertheless I intend to treat of the laws of nature in connection with each of the sciences, I will treat of Light; wherefore I will divide the present work into 3 Parts [Footnote: 10. In the middle ages--for instance, by ROGER BACON, by VIT ELL O N E, with wh o s e w ork s L
d, is in its widest application the science of seeing. Although to Leonardo the two sciences were clearly separate, it is not so as to their names; thus w e f ind a xioms in O ptics un der the he adin g Perspecti ve. Ac cordin g t o this arrangement of the materials for the theoretical portion of the libro di pittura propositions in Perspective and in Optics stand side by side or occur alternately. Although this particular ch
apter deals only with Optics, it is not improbable that the words partirò la presente opera in 3 parti may refer to the same division in to th ree sections which is spoken of in chapters 14 to 17.]. The plan of the book on Pa in ting (14--17). 14. ON THE THREE BRANCHES OF PERSPECTIVE. There are three branches of perspective; the first deals with the reasons of the (apparent) diminution of objects as they recede from the eye, and is known as D
iminishing Perspective.--The second contains the way in which colours vary as they recede from the eye. The third and last is conce rned wit h the explanation of how the objects [in a picture] ought to be less finished in proportion as they are remote (and the names are as follows): Linear Perspecti ve. The Perspective of Colour. The Perspective of Disappearance. [Footnote: 13. From the character of the handwriting I infer that this
passage was written before the year 1490.] 15. ON THE DIMINUTION OF BODIES. Of these, the first includes the diminution in size of opaque objects; the s econd t reats of the diminution of the outline in such opaque objects; the third of the diminution in colour of such opaque objects. 16. THE DISCO URSE ON PAINTING. Perspective, as bearing on d ra wi ng, is divided into three principal sections, of which the first treats of the diminution in the size of bodies at different distances. The second part is that which treats of the diminution in colour in these obje
cts. The third [deals with] the diminished distinctness of the forms and outlines displayed by the objects at various distances. 17. ON THE S CTIONS OF [THE BOOK ON] PAINTING. The first thing in pain tin g is tha t the objects it represents should appear in relief, and that the grou nds surrounding them at different distances shall appear within the vertical plane of the foreground of the picture by means of the 3 branche
s of Perspective, which are: the diminution in the distinctness of the forms of the objects, the diminution in their magnitude; and the diminution i n t heir colour. And of these 3 classes of Perspective the first results from [the structure of] the eye, while the other two are caused by the atmosphere which intervenes between the eye and the objects seen by it. The second essential in painting is appropriate action and a
due variety in the figures, so that the men may not all look like brothers, &c. [Footnote: This and the two foregoing chapters must have been written in 1 5 13 to 1516. They undoubtedly indicate the scheme which Leon ardo wished to c arry out in arranging his researches on Perspec tive as applied to Painting. This is important because it is an evidence against the supposition of H. LUDWIG and others, that Leonardo had colle
cted his principles of Perspective in one book so early as before 1500: a Book which, according to the hypothesis, must have been lost at a very early period , or destroyed possibly, by the French (!) in 1500 (s ee H . LU DWIG. L. da Vinci: Das Buch van der Malerei. Vienna 1 882 III, 7 and 8).] The use of the book on Painting. 18. These rules are of use only in correcting the figures; since every man makes some mistakes in his f
ancy and composition, knowing and not knowing, and it happens that men will praise in your works what deserves blame, and blame what is praiseworthy, and will go off to praise the works of others, and will declaim against those of men who have a reputation for learning, and will prefer the work of a painter who has a bad style to that of one who has a good style, and will praise works which are neither beautiful nor well proportioned if the artist be known to have been a long time at work upon them, and will say that a work done in a short time
dgment is born of clear understanding, and a clear understanding comes of reasons derived from sound rules, and sound rules are the issue of sound experien ce--the common mother of all the sciences and a rts. He nce, bearing in mind the precepts of my rule s, you will be able, merely by your amended judgment, to criticise and recognise every thing that is out of proportion in a work, whether in the perspective or in t
he figures or any thing else. Necessity of theoretical knowledge (19. 20). 19. OF THE MISTAKES MADE BY THOSE WHO PRACTISE WITHOUT KNOWLEDGE. Those who are in love with practi ce without kn o wl edge are lik e the sailor who gets into a sh ip without rudder or compass and who never can be certain whether he is going. Practice must always be founded on sound theory, and to this Perspective is the g
uide and the gateway; and without this nothing can be done well in the matter of drawing. 20. The painter who draws m erely b y pr actice and by eye, without any re ason, is like a mirror wh ich copies every thing placed in front of it without being conscious of their exis tence. The function of the eye (21-23). 21. INTRODUCTION TO PERSPECTIVE:--THAT IS OF THE FUNCTION OF THE EYE. Behold here O reade
r! a thing concerning which we cannot trust our forefathers, the ancients, who tried to define what the Soul and Life ar e--wh ich are beyond proof, whereas those things, which can at any time be clearly kno wn and proved by experience, re mained for many ages unknown or falsely understood. The eye, whose function we so certainly know by experience, has, down to my own time, been defined by an infini
te number of authors as one thing; but I find, by experience, that it is quite another. [Footnote 13: Compare the n ote t o No. 70.] [Footnote: In section 13 we al ready find it indica ted that the study of Perspe ctive and of Optics is to be based on [Footnote 9: I sus tained the Mathematics with the flowers of Perspective.] 22. Here [in the eye] forms, here colours, here the chara ct er of every part of the universe concentr ate d t o a point; and how, being so small a thing, it can represent the whole universe in the same manner as the place of the sun does, I leave Mathematicians to discuss, and I will also put in my Perspective, based on the Mathematics, the results of my own observations. 23. OF THE 10 ATTRIBUTES OF THE EYE, ALL CONCERNED IN PAINTING. Painting is concerned with all the 10 attribute
s of sight; which are:--Darkness, Light, Solidity and Colour, Form and Position, Distance and Propinquity, Mot ion an d Rest. This little work o f mine will be a tissue [of the studies] of thes e a t tr ib ut e s, remindi ng the painter of the rules and methods by which he should use his art to imitate all the works of Nature which adorn the world. 24. ON PAINTING. Variability of the eye. 1st. The pupil of th
e eye contracts, in proportion to the increase of light which is reflected in it. 2nd. The pupil of the eye expand s i n p roportion to the diminution in the day light, or any other light, that is reflected in it. 3rd. [Foot no te: 8. T he subject of this third proposition we find fully discussed in MS. G. 44a.]. The e ye perceives and recognises the objects of its vision with greater intensity in proportion as the pupil is more widely dil
ated; and this can be proved by the case of nocturnal animals, such as cats, and certain birds--as the owl and o th ers--in which t he pupil varies in a high degree from large to small, &c., when in the d a rk o r in the light. 4th. The eye [out of doo rs] in an illuminated atmosphere se e s d arkness behind the windows of houses which [nevertheless] are light. 5th. All colours when placed in the shade ap
pear of an equal degree of darkness, among themselves. 6th. But all colours when placed in a full light, never v ary fr om the i d ea of their colour, but the eye perceives them more or less luminous in proportion as they are more or less distant from the eye. 7th. Of two bodies of equal size, the eye sees that which is the more luminous, to be the larger and more distant from it. 8th. Of two bodies equally luminous, but of unequal size, the eye sees the larger to be the nearer
d by the eyes. 27. Objects seen by one and the same eye appear sometimes large, and sometimes small. 28. The mo tion o f the eye, lo ok s like a perfe ct p ro jectile. If you l ook w ith one eye you will see that the moving person appears to be at rest. ON PAINTING. Objects in relief, when seen from a great distance and with o ne eye, appear to be flat. 29. Why w hen the sketch, m is the left eye and n the right, while the text reverses this lettering. We must therefore supp os e t he eye to be a t m and n, and the object to be at s. 30. Why a painted object in relief appears to be more or less prominent than it is in the case of a painted wall, which appears to be in the same plane as the wall, and appears to be in the same plane as the wall, and appears to be in the same plane as the wall, and