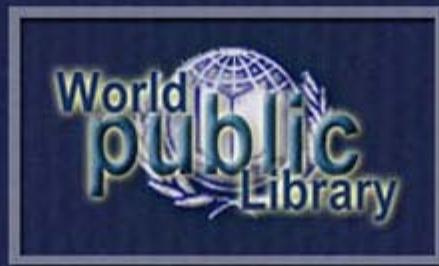


Leonardo Da Vinci

Thoughts

On Art and Life

WORLD PUBLIC LIBRARY EDITION



Edited by Lewis Einstein

Classic Literature Collection
World Public Library.org

Title: Leonardo Da Vinci: Thoughts On Art and Life

Author: Edited by Lewis Einstein

Language: English

Subject: Biography, Literature, Art

Publisher: World Public Library Association



World Public Library

The World Public Library, www.WorldLibrary.net is an effort to preserve and disseminate classic works of literature, serials, bibliographies, dictionaries, encyclopedias, and other reference works in a number of languages and countries around the world. Our mission is to serve the public, aid students and educators by providing public access to the world's most complete collection of electronic books on-line as well as offer a variety of services and resources that support and strengthen the instructional programs of education, elementary through post baccalaureate studies.

This file was produced as part of the "eBook Campaign" to promote literacy, accessibility, and enhanced reading. Authors, publishers, libraries and technologists unite to expand reading with eBooks.

Support online literacy by becoming a member of the World Public Library,
<http://www.WorldLibrary.net/Join.htm>.



www.worldlibrary.net

This eBook has certain copyright implications you should read.

This book is copyrighted by the World Public Library. With permission copies may be distributed so long as such copies (1) are for your or others personal use only, and (2) are not distributed or used commercially. Prohibited distribution includes any service that offers this file for download or commercial distribution in any form, (See complete disclaimer <http://WorldLibrary.net/Copyrights.html>).

World Public Library Association
P.O. Box 22687
Honolulu, Hawaii 96823
info@WorldLibrary.net



(c) **worldLibrary.net**tm

Copyright © 2008, All Rights Reserved Worldwide by World Public Library, www.WorldLibrary.net

THE HUMANISTS' LIBRARY

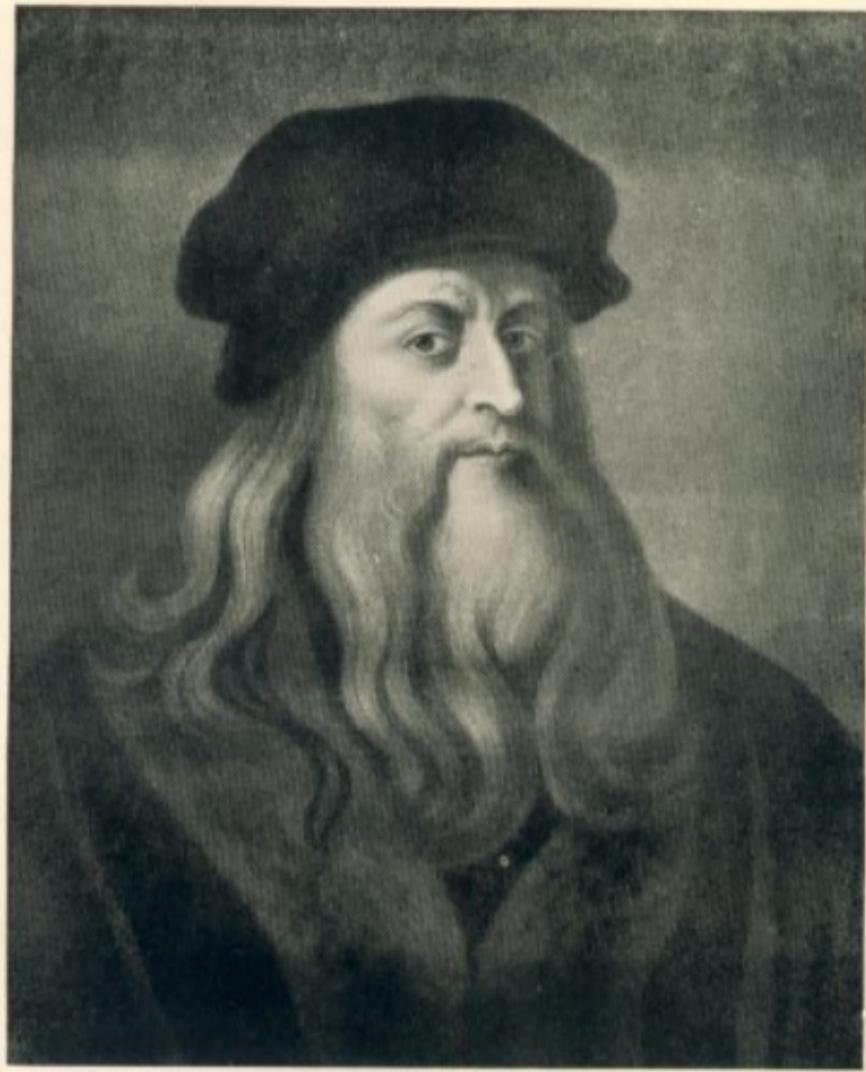
Edited by Lewis Einstein

I

LEONARDO DA VINCI

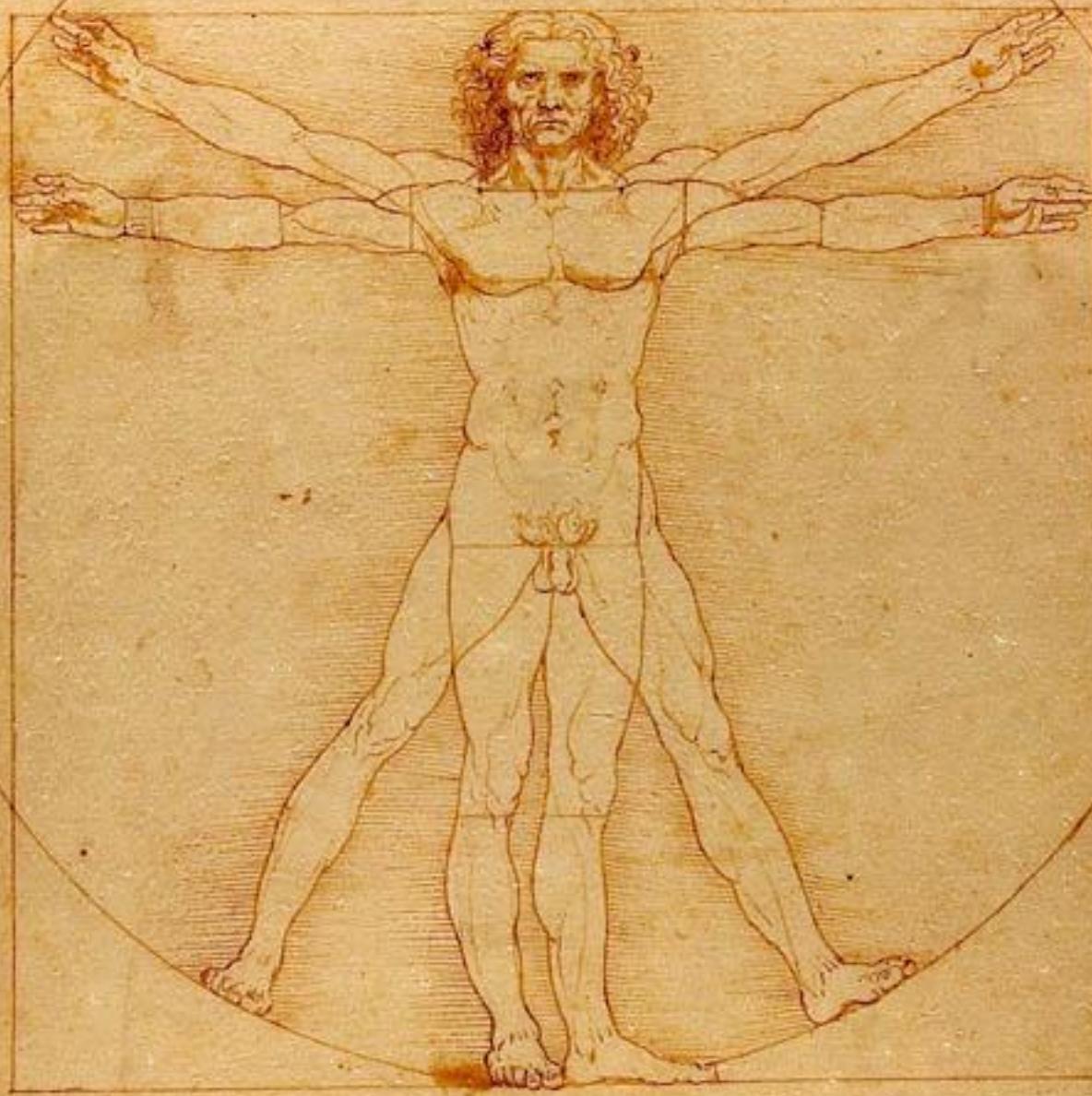
THOUGHTS

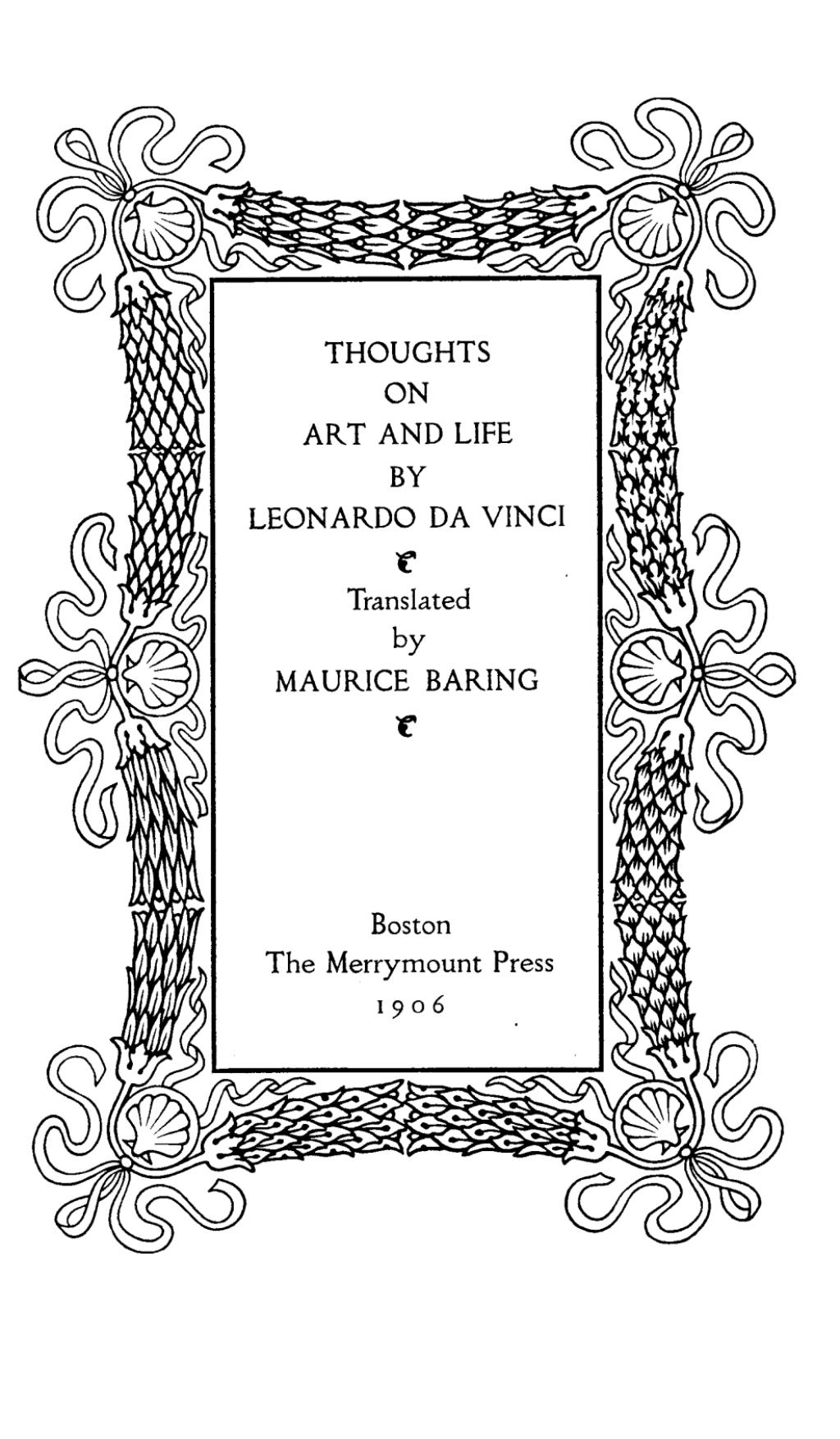
ON ART AND LIFE



LEONARDO DA VINCI

*Painted by himself
Drawn and engraved by Charles Townley*





THOUGHTS
ON
ART AND LIFE
BY

LEONARDO DA VINCI

Translated
by
MAURICE BARING

Boston
The Merrymount Press
1906

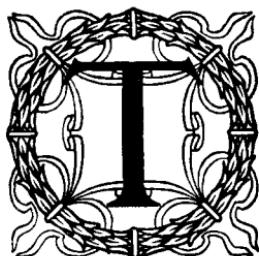
A TABLE OF CONTENTS

Introduction	ix
I. Thoughts on Life	3
II. Thoughts on Art	59
III. Thoughts on Science	141
IV. Bibliographical Note	193
V. Table of References	194

INTRODUCTION

INTRODUCTION

* * *



HE long obscurity of the Dark Ages lifted over Italy, awakening to a national though a divided consciousness. Already two distinct tendencies were apparent. The practical and rational, on the one hand, was soon to be outwardly reflected in the burgher-life of Florence and the Lombard cities, while at Rome it had even then created the civil organization of the curia. The novella was its literary triumph. In art it expressed itself simply, directly and with vigour. Opposed to this was the other great undercurrent in Italian life, mystical, religious and speculative, which had run through the nation from the earliest times, and received fresh volume from mediaeval Christianity, encouraging ecstatic mysticism to drive to frenzy the population of its mountain cities. Umbrian painting is inspired by it, and the glowing words of Jacopone da Todi expressed in poetry the same religious fervour which the life of Florence and Perugia bore witness to in action.

Italy developed out of the relation and conflict of these two forces the rational with the mystical. Their later union in the greater men was to

Intro- form the art temperament of the Renaissance.
duc- The practical side gave it the firm foundation of
tion rationalism and reality on which it rested; the
mystical guided its endeavour to picture the unreal in terms of ideal beauty.

The first offspring of this union was Leonardo. Since the decay of ancient art no painter had been able to fully express the human form, for imperfect mastery of technique still proved the barrier. Leonardo was the first completely to disengage his personality from its constraint, and make line express thought as none before him could do. Nor was this his only triumph, but rather the foundation on which further achievement rested. Remarkable as a thinker alone, he preferred to enlist thought in the service of art, and make art the handmaid of beauty. Leonardo saw the world not as it is, but as he himself was. He viewed it through the atmosphere of beauty which filled his mind, and tinged its shadows with the mystery of his nature. To all this, his birth-right as a painter, a different element was added. A keen desire for knowledge, guiding his action in life, spurred him onward. Conscious of this dominant impulse, he has fancifully described himself in a Platonic allegory. He had passed beneath overhanging cliffs on his way to a great cavern. On bended knees, peering through its darkness, fear and desire had overwhelmed him,—fear for the menacing darkness of the cavern; and desire

to ascertain if there were wonders therein. **Intro-**

From his earliest years, the elements of greatness were present in Leonardo. But the maturity of his genius came unaffected from without. He barely noticed the great forces of the age which in life he encountered. After the first promise of his boyhood in the Tuscan hills, his youth at Florence had been spent under Verrocchio as a master, in company with those whose names were later to brighten the pages of Italian art. He must then have heard Savonarola's impassioned sermons, yet, unlike Botticelli, remained dumb to his entreaties. He must have seen Lorenzo the Magnificent. But there was little opening in the Medicean circle for the young painter, who had first to gain fame abroad. The splendour of Milan under Il Moro, then the most brilliant court in Europe, attracted him. He went there, proclaiming his ability, in a remarkable letter, to accomplish much, but desiring chiefly to erect a great monument to the glory of the Sforza. He spent years at that court, taken up by his different ventures,—painting, sculpture, engineering, even arranging festivities—but his greater project was doomed to failure, enmeshed in the downfall of Ludovico. Even to this he remained impassive. "Visconti dragged to prison, his son dead, . . . the duke has lost his state, his possessions, his liberty, and has finished nothing he undertook," was his only comment on his patron's end, written on the

Intro- margin of a manuscript. After the overthrow of
duc- the Duke of Milan, began his Italian wanderings.
tion At one time he contemplated entering the ser-
vice of an Oriental prince. Instead, he entered
that of Caesar Borgia, as military engineer, and
the greatest painter of the age became inspec-
tor of a despot's strongholds. But his restless na-
ture did not leave him long at this. Returning to
Florence he competed with Michelangelo; yet
the service of even his native city could not re-
tain him. His fame had attracted the attention
of a new patron of the arts, prince of the state
which had conquered his first master. In this his
last venture, he forsook Italy, only to die three
years later at Amboise, in the castle of the French
king.

The inner nature of Leonardo remained as un-
touched by the men he encountered as by the
events which were then stirring Europe. Alone,
he influenced others, remaining the while a mys-
tery to all. The most gifted of nations failed to un-
derstand the greatest of her sons. Isabella d'Este,
the first lady of her time, seeking vainly to ob-
tain some product of his brush, was told that his
life was changeful and uncertain, that he lived for
the day, intent only on his art. His own thoughts
reveal him in another light. "I wish to work mi-
racles," he wrote. And elsewhere he exclaimed,
"Thou, O God, sellest us all benefits, at the cost
of our toil. . . . As a day well spent makes sleep

seem pleasant, so a life well employed makes death pleasant. A life well spent is long." Introduction

Leonardo's views of aesthetic are all important in his philosophy of life and art. The worker's thoughts on his craft are always of interest. They are doubly so when there is in them no trace of literary self-consciousness to blemish their expression. He recorded these thoughts at the instant of their birth, for a constant habit of observation and analysis had early developed with him into a second nature. His ideas were penned in the same fragmentary way as they presented themselves to his mind, perhaps with no intention of publishing them to the world. But his ideal of art depended intimately, none the less, on the system he had thrown out seemingly in so haphazard a manner. His method gives to his writings their only unity. It was more than a method: it was a permanent expression of his own life, which aided him to construct a philosophy of beauty characteristic of the new age.

He had searched to find a scientific basis for art, and discovered it in the imitation of nature, based on rational experience. This idea was, in part, Aristotelian, imbibed with the spirit of the time; though in the ordinary acceptance of the word Leonardo was no scholar, least of all a humanist. His own innovation in aesthetic was in requiring a rational and critical experience as a necessary

Intro- foundation, the acquisition of which was to result
duc- from the permanent condition of the mind. He
tion had trained his own faculties to critically observe
all natural phenomena: first try by experience,
and then demonstrate why such experiment is
forced to operate in the way it does, was his ad-
vice. The eye, he gave as an instance, had been
defined as one thing; by experience, he had found
it to be another.

But by imitation in art, Leonardo intended no
slavish reproduction of nature. When he wrote
that "the painter strives and competes with na-
ture," he was on the track of a more Aristotelian
idea. This he barely developed, using nature only
partly in the Stagirite's sense, of inner force out-
wardly exemplified. The idea of imitation, in
fact, as it presented itself to his mind, was two-
fold. It was not merely the external reproduction
of the image, which was easy enough to secure.
The real difficulty of the artist lay in reflecting
inner character and personality. It was Leonardo's
firm conviction that each thought had some out-
ward expression by which the trained observer
was able to recognize it. Every man, he wrote,
has as many movements of the body as of varie-
ties of ideas. Thought, moreover, expressed itself
outwardly in proportion to its power over the
individual and his time of life. By thus employ-
ing bodily gesture to represent feeling and idea,
the painter could affect the spectator whom he

placed in the presence of visible emotion. He maintained that art was of slight use unless able to show what its subject had in mind. Painting should aim, therefore, to reproduce the inner mental state by the attitude assumed. This was, in other words, a natural symbolism, in which the symbol was no mere convention, but the actual outward projection of the inner condition of the mind. Art here offered an equation of inward purpose and outward expression, neither complete without the other.

Further than this, influenced by Platonic thought, Leonardo's conception of painting was, as an intellectual state or condition, outwardly projected. The painter who practised his art without reasoning of its nature was like a mirror unconsciously reflecting what was before it. Although without a "manual act" painting could not be realized, its true problems—problems of light, of colour, pose and composition, of primitive and derivative shadow—had all to be grasped by the mind without bodily labour. Beyond this, the scientific foundation in art came through making it rest upon an accurate knowledge of nature. Even experience was only a step towards attaining this. "There is nothing in all nature without its reason," he wrote. "If you know the reason, you do not need the experience."

In the history of art, as well, he urged that nature had been the test of its excellence. A natu-

Intro- ral phenomenon had brought art into existence.
duc- The first picture in the world, he remarked in
tion a happy epigram, had been "a line surrounding
the shadow of a man, cast by the sun on the
wall." He traced the history of painting in Italy
during its stagnation after the decay of ancient
art, when each painter copied only his predeces-
sor, which lasted until Giotto, born among bar-
ren mountains, drew the movements of the goats
he tended, and thus advanced farther than all the
earlier masters. But his successors only copied
him, and painting sank again until Masaccio once
more took nature as his guide.

A quite different and combative side to Leo-
nardo's aesthetic, which forced him to state the
broad principles of art, appears in his attacks on
poetry and music as inferior to painting. In that
age of humanistic triumph, literature had lorded
it over the other arts in a manner not free from
arrogance. There was still another cause for his
onslaught on poetry. Leonardo resented the fact
that painters, who were rarely men of educa-
tion, had not defended themselves against the
slurs cast on their art. His counter attack may
have been intended to hide his own small scho-
larship. It served another end as well. His con-
ception of the universal principles of beauty was
made clear by this defence. His first principle
stated broadly that the most useful art was the
one which could most easily be communicated.

Painting was communicable to all since its appeal was made to the eye. While the painter proceeded at once to the imitation of nature, the poet's instruments were words which varied in every land. He took the Platonic view of poetry as a lying imitation, removed from truth. He called the poet a collector of other men's wares, who decked himself in their plumage. Where poetry presented only a shadow to the imagination, painting offered a real image to the eye; and the eye, as the window of the soul through which all earthly beauty was revealed, the sight, he exclaimed, which had discovered navigation, which had impelled men to seek the West, was the noblest of all the senses. Painting spoke only by what it accomplished, poetry ended in the very words with which it sang its own praises. If, then, poets called painting dumb poetry, he could retort by dubbing poetry blind painting. In common with his successors, Leonardo could not escape from this fallacy, which, in overlooking all save descriptive verse, was destined to burden aesthetic until demolished by Lessing.

It was the opinion of Leonardo that the temporary nature of music caused its inferiority to painting. Although durability was in itself no absolute test,—else the work of coppersmiths would be the highest art,—yet in any final scale, permanence could not altogether be disregarded. Music perished in the very act of its creation,

Intro- while painting preserved the beautiful from the
duc- hand of time. "Helen of Troy, gazing in a mir-
tion ror, in her old age, wondered how she had twice
been ravished." Mortal beauty would thus vanish,
if it were not rescued by art from destroying age
and death.

Leonardo contrasted painting with sculpture, for he had practised both, and thought himself peculiarly qualified to judge their merit. He considered the former the nobler art of the two, for sculpture involved bodily toil and fatigue, while by its very nature it lacked perspective and atmosphere, colour, and the feeling of space. Painting, on the other hand, caused by an illusion, was in itself the result of deeper thought. An even broader test served to convince him of its final superiority. That art was of highest excellence, he wrote, which possessed most elements of variety and universality. Painting contained and reproduced all forms of nature; it made its appeal by the harmonious balance of parts which gratified all the senses. By its very duality it fulfilled the highest purpose. The painter was able to visualize the beauty which enchanted him, to bring to reality the fancy of his dreams, and give outward expression to the ideal within.

The genius of Leonardo as a painter came through unfolding the mystery of life. Like Miranda, he had gazed with wonder at the beauty of the world. "Look at the grace and sweetness

of men and women in the street," he wrote. The most ordinary functions of life and nature amazed him most. He observed of the eye how in its form and colour, and the entire universe it reflected, were reduced to a single point. "Wonderful law of nature, which forced all effects to participate with their cause in the mind of man. These are "the true miracles!" Elsewhere he wrote again: "Nature is full of infinite reasons which have not yet passed into experience." He conceived it to be the painter's duty not only to comment on natural phenomena as restrained by law, but to merge his very mind into that of nature by interpreting its relation with art. Resting securely on the reality of experienced truth, he felt the deeper presence of the unreal on every side. In the same way that he visualized the inner workings of the mind, his keen imagination aided him to make outward trifles serve his desire to find mysterious beauty everywhere. Oftentimes, in gazing on some ancient, time-stained wall, he describes how he would trace thereon landscapes, with mountains, rivers and valleys. The whole world was full of a mystery to him, which his work reflected. The smile of consciousness, pregnant of that which is beyond, illuminates the expression of Mona Lisa. So, too, in the strange glance of Ann, of John the Baptist, and of the Virgin of the Rocks, one realizes that their thoughts dwell in another world.

Intro-duc-tion Leonardo had found a refuge in art from the pettiness of material environment. Like his own creations, he, too, had learned the secret of the inner life. The painter, he wrote, could create a world of his own, and take refuge in this new realm. But it must not be one of shadows only. The very mystery he felt so keenly had yet to rest on a real foundation; to treat it otherwise would be to plunge into mere vapouring. Although attempting to bridge the gulf which separated the real from the unreal, he refused to treat the latter supernaturally. That mystery which lesser minds found in the occult, he saw in nature all about him. He denied the existence of spirits, just as he urged the foolishness of the will-o'-the-wisps of former ages,—alchemy and the black art. In one sentence he destroyed the pretensions of palmistry. "You will see," he wrote, "great armies slaughtered in an hour's time, where in each individual the signs of the hands are different."

His art took, thus, its guidance in realism, its purpose in spirituality. The search for truth and the desire for beauty were the twin ideals he strove to attain. The keenness of this pursuit saved him from the blemish of egoism which aloofness from his surroundings would otherwise have forced upon him. For his character presented the anomaly, peculiar to the Renaissance, of a lofty idealism coupled in action with irre-

sponsibility of duty. He stood on a higher plane, Intro-
his attitude toward life recognizing no claims on duc-
the part of his fellowmen. In his desire to surpass tion
himself, fostered by this isolation of spirit and
spurred on by the eager wish to attain universal
knowledge, he has been compared to Faust; but
the likeness is only half correct. He was not blind
to the limitations which encompassed him, his
very genius making him realize their bounds. Of
the ancients he said that in attempting to define
the nature of the soul, they sought the impos-
sible. He wrote elsewhere, "It is the infinite alone
that cannot be attained, for if it could it would
become finite."

In Leonardo's personality was reflected both
the strength and weakness of Renaissance Italy.
So, to know him, it is necessary to understand the
Italy of that age. Its brilliancy, its universality, its
desire for beauty, are but one side of the medal.
On its reverse, Italy lacked the solid vigour of a
national purpose. The discord of political dis-
union, reacting on art, laid bare great weakness
in the want of any constructive direction, toward
which the strength of the Renaissance could aim.
The energy was there, whether finding an outlet
in statecraft or in discovery, in art or in letters.
But it laboured for no common end; there was
internal unity of force and method, but external
divergence of purpose. The tyranny of petty
despots could provide no adequate ideal toward

Intro- which to aim. No ruler, and no city save Venice,
duc- could long symbolize the nation's patriotism.
tion Venetian painters alone glorified the state in their work, and thus felt the living force of a national ambition which raised them above themselves. But elsewhere there was little to inspire that devotion for a common country necessary as a background to sustain the greatest work. Hence Italian art, so living within certain limits, remained stunted beyond these. The conviction that art existed in order to express ideal beauty, that its main purpose was to please the eye and the senses in spite of the result attained, proved inadequate compensation for all that had been withdrawn. The art ideal tended more and more to become a conscience and a purpose in itself, an inward impulse for action and an outward goal.

The artist's real greatness will depend at all times on his qualities as a representative. His true merit will arise from giving expression in ideal terms to his nation and to his age. In so far as he has been able to do this and the spirit of his country is reflected in his work, in so far as he has represented what is best therein and most enduring, he will have achieved greatness. Not that this is always, or even often, a conscious expression. It is unfair reading to search for deep thought in the work of either painter or poet. Neither art of-

fers the best medium to convey the abstractions of the mind, since each has its own method of expression, independent of pure reason. But painter and poet, in the degree they attain greatness, express more than themselves. Ariosto, intent only to amuse, reflects with playful wit and skepticism the splendid luxury and joy of living in Renaissance court life. The care with which he chiselled each line proves that his real seriousness and conscience lay in his artistic purpose. Without Ariosto's wit, Paolo Veronese depicted a similar side in painting, though his Venetian birth-right made him celebrate the glory of the Republic. Poet and painter alike expressed far more than either could know. If such a test be applied to the artists of the Renaissance, each in turn will respond to it,—just as the weakness of the later Bolognese as a school is that, beyond a certain technical merit, they meant and represented so little. But the noblest painters,—Michelangelo and Raphael, Titian and Leonardo,—in addition to possessing the solid grasp of technical mastery, reflected some aspect of their nation's life and civilization. In Michelangelo was realized the grandeur of Italy struggling vainly against crushing oppression. He expressed that which was highest in it, reflecting the loftiest side of its idealism mingled with deep pessimism in his survey over life; for, wrapped in austerity, he saw mankind in heroic terms of sadness. Raphael, on the

Intro- other hand, found only beautiful sweetness every-
duc- where. The tragedies of life failed to touch the
tion young painter, who blotted from view all strug-
gle and sorrow, and, in spite of the misery which
had befallen his nation, could still rejoice in the
sensuous beauty of the world. There was another
side to the Renaissance, dependent neither on
beauty nor heroic grandeur, yet sharing in both
through qualities of its own. Titian, who painted
the living man of action, the man of parts, sus-
ceptible alike to the appreciation of ideal beauty
and heroic impulse, but guided withal by ex-
pediency, reflected this more practical aspect of
life. In his portraiture he expressed the statecraft
for which Italians found opportunity beyond the
Alps, since in Italy it was denied them; and Titian
found even Venice too narrow for the scope of
his art.

But before Titian, before Raphael, before Mi-
chelangelo, Leonardo reflected the rationalism
and the mystery, the subtlety and the philoso-
phical speculation, of the age. To find in his work
only the individual thought of genius would be to
mistake, perhaps, its most important side; for the
expression of his mind, both by its brilliancy and
its limitations, is typical of the spirit of his time.
The Italian Renaissance was reflected in him as
rarely a period has been expressed in the life-
work of a single man. He represented its union
of practice and theory, of thought placed in the

service of action. He summed up its different aspects in his own individuality. Intellectually, he represented its many-sidedness attained through penetration of thought, and a keenness of observation, profiting from experience, extended into every sphere. As an artist he possessed a vigour of imagination from which sprang his power of creating beauty. But, in spite of his practical nature, he remained a dreamer in an age which had in it more of stern reality than of golden dreams. His very limitations, his excess of individualism, his want of long-continued concentration, his lack of patriotism, his feeling of the superiority of art to nationality, are all characteristic of Renaissance Italy.

The union in Leonardo of reality to mystery has often been shared by genius in other fields. His own peculiar greatness sprang from expressing in art the apparent contradiction of attaining the world of mystery through force of reality. Like Hamlet, it was the union of the real with the unreal which appealed to him, of the world as he saw it and the world as he imagined it to be. It was but another expression of the eternal ideal of truth and beauty.

L. E.

American Embassy
London, 1906

I
THOUGHTS ON LIFE

I
THOUGHTS ON LIFE

* * *



EGUN at Florence in the house
of Piero di Braccio Martelli, on
the 22d day of March, 1508; and
this is to be a collection with-
out order, taken from many pa-
pers which I have copied here,
hoping to arrange them later, each in its place, ac-
cording to the various subjects treated. And I
think that before I shall have finished this work,
it will be necessary for me to repeat the same
thing many times over; so, O reader, blame me
not, because the subjects are many, and memory
cannot retain them and say: This I will not write
because I have already written it; and if I did
not wish to fall into this error it would be neces-
sary, every time that I wished to copy some-
thing, in order not to repeat myself, to read over
all the preceding matter, all the more so since
the intervals are long between one time of writ-
ing and another.

Of the
Works
of
Leo-
nardo

2.
Not louder does the tempestuous sea bellow His
when the north wind strikes its foaming waves Thirst
between Scylla and Charybdis; nor Stromboli after
nor Mount Etna when the sulphurous flames, ledge Know-

His shattering and bursting open the great mountain
Thirst with violence, hurl stones and earth through the
after air with the flame it vomits; nor when the fiery
Know caverns of Mount Etna, spitting forth the element
ledge which it cannot restrain, hurl it back to the place
whence it issued, driving furiously before it any
obstacle in the way of its vehement fury . . . so I,
urged by my great desire and longing to see the
blending of strange and various shapes made by
creating nature, wandered for some time among
the dark rocks, and came to the entrance of a
great cave, in front of which I long stood in as-
tonishment and ignorance of such a thing. I bent
my back into an arch and rested my left hand
on my knee, and with my right hand shaded my
downcast eyes and contracted eyebrows. I bent
down first on one side and then on the other to
see whether I could perceive anything, but the
thick darkness rendered this impossible; and af-
ter having remained there some time, two things
arose within me, fear and desire,—fear of the dark
and threatening cave, desire to see whether there
were anything marvellous within.

3.

I discover for man the origin of the first and per-
haps of the second cause of his being.

4.

Recognizing as I do that I cannot make use of

subject matter which is useful and delightful, Leo-
since my predecessors have exhausted the use- nardo's
ful and necessary themes, I shall do as the man Studies
who by reason of his poverty arrives last at the
fair, and cannot do otherwise than purchase what
has already been seen by others and not ac-
cepted, but rejected by them as being of little
value. I shall place this despised and rejected
merchandise, which remains over after many
have bought, on my poor pack, and I shall go
and distribute it, not in the big cities, but in the
poor towns, and take such reward as my goods
deserve.

5.

All knowledge which ends in words will die as
quickly as it came to life, with the exception of
the written word: which is its mechanical part.

Vain
Know-
ledge

6.

Avoid studies the result of which will die toge-
ther with him who studied.

7.

The intellect will always profit by the acquisi-
tion of any knowledge whatsoever, for thus what
is useless will be expelled from it, and what is
fruitful will remain. It is impossible either to hate
or to love a thing without first acquiring know-
ledge of it.

Value
of
Know-
ledge

Value
of
Know-
ledge

8.

Men of worth naturally desire knowledge.

9.

It is ordained that to the ambitious, who derive no satisfaction from the gifts of life and the beauty of the world, life shall be a cause of suffering, and they shall possess neither the profit nor the beauty of the world.

10.

On his Con-tem-ners I know that many will say that this work is useless, and these are they of whom Demetrius said that he recked no more of the breath which made the words proceed from their mouth, than of the wind which proceeded from their body,—men who seek solely after riches and bodily satisfaction, men entirely denuded of that wisdom which is the food and verily the wealth of the soul; because insomuch as the soul is of greater value than the body, so much greater are the riches of the soul than those of the body. And often when I see one of these take this work in his hand, I wonder whether, like a monkey, he will not smell it and ask me if it is something to eat.

11.

Demetrius used to say that there was no difference between the words and the voice of the un-

skilled ignorant and the sounds and noises of a On the stomach full of superfluous wind. And it was not Vul- without reason that he said this, for he considered gar it to be indifferent whence the utterance of such men proceeded, whether from their mouth or their body; both being of the same substance and value.

12.

I do not consider that men of coarse and boorish habits and of slender parts deserve so fine an instrument nor such a complicated mechanism as men of contemplation and high culture. They merely need a sack in which their food may be held and whence it may issue, since verily they cannot be considered otherwise than as vehicles for food, for they seem to me to have nothing in common with the human race save the shape and the voice; as far as the rest is concerned they are lower than the beasts.

13.

Knowledge of the past and of the places of the earth is the ornament and food of the mind of man.

14.

Cornelius Celsus: Knowledge is the supreme Knowledge, the supreme evil is physical pain. We are composed of two separate parts, the soul and the body; the soul is the greater of these two, the body the lesser. Knowledge appertains to the Good

Know- greater part, the supreme evil belongs to the
ledge lesser and baser part. Knowledge is an excellent
the su- thing for the mind, and pain is the most grievous
preme thing for the body. Just as the supreme evil is
Good physical pain, so is wisdom the supreme good of
the soul, that is to say of the wise man, and no
other thing can be compared with it.

15.

Life
and
Wis-
dom

In the days of thy youth seek to obtain that
which shall compensate the losses of thy old age.
And if thou understandest that old age is fed
with wisdom, so conduct thyself in the days of
thy youth that sustenance may not be lacking
to thy old age.

16.

Praise
of
Know-
ledge

The fame of the rich man dies with him; the
fame of the treasure, and not of the man who
possessed it, remains. Far greater is the glory of
the virtue of mortals than that of their riches.
How many emperors and how many princes
have lived and died and no record of them re-
mains, and they only sought to gain dominions
and riches in order that their fame might be ever-
lasting. How many were those who lived in scar-
city of worldly goods in order to grow rich in
virtue; and as far as virtue exceeds wealth, even
in the same degree the desire of the poor man
proved more fruitful than that of the rich man.

Dost thou not see that wealth in itself confers no Praise honour on him who amasses it, which shall last of when he is dead, as does knowledge?—know- Knowledge which shall always bear witness like a clade rion to its creator, since knowledge is the daughter of its creator, and not the stepdaughter, like wealth.

17.

Bountiful nature has provided that in all parts of The the world you will find something to imitate. World

18.

Consider in the streets at nightfall the faces of men and women when it is bad weather, what grace and sweetness they manifest! The Beauty of Life

19.

Just as iron which is not used grows rusty, and water putrefies and freezes in the cold, so the mind of which no use is made is spoilt.

20.

Just as food eaten without appetite is a tedious nourishment, so does study without zeal damage the memory by not assimilating what it absorbs. Fruit-less Study

21.

Truth was the only daughter of time.

So vile a thing is a lie that even if it spoke fairly of God it would take away somewhat from His divinity; and so excellent a thing is truth that if it praises the humblest things they are exalted. There is no doubt that truth is to falsehood as light is to darkness; and so excellent a thing is truth that even when it touches humble and lowly matters, it still incomparably exceeds the uncertainty and falsehood in which great and elevated discourses are clothed; because even if falsehood be the fifth element of our minds, notwithstanding this, truth is the supreme nourishment of the higher intellects, though not of disorderly minds. But thou who feedest on dreams dost prefer the sophistry and subterfuges in matters of importance and uncertainty to what is certain and natural, though of lesser magnitude.

Obstacles in the way of truth are finally punished.

I am well aware that not being a literary man the presumptuous will think that they have the right to blame me on the ground that I am not a man of letters. Vainglorious people! Know they not that I could make answer as Marius did to the Roman people, and say: They who make a dis-

play with the labours of others will not allow me Versus
mine? They will say that being unskilled in let- Hu-
ters I cannot find true expression for the matters man-
of which I desire to treat; they do not know that ists
in my subjects experience is a truer guide than
the words of others, for experience was the teacher
of all great writers, and therefore I take her for
guide, and I will cite her in all cases.

25.

Although I may not be able to quote other au-
thors, as they do, I can quote from a greater and
more worthy source, namely, experience,—the
teacher of their masters. They go about swelled
with pride and pomposity, dressed up and be-
dight, not with their own labour, but with that of
others; and they will not concede me mine. And
if they despise me, who am a creator, far more
are they, who do not create but trumpet abroad
and exploit the works of other men, to be blamed.

26.

He who in reasoning cites authority is making Au-
use of his memory rather than of his intellect. thority

27.

Men who are creators and interpreters of nature
to man, in comparison with boasters and ex-
ploiters of the works of others, must be judged

On Com-
men-
tators and esteemed like the object before the mirror as compared with its image reflected in the mirror,—one being something in itself, and the other nothing. Little to nature do they owe, since it is merely by chance they wear the human form, and but for it I might include them with herds of cattle.

28.

A well lettered man is so because he is well nutured, and just as the cause is more admirable than the effect, so is a good disposition, unlettered, more praiseworthy than a well lettered man who is without natural disposition.

29.

Against certain commentators who disparage the inventors of antiquity, the originators of science and grammar, and who attack the creators of antiquity; and because they through laziness and the convenience of books have not been able to create, they attack their masters with false reasoning.

30.

It is better to imitate ancient than modern work.

Expe-
rience

31.

Wisdom is the daughter of experience.

32.

Wrongly men complain of experience, which

with great railing they accuse of falsehood. Leave Experience alone, and turn your lamentation to rience your ignorance, which leads you, with your vain and foolish desires, to promise yourselves those things which are not in her power to confer, and to accuse her of falsehood. Wrongly men complain of innocent experience, when they accuse her not seldom of false and lying demonstrations.

33.

Experience never errs; it is only your judgements that err, ye who look to her for effects which our experiments cannot produce. Because given a principle, that which ensues from it is necessarily the true consequence of that principle, unless it be impeded. Should there, however, be any obstacle, the effect which should ensue from the aforesaid principle will participate in the impediment as much or as little as the impediment is operative in regard to the aforesaid principle.

34.

Experience, the interpreter between creative nature and the human race, teaches the action of nature among mortals: how under the constraint of necessity she cannot act otherwise than as reason, who steers her helm, teaches her to act.

35.

All our knowledge is the offspring of our perceptions.

Origin
of
Know-
ledge

36.

The sense ministers to the soul, and not the soul to the sense; and where the sense which ministers to the soul ceases to serve the soul, all the functions of that sense are lacking in life, as is evident in those who are born dumb and blind.

Testi-
mony
of the
Senses

37.

And if thou sayest that sight impedes the security and subtlety of mental meditation, by reason of which we penetrate into divine knowledge, and that this impediment drove a philosopher to deprive himself of his sight, I answer that the eye, as lord of the senses, performs its duty in being an impediment to the confusion and lies of that which is not science but discourse, by which with much noise and gesticulation argument is constantly conducted; and hearing should do the same, feeling, as it does, the offence more keenly, because it seeks after harmony which devolves on all the senses. And if this philosopher deprived himself of his sight to get rid of the obstacle to his discourses, consider that his discourses and his brain were a party to the act, because the whole was madness. Now could he not have closed his eyes when this frenzy came upon him, and have kept them closed until the frenzy consumed itself? But the man was mad, the discourse insane, and egregious the folly of destroying his eyesight.

38.

There is nothing which deceives us as much as our own judgement.

Judge-
ment
prone
to Er-
ror

39.

The greatest deception which men incur proceeds from their opinions.

40.

Avoid the precepts of those thinkers whose reasoning is not confirmed by experience.

41.

Man discourses greatly, and his discourse is for the greater part empty and false; the discourse of animals is small, but useful and true: slender Intelli-
gence of Animals
certainty is better than portentous falsehood.

42.

What is an element? It is not in man's power to define the quiddity of the elements, but a great many of their effects are known.

43.

That which is divisible in fact is divisible in potentiality also; but not all quantities which are divisible in potentiality are divisible in fact.

44.

What is that thing which is not defined and would

Infinity not exist if it were defined? It is infinity, which incom-
pre- because that which can be defined ends with the
hensi- limits of its circumference, and that which cannot
ble be defined has no limits.

45.

O contemplators of things, do not pride yourselves for knowing those things which nature by herself and her ordination naturally conducts; but rejoice in knowing the purposes of those things which are determined by your mind.

46.

Insol- Consider, O reader, how far we can lend cre-
uble dence to the ancients who strove to define the
Ques- soul and life,—things which cannot be proved;
tions while those things which can be clearly known
and proved by experience remained during so
many centuries ignored and misrepresented! The
eye, which so clearly demonstrates its functions,
has been up to my time defined in one manner
by countless authorities; I by experience have
discovered another definition.

47.

Although human ingenuity may devise various inventions which, by the help of various instruments, answer to one and the same purpose, yet

will it never discover any inventions more beautiful, more simple or more practical than those of Nature, because in her inventions there is nothing lacking and nothing superfluous; and she Invents makes use of no counterpoise when she constructs the limbs of animals in such a way as to correspond to the motion of their bodies, but she puts into them the soul of the body. This is not the proper place for this discourse, which belongs rather to the subject of the composition of animated bodies; and the rest of the definition of the soul I leave to the minds of the friars, the fathers of the people, who know all secrets by inspiration. I leave the sacred books alone, because they are the supreme truth.

48.

Those who seek to abbreviate studies do injury to knowledge and to love because the love of anything is the daughter of this knowledge. The fervency of the love increases in proportion to the certainty of the knowledge, and the certainty issues from a complete knowledge of all the parts, which united compose the totality of the thing which ought to be loved. Of what value, then, is he who abbreviates the details of those matters of which he professes to render a complete account, while he leaves behind the chief part of the things of which the whole is composed? It is true that impatience, the mother of

Completeness in Knowledge

**Com-
plete-
ness in
Know-
ledge** stupidity, praises brevity, as if such persons had not life long enough to enable them to acquire a complete knowledge of one subject such as the human body! And then they seek to comprehend the mind of God, in which the universe is included, weighing it and splitting it into infinite particles, as if they had to dissect it!

O human folly! dost thou not perceive that thou hast been with thyself all thy life, and thou art not yet aware of the thing which more fully than any other thing thou dost possess, namely, thy own folly? And thou desirest with the multitude of sophists to deceive thyself and others, despising the mathematical sciences in which truth dwells and the knowledge of the things which they contain; and then thou dost busy thyself with miracles, and writest that thou hast attained to the knowledge of those things which the human mind cannot comprehend, which cannot be proved by any instance in nature, and thou deemest that thou hast wrought a miracle in spoiling the work of some speculative mind; and thou perceivest not that thy error is the same as that of a man who strips a plant of the ornament of its branches covered with leaves, mingled with fragrant flowers and fruits. Just as Justinus did when he abridged the stories written by Trogus Pompeius, who had written elaborately the noble deeds of his forefathers, which were full of wonderful beauties of style; and thus

he composed a barren work, worthy only of the Com-
impatient spirits who deem that they are wasting plete-
the time which they might usefully employ in ness in
studying the works of nature and mortal affairs. Know-
But let such men remain in company with the ledge
beasts; let dogs and other animals full of rapine
be their courtiers, and let them be accompanied
with these running ever at their heels! and let
the harmless animals follow, which in the season
of the snows come to the houses begging alms
as from their master.

49.

Nature is full of infinite causes which are beyond Na-
the pale of experience. ture

50.

Nature in creating first gives size to the abode
of the intellect (the skull, the head), and then to
the abode of the vital spirit (the chest).

51.

Necessity is the mistress and guide of nature. Ne- Law
cessity is the theme and inventress of nature, her of Ne-
curb and her eternal law. cessity

52.

When anything is the cause of any other thing,
and brings about by its movement any effect,

Of the movement of the effect necessarily follows
Light- the movement of the cause.
ning
in the

53.

Clouds O mighty and once living instrument of creative nature, unable to avail thyself of thy great strength thou must needs abandon a life of tranquillity and obey the law which God and time gave to Nature the mother. Ah! how often the frightened shoals of dolphins and great tunny fish were seen fleeing before thy inhuman wrath; whilst thou, fulminating with swift beating of wings and twisted tail, raised in the sea a sudden storm with buffeting and sinking of ships and tossing of waves, filling the naked shores with terrified and distracted fishes.

54.

The
Hu-
man
Eye

Since the eye is the window of the soul, the soul is always fearful of losing it, so much so that if a man is suddenly frightened by the motion of an object before him, he does not with his hands protect his heart, the source of all life; nor his head, where dwells the lord of the senses; nor the organs of hearing, smell and taste. But as soon as he feels fright it does not suffice him to close the lids of his eyes, keeping them shut with all his might, but he instantly turns in the opposite direction; and still not feeling secure he covers his eyes with one hand, stretching out the

other to ward off the danger in the direction in which he suspects it to lie. Nature again has ordained that the eye of man shall close of itself, so that remaining during his sleep without protection it shall suffer no hurt.

55.

Every object naturally seeks to maintain itself in

Uni-versal Law

56.

The part always tends to reunite with its whole in order to escape from its imperfection; the soul desires to remain with its body, because without the organic instruments of that body it can neither act nor feel.

57.

The lover is moved by the object he loves as the senses are by sensible things; and they unite and become one and the same. The work is the first thing which is born of this union; if the thing loved is base, the lover becomes base. When what is united is in harmony with that which receives it, delight, pleasure and satisfaction ensue. When the lover is united to the beloved he rests there; when the burden is laid down it finds rest there.

58.

A natural action is accomplished in the briefest manner.

To such an extent does nature delight and abound in variety that among her trees there is not one plant to be found which is exactly like another; and not only among the plants, but among the boughs, the leaves and the fruits, you will not find one which is exactly similar to another.

If nature had made one rule for the quality of limbs, the faces of men would resemble each other to such a degree that it would not be possible to distinguish one from the other; but she has varied the five features of the face in such a way that, although she has made an almost universal rule with regard to their size, she has not done so with regard to their quality, so that each one can be clearly distinguished from the other.

It is an easy matter for him who knows man to arrive at universal knowledge, since all terrestrial animals are similar in regard to their structure, that is to say, in regard to the muscles and bones, and they do not vary save in height and thickness; then there are the aquatic animals, and I will not persuade the painter that any rule can be made with regard to these because they are of infinite variety—so are the insects.

62.

The body of anything which is fed is continually dying and being reborn, since nourishment cannot enter save where the past nourishment is exhausted; and if it is exhausted, it no longer has life, and if you do not furnish it with nourishment equal to that which has been before, you will impair the health of the organism, and if you deprive it of this nourishment, life will be altogether destroyed. But if you supply it with so much as can be consumed in a day, then as much life will be restored as was consumed, like the light of the candle which is furnished to it by the fuel provided by the moisture of the candle, and this light with most speedy succour restores beneath what is consumed above as it dies in dusky smoke; and this death is continuous, likewise the continuity of the smoke is equal to the continuity of the fuel; and in the same moment the light dies and is born again together with the movement of its fuel.

The
Body
dies
and is
re-
born

63.

Man and animals are in reality vehicles and conduits of food, tombs of animals, hostels of Death, coverings that consume, deriving life by the death of others.

64.

Look on light and consider its beauty. Shut your

Light eyes, and look again: that which you see was not there before, and that which was, no longer is. Who is he who remakes it if the producer is continually dying?

65.

Anaxagoras: Everything proceeds from everything, and everything becomes everything, because that which exists in the elements is composed of those elements.

66.

Nature Nature appears to have been the cruel stepmother rather than the mother of many animals, and in some cases not the stepmother, but the pitying mother.

67.

Why did nature not ordain that one animal should not live by the death of the other? Nature, being inconstant and taking pleasure in continually creating and making lives and forms, because she knows that her earthly materials are thereby augmented, is more willing and swift to create than time is to destroy; and so she has ordained that many animals shall feed on each other. And as even thus her desire is not satisfied, she frequently sends forth certain poisonous and pestilential vapours upon the increasing multitude and congregation of animals, and especially upon men who increase to a great extent, because other animals do not feed on them; and since there is no cause,

there would follow no effect. This earth, therefore, seeks to lose its [animal] life, desiring only continual reproduction, and as, by the logical demonstration you adduce, effects often resemble their causes, animals are the image of the life of the world.

68.

Now you see that the hope and the desire of returning home to one's former state is like the desire of the moth for the light, and the man who, with constant yearning and joyful expectancy, awaits the new spring and the new summer, and every new month and the new year, and thinks that what he longs for is ever too late in coming, and does not perceive that he is longing for his own destruction. But this desire is the quintessence, the spirit, of the elements, which, finding itself captive in the soul of the human body, desires always to return to its giver. And I would have you know that this same desire is the quintessence which is inseparable from nature, and that man is the model of the world. And such is the supreme folly of man that he labours so as to labour no more, and life flies from him while he forever hopes to enjoy the goods which he has acquired at the price of great labour.

Life's
Philoso-
phy

69.

The soul seems to dwell in the intellect, and the intellect appears to dwell in that part where all

The Senses and the Soul the senses meet which is called the brain, and the brain does not pervade the whole body, as many have thought; on the contrary, it dwells entirely in one part, because if it were all in all and the same in every part, it would not have been necessary for the instruments of the senses to combine among themselves in one single spot; but rather, it would have been sufficient for the eye to fulfil the function of its sensation on the surface without transmitting, by means of the optic nerves, the likeness of its vision to the brain, so that the soul, for the reason given above, might perceive it in the surface of the eye. Likewise, with regard to the sense of hearing, it would have been sufficient if the voice had sounded only in the porous cavity of the indurated bone which lies within the ear, without making any further transit from this bone to the brain, which is its destination and where it discourses with common judgement. The sense of smell, too, is likewise compelled by necessity to proceed to the intellect; the sense of touch passes through the nerves and is conveyed to the brain, and these nerves diverge with infinite ramification in the skin, which encloses the limbs of the body and the entrails. The nerves convey volition and sensation to the muscles, and these nerves and the tendons which lie between the muscles and the sinews give movement to them; the muscles and sinews obey, and this obedience takes effect by the decrease

of their thickness, for in swelling their length is The reduced, and the tendons which are interwoven Senses among the particles of the limbs shrink, and as and they extend to the tips of the fingers they trans- the mit to the brain the cause of the sense of touch Soul which they feel. The tendons with their muscles obey the nerves as soldiers obey their officers, and the nerves obey the brain as the officers obey their captain; thus the joint of the bones obeys the tendon, and the tendons obey the muscles, and the muscles obey the nerves, and the nerves obey the brain, and the brain is the dwelling of the soul, and the memory is its ammunition and the perception is its refinary.

70.

The brain is that which perceives what is transmitted to it by the other senses. The brain moves Of Sensation by means of that which is transmitted to it by the five senses. Motion is transmitted to the senses by objects, and these objects, transmitting their images to the five senses, are transferred by them to the perception, and by the perception to the brain; and there they are comprehended and committed to the memory, in which, according to their intensity, they are more or less firmly retained.

The thinkers of ancient times concluded that the part of man which constitutes his intellect is caused by an instrument to which the other five

Of Senses refer everything by means of the perception, and this instrument they have named the "common sense" or brain, and they say that this sense is situated in the centre of the head. And they have given it this name "common sense" solely because it is the common judge of the five other senses, that is to say, sight, hearing, touch, taste and smell. The "common sense" is stirred by means of the perception which is placed between it and the senses. The perception is stirred by means of the images of things conveyed to it by the external instruments to the senses, and these are placed in the centre between the external things and the perception, and the senses likewise are stirred by objects. Surrounding objects transmit their images to the senses, and the senses transfer them to the perception, and the perception transfers them to the "common sense" (brain), and by it they are stamped upon the memory, and are there retained in a greater or lesser degree according to the importance and intensity of the impression. The sense which is most closely connected with the perception is the most rapid in action, and this sense is the eye, the highest and chief of the others; of this sense alone we will treat, and we will leave the others in order not to unduly lengthen our matter.

71.

Nature has ordained for man the ministering

muscles which exercise the sinews, and by means of which the limbs can be moved according to the will and desire of the brain, like to officers distributed by a ruler over many provinces and towns, who represent their ruler in these places, and obey his will. And this officer, who will in a single instance have most faithfully obeyed the orders he received from his master by word of mouth, will afterwards, in a similar way, of his own accord fulfil the wishes of his master.

An example of this can be frequently seen in the fingers, which learn to perform on an instrument the things which the intellect commands, and the lesson once learnt they will perform it without the aid of the intellect. And do not the muscles which cause the legs to move perform their duty without man being conscious of it?

72.

You will see palsied and shivering persons move, and their trembling limbs, such as their head and hands, quiver, without the permission of the soul, and the soul, though it expend all its might, cannot prevent these limbs from trembling. The same thing occurs in epilepsy or when limbs are partially truncated, as in the case of tails of lizards.

73.

It happens that our intellect is that which prompts the hand to create the features of figures in di-

Intellect vine aspects until it finds satisfaction; and since the intellect is one of the tones of our soul, by means of the soul it composes the form of the body where it dwells, according to its volition. And when it has to reproduce a human body, it takes pleasure in repeating the body which it originally created; whence it follows that they who fall in love are prone to become enamoured of what resembles them.

74.

Of the Senses There are the four powers: memory, intellect, sensuality and lust. The first two are intellectual, the others sensual. Of the five senses, sight, hearing, smell are with difficulty prevented; touch and taste not at all. Taste follows smell in the case of dogs and other greedy animals.

75.

Why does the eye perceive things more clearly in dreams than with the imagination when one is awake?

76.

Time Although time is included among continuous quantities, being indivisible and immaterial it does not altogether fall into the scope of geometry,—by which it is divided into figures and bodies of infinite variety, which are seen to be continuous inasmuch as they are visible and material,—but it agrees only with its first principles,

i.e. with the point and the line; the point in time Time may be compared to an instant, and the line to the length of a certain quantity of time. Just as the point is the beginning and end of a line, so is an instant the beginning and end of any given space of time; and just as a line is infinitely divisible, so can a given space of time be likewise divided, and as the divisions of the line are in proportion to each other, so likewise are the divisions of time.

77.

In twelve whole figures the cosmography of the miniature world will be shown to you in the same manner as Ptolemy in his cosmography. And so I will divide it afterwards into limbs as he divided the world into provinces; then I will explain the function of the parts in every direction, and put before your eyes a description of the whole figure and substance of man as regards his movements by means of his limbs. And thus if it please our great author I will demonstrate the nature of man and his habits in the way I describe his form.

78.

And thou, O man, who wilt gaze in this work of mine on the marvellous works of nature, if thou thinkest it would be an act of wickedness to destroy it, think how much more wicked it is to take the life of a man; and if this his structure appears to thee a miraculous work of art, remember that

On the
Hu-
man
Body

On the it is nothing in comparison with the soul which
Hu- inhabits this structure; for verily, whatever it may
man be, it is divine. Let it, then, dwell in His work and
Body at His good will, and let not thy rage or malice
destroy so great a thing as life, for he who does
not value it does not deserve it.

79.

The Ex- peri- mental Me- thod By these rules thou wilt be able to distinguish falsehood from truth by means of which knowledge men aim at possible things with greater moderation; and do not veil thyself in ignorance, for the result of this would be that thou wouldest be ineffectual and fall into melancholy and despair.

80.

Of Navi- gation below the Wa- ters How by the aid of a machine many may remain for some time under water. And how and why I do not describe my method of remaining under water and of living long without food; and I do not publish nor divulge these things by reason of the evil nature of man, who would use them for assassinations at the bottom of the sea and to destroy and sink ships, together with the men on board of them; and notwithstanding I will teach other things which are not dangerous. . . .

81.

I will not dwell on false physiognomy and chiro-

mancy because there is no truth in them, and this Of
is manifest because chimeras of this kind have no Phy-
scientific foundation. It is true that the lineaments siog-
of the face partly reveal the character of men, nomy
their vices and temperaments; but in the face:
(a) the features which separate the cheeks from
the lips, and the nostrils and cavities of the eyes,
are strongly marked if they belong to cheerful and
good-humoured men, and if they are slightly
marked it denotes that the men to whom they
belong are given to meditation. (b) Those whose
features stand out in great relief and depth are
brutal and bad-tempered, and reason little. (c)
Those who have strongly marked lines between
the eyebrows are bad-tempered. (d) Those who
have strongly marked lines on the forehead are
men full of concealed or unconcealed bewailing.

And we can reason thus about many features.
But the hand? You will find that whole armies
perished in the same hour by the sword in which
no two men had similar marks in their hands, and
the same argument applies to a shipwreck.

82.

Nature has placed in the front part of man, as Of
he moves, all those parts which when struck cause Pain
him to feel pain; and this is felt in the joints of
the legs, the forehead and the nose, and has been
so devised for the preservation of man, because

Of Pain if such pain were not felt in these limbs they would be destroyed by the many blows they receive.

83.

Why Plants do not feel Pain While nature has ordained that animals should feel pain in order that the instruments which might be liable to be maimed or marred by motion may be preserved, plants do not come into collision with the objects which are before them; whence pain is not a necessity for them, and therefore when they are broken they do not feel pain, as animals do.

84.

Lust is the cause of generation.

Appetite is the support of life.

Fear or timidity is the prolongation of life.

Pain is the preserver of the instrument (of the human frame).

85.

Fear Just as courage is the danger of life, so is fear its safeguard.

86.

Body and Soul Let him who wishes to see how the soul inhabits its body observe what use the body makes of its daily habitation; that is to say, if the soul is full of confusion and disorder the body will be kept in disorder and confusion by the soul.

87.

Body

The soul can never be corrupted with the corruption of the body, but it is like the wind which causes the sound of the organ, and which ceases to produce a good effect when a pipe is spoilt.

88.

Every loss which we incur leaves behind it vexation in the memory, save the greatest loss of all, that is, death, which annihilates the memory, together with life.

89.

Our body is subject to Heaven, and Heaven is subject to the Spirit.

90.

Sense
and
Reason

The senses are earthly; reason lies outside them when in contemplation.

91.

Where most feeling exists, there amongst martyrs is the greatest martyr.

92.

That which can be lost cannot be deemed riches. Virtue is our true wealth and the true reward of its possessor; it cannot be lost, it never deserts us until life leaves us. Hold property and external riches with fear; they often leave their possessor scorned and mocked at for having lost them.

Flight

93.

**of
Time**

Men wrongly lament the flight of time, blaming it for being too swift; they do not perceive that its passage is sufficiently long, but a good memory, which nature has given to us, causes things long past to seem present.

94.

**Illu-
sions**

Our intellect does not judge events which happened at various intervals of time in their true proportion, because many things which happened years ago appear recent and close to the present, and often recent things appear old and seem to belong to our past childhood. The eye does likewise with regard to distant objects which in the light of the sun appear to be close to the eye, and many objects which are close appear to be remote.

95.

Let us not lack ways and means of dividing and measuring these our wretched days, which we ought to take pleasure in spending and living not vainly and not without praise, nor without leaving any memory in the minds of men, so that this our miserable existence may not be spent in vain.

96.

**Virtu-
ous
Life**

The age which flies glides by in stealth and deceives others; and nothing is more swift than the years, and he who sows virtue reaps glory.

97.

O sleeper, what is sleep? Sleep is like unto death. Why dost thou not work in such wise that after death thou mayst have the semblance of perfect life, just as during life thou hast in thy sleep the semblance of the hapless dead?

98.

The water you touch in a river is the last of that which has gone, and the first of that which is coming: so it is with time present.

99.

A long life is a life well spent.

100.

As a well spent day affords happy sleep, so does Life a life profitably employed afford a happy death.

101.

O time, consumer of things! O envious age! Thou dost destroy all things, and consumest all things with the hard teeth of old age, little by little in a slow death. Helen, when she looked in her mirror and saw the withered wrinkles made in her face by old age, wept, and wondered why she had twice been ravished. O time, devourer of things! O envious age, by which all is consumed!

Time
the
De-
stroyer

Fault-finders There exists among the foolish a certain sect of hypocrites who continually seek to deceive themselves and others, but others more than themselves, though in reality they deceive themselves more than others. And these are they who blame the painters who study on feast-days the things which relate to the true knowledge of the forms of the works of nature, and sedulously strive to acquire knowledge of these things to the best of their ability.

But such fault-finders pass over in silence the fact that this is the true manner of knowing the Artificer of such great and marvellous things, and that this is the true way in which to love so great an Inventor! For great love proceeds from the perfect knowledge of the thing loved; and if you do not know it you can love it but little or not at all; and if you love it for the gain which you anticipate obtaining from it and not for its supreme virtue, you are like the dog which wags its tail and shows signs of joy, leaping towards him who can give him a bone. But if you knew the virtue of a man you would love him more—if that virtue was in its place.

I obey Thee, Lord, first for the love which in reason I ought to bear Thee; secondly because Thou

hast the power to shorten or prolong the lives of Prayer men.

104.

Thou, O God, dost sell us all good things at the price of labour.

105.

And many make a trade deceiving the foolish multitude, and if no one comes to unmask their deceits, they punish it.

106.

Pharisees,—that is to say, holy friars.

107.

Nothing can be written by means of new researches.

108.

Patience serves against insults as clothes do ^{Pa-}against the cold; since if you multiply your clothes ^{tience}as the cold increases, the cold cannot hurt you. Similarly, let thy patience increase under great offences, and they will not be able to hurt your feelings.

109.

Words which do not satisfy the ear of the listener ^{Ad-}will always weary or annoy him; and you will ^{vice}often see signs of this in such listeners in their frequent ^{to a}yawns. Therefore, you who speak before ^{Speaker}men whose good opinion you seek, when you ob-

**Ad-
vice
to a
Speaker**

serve such signs of vexation, shorten your speech or vary your argument; and if you do otherwise, then instead of the favour you seek you will incur hate and hostility.

And if you would see what gives pleasure to a man speak to him on various themes, and when you see him intent, without yawning, or contracting his brow, or performing other actions, then be certain that the matter of which you are speaking is such as affords him pleasure.

110.

**Ad-
vice**

Here is a thing which the more it is needed the more it is rejected: and this is advice, which is unwillingly heeded by those who most need it, that is to say, by the ignorant.

Here is a thing which the more you fear and avoid it the nearer you approach to it, and this is misery; the more you flee from it the more miserable and restless you will become. When the work comes up to the standard of the judgement, this is a bad sign for the judgement; and when the work excels the standard of the judgement, this is the worst sign, as occurs when a man marvels at having worked so well; and when the standard of the judgement exceeds that fulfilled by the work, this is a sign of perfection; and if the man is young and be thus disposed, he will without doubt grow into an excellent workman: he will only accomplish few works. But they will

be of a quality which will compel men to con- Pro-
template their perfection with admiration. verbs

III.

Nothing should be so greatly feared as empty fame.

This empty fame issues from vices.

A broken vase of clay can be remodelled, but this is no longer possible when it has been baked.

The vow is born when hope dies.

The beautiful is not always the good. And the fine talkers labour under this error without any reason.

He who wishes to grow rich in a day will be hanged in a year.

The memory of benefits is a frail defence against ingratitude.

Reprove your friend in secret and praise him in public.

He who fears dangers will not perish by them.

The evil which does me no harm is like the good which in no wise avails me.

He who offends others is not himself secure.

Be not false about the past.

Folly is the shield of lies, just as unreadiness is the defence of poverty.

Where there is liberty, there is no rule.

Pro- Here is a thing which the more it is heeded the verbs more it is spurned,—advice.

It is ill to praise, and worse to blame, the thing which you do not understand.

On Mount Etna the words freeze in your mouth and you make ice of them.

Threats are the only weapons of the threatened man.

Ask advice of him who governs himself well.

Justice needs power, intelligence and will, and is like the Queen Bee.

Not to punish evil is equivalent to authorizing it.
He who takes the snake by the tail will be bitten by it.

The pit will fall in upon him who digs it.

He who does not restrain voluptuousness is in the category of the beasts.

You can have no dominion greater or less than that over yourself.

He who thinks little errs much.

It is easier to contend at the first than at the last.

No counsel is more sincere than that given on ships which are in danger.

Let him who acts on the advice of the young expect loss.

You grow in reputation like bread in the hands of a child.

Cannot beauty and utility be combined—as appears in citadels and men? Pro-verbs

He who is without fear often incurs great losses, and is often full of regret.

If you governed your body according to virtue you would not live in this world.

Where good fortune enters, envy lays siege to her and attacks her, and when she departs sorrow and regret remain behind.

When beauty exists side by side with ugliness, the one seems more powerful, owing to the presence of the other.

He who walks straight rarely falls.

O miserable race of man! of how many things you make yourself the slave for the sake of money!

The worst evil which can befall the artist is that his work should appear good in his own eyes.

To speak well of a bad man is the same as speaking ill of a good man.

Truth ordains that lying tongues shall be punished by the lie.

He who does not value life does not deserve it.

The beautiful works of mortals pass and do not endure.

Labour flies with fame almost hidden in its arm.

The gold in ingots is refined in the fire.

- Pro-
verbs**
- The shuttle says: I will continue to move until
the cloth is woven.
- Everything that is crooked is straightened.
- Great ruin proceeds from a slight cause.
- Fine gold is recognized when it is tested.
- The image will correspond to the die.
- The wall will fall on him who scrapes it.
- Ivy lives long.
- To the traitor, death is life, because if he makes
use of others he is no longer believed.
- When fortune comes seize her in front firmly,
because behind she is bald.
- Constancy means, not he who begins, but he
who perseveres.
- I do not yield to obstacles.
- Every obstacle is overcome by resolve.
- He who is chained to a star does not change.

112.

- Truth**
- Fire destroys falsehood,—that is to say, sophistry,
—and rehabilitates truth, scattering the darkness.
- Fire must be represented as the consumer of
all sophistry and the revealer of truth, because
it is light and scatters darkness which conceals
all essences.
- Fire destroys all sophistry,—that is to say, de-
ceit,—and preserves truth alone, which is gold.

Truth cannot be concealed in the end, dissimulation is of no avail. Dissimulation is frustrated before so great a judge. Falsehood puts on a mask.

There is nothing hidden under the sun. Fire must represent truth because it destroys all sophistry and lies, and the mask is for sophistry and lies, which conceal truth.

113.

Rather privation of limbs than weariness of doing good. The power of using my limbs shall fail me before the power of being useful. Rather death than weariness. I cannot be satiated with serving. I do not weary of giving help. No amount of work is sufficient to weary me. This is a carnival motto: "Sine lassitudine." Hands in which ducats and precious stones abound like snow never grow weary of serving, but such a service is for its utility only and not for our profit. Nature has formed me thus.

114.

This shall be placed in the hand of ingratitude: ^{Ingrat-}
The wood nourishes the fire that consumes it. ^{itude}
When the sun, the scatterer of darkness, shines, you put out the light which for you in particular, and for your need and convenience, expelled the darkness.

115.

I have found that in the composition of the human body as compared with the bodies of ani-

**Physi-
ologi-
cal In-
ferior-
ity of
Man**

imals the senses are less subtle and coarser; it is thus composed of less ingenious machinery and of cells less capable of receiving the power of the senses. I have seen that in the lion the sense of smell is connected with the substance of the brain and descends through the nostrils which form an ample receptacle for it; and it enters into a great number of cartilaginous cells which are provided with many passages in order to receive the brain. A large part of the head of the lion is given up to the sockets of the eyes, and the optic nerves are in immediate contact with the brain; the contrary occurs in man, because the sockets of the eyes occupy a small portion of the head, and the optic nerves are subtle and long and weak, and owing to the weakness of their action we see little by day and less at night; and the animals above mentioned see better at night than in the daytime; and the proof of this is that they seek their prey at night and sleep during the daytime, as do also the nocturnal birds.

116.

**Man's
Ethical
Inferi-
ority**

Thou hast described him king of animals, but I would rather say, king of beasts, thou being the greatest—for hast thou not slain them in order that they may give thee their children to glut thy greed with which thou hast striven to make a sepulchre for all animals? And I would say still more if I might speak the whole truth. But let us

confine ourselves to human matters, relating one Man's supreme infamy, which is not to be found among the animals of the earth; because among these you will not find animals who eat their young, except when they are utterly foolish (and there are few indeed of such among them), and this occurs only among the beasts of prey, such as the lions, and leopards, panthers, lynxes, cats and the like, which sometimes feed on their young; but thou, besides thy children, dost devour thy father, thy mother, thy brother and thy friends; and not satisfied with this, thou goest forth to hunt on the islands of others, seizing other men and these half naked . . . thou fattenest and chasest them down thy own throat. Now does not nature produce enough vegetables for thee to satisfy thyself? And if thou art not content with vegetables, canst thou not by a mixture of them make infinite compounds as Platina wrote, and other writers on food?

117.

The description of man, including that of such creatures belonging almost to the same species, such as apes, monkeys and the like, of which there are many.

118.

The way of walking in man is similar in all cases to the universal way of walking in four-footed animals, because, just as they move their feet

Man
in the
Ani-
mal
World

**Man
in the
Ani-
mal
World** crosswise, like a trotting horse, so man moves his four limbs crosswise, that is to say, in walking he puts forward his right foot simultaneously with his left arm, and so on vice versa.

119.

Write a special treatise to describe the movements of four-footed animals, among which is man, who in his childhood also walks on four feet.

120.

**Frag-
ment
of a
Letter** There is one who having promised me much less than his due, and being disappointed of his presumptuous desire, has tried to deprive me of all my friends; and finding them wise and not pliable to his will, he has threatened me that he would bring accusations against me and alienate my benefactors from me: hence I have informed Your Lordship of this, so that this man, who wishes to sow the usual scandals, may not find a soil fit for sowing the thoughts and deeds of his evil nature; and that when he tries to make Your Lordship the tool of his infamous and malicious nature he may be disappointed of his desire.

121.

On the 23d of April, 1490, I began this book; and started again on the horse. Giacomo came to live with me on Saint Mary Magdalen's day in 1490;

Gia-
como
a Pu-
pil of
Leo-
nardo

he was ten years old. He was a thief, a liar, obstinate, and a glutton. On the second day I had two shirts made for him, a pair of socks and a jerkin, and when I placed the money aside to pay for these things, he stole it out of the purse and I could never force him to confess the fact, though I was quite certain of it—4 lire. On the following day I went to sup with Giacomo Andrea, and this same Giacomo supped for two and did mischief for four, since he broke three bottles, spilled the wine, and after this came to sup where I... Item: on the 7th of September he stole a silver point, worth twelve soldi, from Marco, who was living with me, and took it from his studio; and when Marco had looked for it for some time he found it hidden in Giacomo's box—lire 1, soldi 2. Item: on the 26th of the following January, being in the house of Messer Galeazzo di San Severino, in order to arrange the festivity of his joust, and certain henchmen having undressed to try on the costumes of rustics who were to take part in the aforesaid festivity, Giacomo took the purse of one of them, which was on the bed with other clothes, and stole the money he found in it—2 lire, 4 soldi. Item: Maestro Agostino of Padua gave me while I was in the same house a Turkish hide to have a pair of shoes made of it, and Giacomo stole this from me within a month and sold it to a cobbler for 20 soldi, with which money by his own confession he bought sweets of aniseed. Item:

Gia- again, on the 2d of April, Giovanni Antonio left
como a silver point on one of his drawings, and **Gia-**
a Pu- como stole it; it was worth 24 soldi, —1 lire, 4 soldi.
pil of The first year a cloak, 2 lire; six shirts, 4 lire;
Leo- three doublets, 6 lire; four pairs of socks, 7 lire,
nardo 8 soldi.

122.

And in this case I know that I shall make not a few enemies, since no one will believe what I say of him; because there are but few whom his vices have disgusted, indeed they only disgusted those men whose natures are contrary to such vices; and many hate their fathers and break off friendship with those who reprove their vices, and they will have no examples brought up against them, nor tolerate any advice. And if you meet with any one who is good and virtuous drive him not away from you, do him honour, so that he may not have to flee from you and hide in hermitages, or caverns and other solitary spots, in order to escape from your treachery; and if there be such an one do him honour, because these are your gods upon earth, they deserve statues from you and images . . . but remember that you are not to eat their images, as is practised still in some parts of India, where, when images have performed some miracle, the priests cut them in pieces (since they are of wood) and distribute them among the people of the country, not with-

out payment, and each one grates his portion Gia-
very fine and puts it upon the first food he eats; como
and thus they believe that they have eaten their a Pu-
saint by faith, who will preserve them from all pil of
perils. What is thy opinion, O man, of thy own Leo-
species? Art thou so wise as thou believest to be? nardo
Are these things to be done by men?

123.

This represents pleasure together with pain be- Plea-
cause one is never separated from the other; they sure
are depicted back to back because they are op- and
posed to each other; they are represented in one Pain
body because they have the same basis, because
the source of pleasure is labour mingled with
pain, and the pain issues from the various evil
pleasures. And it is therefore represented with a
reed in its right hand which is ineffectual and de-
void of strength, and the wounds inflicted by it
are poisonous. In Tuscany such reeds are placed
to support beds, to signify that this is the place
of idle dreams, that here a great part of life is con-
sumed, here much useful time is wasted, that is,
the morning hours when the mind is sober and
rested and the body disposed to start on fresh la-
bours; there, again, many vain pleasures are en-
joyed by the mind, which pictures to itself impos-
sible things, and by the body, which indulges in
those pleasures that are so often the cause of the

Brain failing of life; and for this reason the reed is used
and as their support.
Soul

124.

The spirit returns to the brain whence it had departed, with a loud voice and uttering these words:

O blissful and fortunate spirit, whence comest thou? I have known this man well, against my will. He is a receptacle of villainy, he is a very heap of the highest ingratitude combined with all the other vices. But why should I tire myself with vain words? Nothing is to be found in him save the accumulation of all sins, and if there is to be found among them any that possess good, they will not be treated differently than I have been by other men; in short I have come to the conclusion that they are bad if they are enemies, and worse if they are friends.

125.

Of the Eye The eye, which reflects the beauty of the universe to those who see, is so excellent a thing that he who consents to its loss deprives himself of the spectacle of the works of nature; and it is owing to this spectacle, effected by means of the eye, which enables the soul to behold the various objects of nature, that the soul is content to remain in the prison of the body; but he who loses his eyesight leaves the soul in a dark prison, where

all hope of once more beholding the sun, the light Of the
of the whole world, is lost.... And how many are Eye
they who feel great hatred for the darkness of
night, although it is brief. Oh! what would they
do were they constrained to abide in this dark-
ness during the whole of their life? Certainly there
is no one who would not rather lose his hearing
or his sense of smell than his eyesight, and the
loss of hearing includes the loss of all sciences
which find expression in words; and this loss a
man would incur solely so as not to be deprived
of the sight of the beauty of the world which con-
sists in the surfaces of bodies artificial as well as
natural, which are reflected in the human eye.

126.

Animals suffer greater loss in losing their sight
than their hearing for many reasons: firstly, be-
cause it is by means of their sight that they find
the food which is their nourishment, and is neces-
sary for all animals; secondly, because by means
of sight the beauty of created things is appre-
hended, especially those which lead to love, while
he who is born blind cannot apprehend such
beauty by hearing, because he has never re-
ceived any knowledge as to what is beauty of any
kind. There remains hearing, by which I mean
only the human voice and speech; they contain
the names of all things whatsoever. It is possible
to live happily without the knowledge of these

The
Eye in
Ani-
mal
Life

Ascen- words, as is seen in those who are born deaf, that
sion of is to say, the dumb, who take delight in drawing.

Monte

Rosa

127.

I say that the azure we see in the atmosphere is not its true colour, but is caused by warm moisture evaporated in minute and insensible atoms which the solar rays strike, rendering them luminous against the darkness of the infinite night of the fiery region which lies beyond and includes them. And this may be seen, as I saw it, by him who ascends Mounboso (Monte Rosa), a peak of the Alps which separates France from Italy. The base of this mountain gives birth to the four large rivers which in four different directions water the whole of Europe; and no mountain has its base at so great a height as this. It rises to such a height that it almost lifts itself up above the clouds; snow seldom falls on it, but only hail in summer, when the clouds are at their greatest height, and this hail is preserved there so that were it not for the absorption of the rising and falling clouds, which does not occur twice in an age, a great quantity of ice would be piled up there by the hail, which in the middle of July I found to be very considerable; and I saw above me the dark air, and the sun which struck the mountain shone far lighter than in the plains below, because a lesser quantity of atmosphere lay between the summit of the mountain and the sun.

Men will communicate with each other from the phe-
most distant countries, and reply. cies

Many will abandon their own habitations and
take with them their own goods, and go and in-
habit other countries.

Men will pursue the thing which they most
greatly fear; that is to say, they will be miser-
able in order to avoid falling into misery.

Men standing in separate hemispheres will con-
verse with each other, embrace each other, and
understand each other's language.

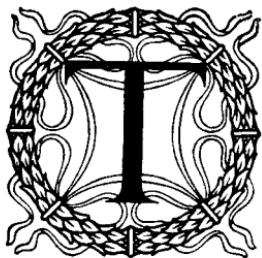
We should not desire the impossible.

II
THOUGHTS ON ART



II THOUGHTS ON ART

* * *



HE painter's work will be of little merit if he takes the painting of others as his standard, debut if he studies from nature he will produce good fruits; as is seen in the case of the painters of the age after the Romans, who continued to imitate one another and whose art consequently declined from age to age. After these came Giotto the Florentine, who was born in the lonely mountains, inhabited only by goats and similar animals; and he, being drawn to his art by nature, began to draw on the rocks the doings of the goats of which he was the keeper; and thus he likewise began to draw all the animals which he met with in the country: so that after long study he surpassed not only all the masters of his age, but all those of many past centuries. After him art relapsed once more, because all artists imitated the painted pictures, and thus from century to century it went on declining, until Tomaso the Florentine, called Masaccio, proved by his perfect work that they who set up for themselves a standard other than nature, the mistress of all masters, labour in vain.

Painting
clines
when
aloof
from
Nature

Paint- Thus I wish to say, in regard to these mathe-
ing de- matical matters, that they who merely study
clines the masters and not the works of nature are the
when grandchildren, and not the children, of nature, the
aloof mistress of good masters. I abhor the supreme
from folly of those who blame the disciples of nature
Na- in defiance of those masters who were themselves
ture her pupils.

2.

Its The first picture was a single line, drawn round
Origin the shadow of a man cast by the sun on the wall.

3.

Vastness of the field of painting: All that is visi-
ble is included in the science of painting.

4.

De- With due lamentation Painting complains that it
fence has been expelled from the liberal arts, because
of it is the true daughter of nature and is practised by
Paint- means of the most worthy of the senses. Whence
ing wrongly, O writers, you have excluded painting
from the liberal arts, since it not only includes in
its range the works of nature, but also infinite
things which nature never created.

5.

Because writers have had no knowledge of the
science of painting, they have not been able to

describe its gradations and parts, and since paint- De-
ing itself does not reveal itself nor its artistic work fence
in words, it has remained, owing to ignorance, of
behind the sciences mentioned above, but it has Paint-
thereby lost nothing of its divinity. And truly it ing
is not without reason that men have failed to
honour it, because it does honour to itself without
the aid of the speech of others, just as do the ex-
cellent works of nature. And if the painters have
not described the art of painting, and reduced it
to a science, the fault must not be imputed to
painting and it is no less noble on that account,
since few painters profess a knowledge of letters,
as their life would not be long enough for them
to acquire such knowledge. Therefore we ask, Is
the virtue of herbs, stones and plants non-exis-
tent because men have been ignorant of it? Cer-
tainly not; but we will say that these herbs re-
mained noble in themselves without the aid of
human tongues or letters.

6.

A science is more useful in proportion as its fruits Paint-
are more widely understood, and thus, on the ing
other hand, it is less useful in proportion as it is
less widely understood. The fruits of painting can
be apprehended by all the populations of the
universe because its results are subject to the
power of sight, and it does not pass by the ear
to the brain, but by the same channel by which

Painting sight passes. Therefore it needs no interpreters of diverse tongues, as letters do, and it has instantly satisfied the human race in the same manner as the works of nature have done. And not only the human race, but other animals; as was shown in a picture representing the father of a family to whom little children still in the cradle gave caresses, as did the dog and the cat in the same house; and it was a wonderful thing to see such a sight.

7.

The arts which admit of exact reproduction are such that the disciple is on the same level as the creator, and so it is with their fruits. These are useful to the imitator, but are not of such high excellence as those which cannot be transmitted as an inheritance like other substances. Among these painting is the first. Painting cannot be taught to him on whom nature has not conferred the gift of receiving such knowledge, as mathematics can be taught, of which the disciple receives as much as the master gives him; it cannot be copied, as letters can be, in which the copy equals the original; it cannot be stamped, in the same way as sculpture, in which the impression is in proportion to the source as regards the quality of the work; it does not generate countless children, as do printed books. It alone remains noble, it alone confers honour on its author and remains precious

and unique, and does not beget children equal to Painting itself. And it is more excellent by reason of this quality than by reason of those which are everywhere proclaimed. Now do we not see the great monarchs of the East going about veiled and covered up from the fear of diminishing their glory by the manifestation and the divulgation of their presence? and do we not see that the pictures which represent the divine deity are kept covered up with inestimable veils? their unveiling is preceded by great sacred solemnities with various chants and diverse music, and when they are unveiled, the vast multitude of people who are there flocked together, immediately prostrate themselves and worship and invoke those whom such pictures represent that they may regain their lost holiness and win eternal salvation, just as if the deity were present in the flesh. This does not occur in any other art or work of man. And if you say that is owing to the nature of the subject depicted rather than to the genius of the painter, the answer is that the mind of man could satisfy itself equally well in this case, were the man to remain in bed and not make pilgrimages to places which are perilous and hard of access, as we so often see is the case. But if such pilgrimages continually exist, what is then their unnecessary cause? You will certainly admit that it is an image of this kind, and all the writings in the world could not succeed in representing the semi-

Painting blance and the power of such a deity. Therefore it appears that this deity takes pleasure in the pictures and is pleased that it should be loved and revered, and takes a greater delight in being worshipped in that rather than in any other semblance of itself, and by reason of this it bestows grace and gifts of salvation according to the belief of those who meet together in such a place.

8.

Painting excels all the Works of Man

The eye, which is called the window of the soul, is the principal means by which the brain can most abundantly and splendidly contemplate the infinite works of nature; and the ear is the next in order, which is ennobled by hearing the recital of the things seen by the eye. If you, historians and poets, or mathematicians, had not seen things with the eyes, you could not report of them in writing. If thou, O poet, dost tell a story with thy painting pen, the painter will more easily give satisfaction in telling it with his brush and in a manner less tedious and more easily understood. And if thou callest painting mute poetry, the painter can call poetry blind painting. Now consider which is the greater loss, to be blind or dumb? Though the poet is as free as the painter in his creations and compositions, they are not so satisfactory to men as paintings, because if poetry is able to describe forms, actions and places in words, the painter deals with the very sem-

blance of forms in order to represent them. Now Paint-
consider which is nearer to man, the name of man ing
or the image of man? The name of man varies excels
in diverse countries, but death alone changes his all the
form. If thou wast to say that painting is more Works
lasting, I answer that the works of a coppersmith,
which time preserves longer than thine or ours,
are more eternal still. Nevertheless there is but
little invention in it, and painting on copper with
colours of enamel is far more lasting.

We by our art can be called the grandsons of
God. If poetry deals with moral philosophy, paint-
ing deals with natural philosophy; if poetry de-
scribes the action of the contemplative mind,
painting represents the effect in motion of the
action of the mind; if poetry terrifies people with
the pictures of Hell, painting does the same by
depicting the same things in action. If a poet chal-
lenges the painter to represent beauty, fierceness,
or an evil, an ugly or a monstrous thing, whatever
variety of forms he may produce in his way, the
painter will cause greater satisfaction. Are there
not pictures to be seen so like reality that they
deceive men and animals?

9.

The imagination is to the effect as the shadow to the
opaque body which causes the shadow, and the
proportion is the same between poetry and paint-
ing. Because poetry produces its results in the

Painting creates Reality imagination of the reader, and painting produces them in a concrete reality outside the eye, so that the eye receives its images just as if they were the works of nature; and poetry produces its results without images, and they do not pass to the brain through the channel of the visual faculty, as in painting.

10.

Painting represents to the brain the works of nature with greater truth and accuracy than speech or writing, but letters represent words with greater truth, which painting does not do. But we say that the science which represents the works of nature is more wonderful than that which represents the works of the artificer, that is to say, the works of man, which consist of words—such as poetry and the like—which issue from the tongue of man.

II.

The Painter goes to Nature Painting ministers to a nobler sense than poetry, and depicts the forms of the works of nature with greater truth than poetry; and the works of nature are nobler than the words which are the works of man, because there is the same proportion between the works of man and those of nature as there is between man and God. Therefore it is a more worthy thing to imitate the works of nature, which are the true images embodied in reality, than to imitate the actions and the words of men.

And if thou, O poet, wishest to describe the works of nature by thine unaided art, and dost Paint-represent various places and the forms of diverse objects, the painter surpasses thee by an infinite degree of power; but if thou wishest to have recourse to the aid of other sciences, apart from poetry, they are not thy own; for instance, astrology, rhetoric, theology, philosophy, geometry, arithmetic and the like. Thou art not then a poet any longer. Thou transformest thyself, and art no longer that of which we are speaking. Now seest thou not that if thou wishest to go to nature, thou reachest her by the means of science, deduced by others from the effects of nature? And the painter, through himself alone, without the aid of aught appertaining to the various sciences, or by any other means, achieves directly the imitation of the things of nature. By painting, lovers are attracted to the images of the beloved to converse with the depicted semblance. By painting whole populations are led with fervent vows to seek the image of the deities, and not to see the books of poets which represent the same deities in speech; by painting animals are deceived. I once saw a picture which deceived a dog by the image of its master, which the dog greeted with great joy; and likewise I have seen dogs bark at and try to bite painted dogs; and a monkey make a number of antics in front of a painted monkey. I have seen swallows fly and alight on painted iron-

Supe- works which jut out of the windows of buildings.
riority

of

Paint- Painting includes in its range the surface, colour
ing to and shape of anything created by nature; and
Philo- philosophy penetrates into the same bodies and
sophy takes note of their essential virtue, but it is not
satisfied with that truth, as is the painter, who
seizes hold of the primary truth of such bodies
because the eye is less prone to deception.

12.

Paint- Poetry surpasses painting in the representation
ing & of words, and in the representation of actions
Poe- painting excels poetry; and painting is to poetry
try as actions are to words, because actions depend
on the eye and words on the ear; and thus the
senses are in the same proportion one to another
as the objects on which they depend; and on this
account I consider painting to be superior to poe-
try. But since those who practised painting were
for long ignorant as to how to explain its theory,
it lacked advocates for a considerable time; be-
cause it does not speak itself, but reveals itself
and ends in action, and poetry ends in words.
which in its vainglory it employs for self-praise.

13.

What poet will place before thee in words, O

lover, the true semblance of thy idea with such Paint-truth as will the painter? Who is he who will show ing is thee rivers, woods, valleys and plains, which will Mute recall to thee the pleasures of the past, with greater Poe-truth than the painter? And if thou sayest that try painting is mute poetry in itself, unless there be some one to speak for it and tell what it represents—seest thou not, then, that thy book is on a lower plane? Because even if it have a man to speak for it, nothing of the subject which is related can be seen, as it is seen when a picture is explained. And the pictures, if the action represented and the mental attributes of the figures are in the true proportion one to another, will be understood in the same way as if they spoke.

15.

Painting is mute poetry, and poetry is blind painting. Therefore these two forms of poetry, or rather these two forms of painting, have exchanged the senses through which they should reach the intellect. Because if they are both of them painting, they must reach the brain by the noblest sense, namely, the eye; if they are both of them poetry, they must reach the brain by the less noble sense, that is, the hearing. Therefore we will appoint the man born deaf to be judge of painting, and the man born blind to be judge of poetry; and if in the painting the movements are appropri-

Painting is Mute Poetry

ate to the mental attributes of the figures which are engaged in any kind of action, there is no doubt that the deaf man will understand the action and intentions of the figures, but the blind man will never understand what the poet shows, and what constitutes the glory of the poetry; since one of the noblest functions of its art is to describe the deeds and the subjects of stories, and adorned and delectable places with transparent waters in which the green recesses of their course can be seen as the waves disport themselves over meadows and fine pebbles, and the plants which are mingled with them, and the gliding fishes, and similar descriptions, which might just as well be made to a stone as to a man born blind, since he has never seen that which composes the beauty of the world, that is, light, darkness, colour, body, shape, place, distance, propinquity, motion and rest, which are the ten ornaments of nature.

But the deaf man, lacking the less noble sense, although he has at the same time lost the gift of speech, since never having heard words spoken he never has been able to learn any language, will nevertheless perfectly understand every attribute of the human body better than a man who can speak and hear; and likewise he will know the works of painters and what is represented in them, and the action which is appropriate to such figures.

Painting is mute poetry, and poetry is blind painting, and both imitate nature to the best of their powers, and both can demonstrate moral principles, as Apelles did in his *Calumny*. And since painting ministers to the most noble of the senses, the eye, a harmonious proportion ensues from it, that is to say, that just as from the concord of many diverse voices at the same moment there ensues a well-proportioned harmony which will please the sense of hearing to such an extent that the listeners in dizzy admiration are like men half ravished of their senses, still greater will be the effect of the beautiful proportions of a celestial face in a picture from whose proportions a harmonious concord will ensue, which delights the eye in one moment, just as music delights the ear. And if this harmonious beauty is shown to one who is the lover of the woman from whom such great beauty has been copied, he will most certainly be struck dizzy with admiration and incomparable joy superior to that afforded by all the other senses.

But with regard to poetry, which in order to afford the representation of a perfect beauty is obliged to describe each separate part in detail,—a representation which in painting produces the harmony described above,—no further charm is produced than would occur in music if each voice

Painting is Mute Poetry were to be heard separately at various intervals of time, whence no concord would ensue; just as if we wished to show a countenance bit by bit, always covering up the parts already shown, forgetfulness would prevent the production of any harmonious concord, since the eye could not apprehend the parts with its visual faculty at the same moment. The same thing occurs in the beauty of any object created by the poet, for as its parts are related separately, at separate times the memory receives no harmony from it.

17.

The Im- pres- sion of Paint- ing Painting reveals itself immediately to thee with the semblance given it by its creator, and affords to the chief of the senses as great a delight as any object created by nature. And the poet in this case reveals the same objects to the brain by the channel of the hearing, the inferior sense, and affords the eye no more pleasure than it derives from anything which is related. Now consider what a difference there is between hearing the recital of a thing which in the course of time gives pleasure to the eye, and perceiving it with the same velocity with which we apprehend the works of nature.

And in addition to the fact that a long interval of time is necessary to read the works of the poets, it often occurs that they are not understood, and it is necessary to make diverse com-

ments on them, and it is exceedingly rare that the commentators are agreed as to the meaning of the poet; and often the readers peruse but a small portion of their works, owing to lack of time. But the works of the painter are immediately understood by those who behold them.

18.

Painting manifests its essence to thee in an instant of time,—its essence by the visual faculty, the very means by which the perception apprehends natural objects, and in the same duration of time,—and in this space of time the sense-satisfying harmony of the proportion of the parts composing the whole is formed. And poetry apprehends the same things, but by a sense inferior to that of the eyesight, which bears the images of the objects named to the perception with greater confusion and less speed. Not in such wise acts the eye (the true intermediary between the object and the perception), for it immediately communicates the true semblance and image of what is represented before it with the greatest accuracy; whence that proportion arises called harmony, which with sweet concord delights the sense in the same way as the harmony of diverse voices delights the ear; and this harmony is less worthy than that which delights the eye, because for every part of it that is born a part dies, and it dies as fast as it is born. This

The Im- pres- sion of Paint- ing cannot occur in the case of the eye; because if thou presentest a beautiful living mortal to the eye, composed of a harmony of fair limbs, its beauty is not so transient nor so quickly destroyed as that of music; on the contrary it has permanent duration, and allows thee to behold and consider it; and it is not reborn as in the case of music which is played many times over, nor will it weary thee; on the contrary, thou becomest enamoured with it, and the result it produces is that all the senses, together with the eye, would wish to possess it, and it seems that they would wish to compete with the eye: it appears that the mouth desires it for itself, if the mouth can be considered as a sense; the ear takes pleasure in hearing its beauty; the sense of touch would like to penetrate into all its pores; the nose also would like to receive the air it exhales.

Time in a few years destroys this harmony, but this does not occur in the case of beauty depicted by the painter, because time preserves it for long; and the eye, as far as its function is concerned, receives as much pleasure from the depicted as from the living beauty; touch alone is lacking to the painted beauty,—touch, which is the elder brother of sight; which after it has attained its purpose does not prevent the reason from considering the divine beauty. And in this case the picture copied from the living beauty acts for the greater part as a substitute; and the

description of the poet cannot accomplish this, The —the poet who is now set up as a rival to the Im-painter, but does not perceive that time sets a pres-division between the words in which he describes sion of the various parts of the beauty, and that forget- Paint-fulness intervenes and divides the proportions ing which he cannot name without great prolixity; he cannot compose the harmonious concord which is formed of divine proportions. And on this account beauty cannot be described in the same space of time in which a painted beauty can be seen, and it is a sin against nature to attempt to transmit by the ear that which should be transmitted by the eye.

What prompts thee, O man, to abandon thy habitations in the city, to leave thy parents and friends, and to seek rural spots in the mountains and valleys, if it be not the natural beauty of the world, which, if thou reflectest, thou dost enjoy solely by means of the sense of sight? And if the poet wishes to be called a painter in this connection also, why didst thou not take the descriptions of places made by the poet and remain at home without exposing thyself to the heat of the sun? Oh! would not this have been more profitable and less fatiguing to thee, since this can be done in the cool without motion and danger of illness? But the soul could not enjoy the benefit of the eyes, the windows of its dwelling, and it could not note the character of joyous

The places; it could not see the shady valleys watered
Im- by the sportiveness of the winding rivers; it could
pres- not see the various flowers, which with their co-
sion of lours make a harmony for the eye, and all the
Paint- other objects which the eye can apprehend. But
ing if the painter in the cold and rigorous season
of winter can evoke for thee the landscapes, va-
riegated and otherwise, in which thou didst ex-
perience thy happiness; if near some fountain
thou canst see thyself, a lover with thy beloved,
in the flowery fields, under the soft shadow of
the budding boughs, wilt thou not experience
a greater pleasure than in hearing the same ef-
fect described by the poet?

Here the poet answers, admitting these argu-
ments; but he maintains that he surpasses the
painter, because he causes men to speak and rea-
son in diverse fictions, in which he invents things
which do not exist, and that he will incite men
to take arms, and describe the heavens, the stars,
nature, and the arts and everything.

To which we reply that none of these things
of which he speaks is his true profession; but if
he wishes to speak and make orations, it can be
shown that he is surpassed by the orator in this
province; and if he speaks of astrology, that he
has stolen the subject of the astrologer; and in
the case of philosophy, of the philosopher; and
that in reality poetry has no true position and
merits no more consideration than a shopkeeper

who collects goods made by various workmen. As soon as the poet ceases to represent by means of words the phenomena of nature, he then ceases to act as a painter, because if the poet leaves such representation and describes the flowery and persuasive speech of him to whom he wishes to give speech, he then becomes an orator, and neither a poet nor a painter; and if he speaks of the heavens he becomes an astrologer, and a philosopher and a theologian if he discourses of nature or God; but if he returns to the description of any object he would rival the painter, if with words he could satisfy the eye as the painter does.

But the spirit of the science of painting deals with all works, human as well as divine, which are terminated by their surfaces, that is, the lines of the limits of bodies by means of which the sculptor is required to achieve perfection in his art. She with her fundamental rules, i.e. drawing, teaches the architect how to work so that his building may be pleasant to the eye; she teaches the makers of diverse vases, the goldsmiths, weavers, embroiderers; she has found the characters with which diverse languages find expression; she has given symbols to the mathematicians; she has taught geometry its figures, and instructed the astrologers, the makers of machines and engineers.

19.

The poet says that his science consists of inven-

Poet and Painter

tion and rhythm, and this is the simple body of poetry, invention as regards the subject matter and rhythm as regards the verse, which he afterwards clothes with all the sciences. To which the painter rejoins that he is governed by the same necessities in the science of painting, that is to say, invention and measure (fancy as regards the subject matter which he must invent, and measure as regards the matters painted), so that they may be in proportion, but that he does not make use of three sciences; on the contrary it is rather the other sciences that make use of painting, as, for instance, astrology, which effects nothing without the aid of perspective, the principal link of painting, — that is, mathematical astronomy and not fallacious astrology (let those who by reason of the existence of fools make a profession of it, forgive me). The poet says he describes an object, that he represents another full of beautiful allegory; the painter says he is capable of doing the same, and in this respect he is also a poet. And if the poet says he can incite men to love, which is the most important fact among every kind of animal, the painter can do the same, all the more so because he presents the lover with the image of his beloved; and the lover often does with it what he would not do with the writer's delineation of the same charms, i.e. talk with it and kiss it; so great is the painter's influence on the minds of men that he incites them to love and

become enamoured of a picture which does not Poet
represent any living woman. and

And if the poet pleases the sense by means of Paint-the ear, the painter does so by the eye, which is er the superior sense. I will enlarge no further on this theme save to say that if a good painter were to represent the fury of a battle, and if the poet were to describe one, and both representations were put before the public together, you will see before which of the two most of the spectators will stop, to which of the two they will pay most attention, which of the two will be the most praised and give the greater satisfaction. Without any doubt, the painting, being infinitely the most beautiful and useful, will please the most. Write the name of God in some spot, and set up His image opposite, and you will see which will be the most reverenced. While painting embraces in itself all the forms of nature, you have nothing save words, which are not universal, like forms. If you have the effects of the representation, we have the representation of the effects. Take a poet who describes the charms of a woman to her lover, and a painter who represents her, and you will see whether nature leads the enamoured critic. Certainly the proof should rest on the verdict of experience. You have classed painting among the mechanical arts, but, truly, if painters were as apt at praising their own works in writing as you are, it would not lie under the stigma

**Poet
and
Paint-
er** of so unhonoured a name. If you call it mechanical because it is by manual work and that the hand represents the conception of the imagination, you writers put down with the pen the conceptions of your mind. And if you say that it is mechanical because it is done for money, who is more guilty of this error — if error it can be called — than you? If you lecture in the schools, do you not go to whomsoever rewards you most? Do you perform any work without some pay? Although I do not say this to blame such opinions, because all labour expects its reward; and if a poet were to say: "I will devise with my fancy a work which shall be pregnant with meaning," the painter can do the same, as Apelles did when he painted *The Calumny*.

20.

**King
Mat-
thias
& the
Poet** On the birthday of King Matthias, a poet brought him a work made in praise of the royal birthday for the benefit of the world, and a painter presented him with a portrait of his lady-love. The king immediately shut the book of the poet and turned to the picture, and remained gazing on it with profound admiration. Then the poet, greatly slighted, said: "O king, read, read, and thou wilt hear something of far greater substance than a dumb picture!" Then the king, hearing himself blamed for contemplating a mute object, said: "O poet, be silent, thou knowest not what thou

sayest; this picture gratifies a nobler sense than King thy work, which is for the blind. Give me an object which I can see and touch and not only hear, and blame not my choice in having placed thy work beneath my elbow, while I hold the work of the painter with both my hands before my eyes, because my very hands have chosen to serve a worthier sense than that of hearing.

“ And as for myself I consider that the same proportion exists between the art of the painter and that of the poet as that which exists between the two senses on which they respectively depend.

“ Knowest thou not that our soul is composed of harmony, and harmony can only be begotten in the moments when the proportions of objects are simultaneously visible and audible? Seest thou not that in thine art there is no harmony created in a moment, and that, on the contrary, each part follows from the other in succession, and the second is not born before its predecessor dies. For this reason I consider thy creation to be considerably inferior to that of the painter, simply because no harmonious concord ensues from it. It does not satisfy the mind of the spectator or the listener, as the harmony of the perfect features which compose the divine beauty of this face which is before me; for the features united all together simultaneously afford me a pleasure which I consider to be unsurpassed by any other thing on the earth which is made by man.”

Value
of the
Visible
Uni-
verse

21.

There is no one so foolish who if offered the choice between everlasting blindness and deafness would not immediately elect to lose both his hearing and sense of smell rather than to be blind. Since he who loves his sight is deprived of the beauty of the world and all created things, and the deaf man loves only the sound made by the percussion of the air, which is an insignificant thing in the world.

Thou sayest that science increases in nobility in proportion as the subjects with which it deals are more elevated, and, for this reason, a false rendering of the being of God is better than the portrayal of a less worthy object; and on this account we will say that painting, which deals alone with the works of God, is worth more than poetry, which deals solely with the lying imaginings of human devices.

22.

Poet
and
Paint-
er

Thou sayest, O painter, that worship is paid to thy work, but impute not this power to thyself, but to the subject which such a picture represents. Here the painter makes answer: O thou poet, who sayest that thou also art an imitator, why dost thou not represent with thy words objects of such a nature that thy writings which contain these words may be worshipped also? But nature has favoured the painter more than the poet.

and it is fair that the works of the more greatly Poet favoured one should be more honoured than and those of the less favoured one. Therefore let us Paint-praise him who with words satisfies the hearing, er and him who by painting affords perfect content to the eyes; but let the praise given to the worker in words be less, inasmuch as they are accidental and created by a less worthy author than the works of nature of which the painter is the imitator. And the existence of these works is confined within the forms of their surfaces.

23.

Since we have concluded that the utmost extent of the comprehension of poetry is for the blind, and that of painting for the deaf, we will say that the value of painting exceeds that of poetry in proportion as painting gratifies a nobler sense than poetry does, and this nobility has been proved to be equal to that of three other senses, because we elect to lose our sense of hearing, smell and touch rather than our eyesight. For he who loses his sight is deprived of the beauty of the universe, and is like to one who is confined during his lifetime in a tomb, in which he enjoys life and motion.

Now seest thou not that the eye comprehends the beauty of the whole world? It is the head of astrology; it creates cosmography; it gives counsel and correction to all the human arts; it impels

Poet and Painter men to seek diverse parts of the world; it is the principle of mathematics; its science is most certain; it has measured the height and the magnitude of the stars; it has discovered the elements and their abodes; it has been able to predict the events of the future, owing to the course of the stars; it has begotten architecture and perspective and divine painting. O most excellent above all the things created by God! What praise is there which can express thy nobility? What peoples, what tongues, are they who can perfectly describe thy true working? It is the window of the human body, through which the soul gazes and feasts on the beauty of the world; by reason of it the soul is content with its human prison, and without it this human prison is its torment; and by means of it human diligence has discovered fire by which the eye wins back what the darkness has stolen from it. It has adorned nature with agriculture and pleasant gardens. But what need is there for me to indulge in long and elevated discourse? What thing is there which acts not by reason of the eye? It impels men from the East to the West; it has discovered navigation; and in this it excels nature, because the simple products of the earth are finite and the works which the eye makes over to the hands are infinite, as the painter shows in his portrayal of countless forms of animals, herbs, plants and places.

Music should be given no other name than the sister of painting, inasmuch as it is subject to the hearing, — a sense inferior to the eye, — and it produces harmony by the unison of its proportioned parts, which are brought into operation at the same moment and are constrained to come to life and die in one or more harmonic times; and time is, as it were, the circumference of the parts which constitute the harmony, in the same way as the outline constitutes the circumference of limbs whence human beauty emanates.

But painting excels and lords over music because it does not die as soon as it is born, as occurs with music, the less fortunate; on the contrary, it continues to exist and reveals itself to be what it is, a single surface. O marvellous science, thou givest lasting life to the perished beauty of mortals, which are thus made more enduring than the works of nature, for these undergo forever the changes of time, and time leads them to inevitable old age! And this science is to divine nature as its works are to the works of nature, and on this account it is worshipped.

The most worthy thing is that which satisfies the most worthy sense; therefore painting, which satisfies the sense of sight, is more worthy than

Painting & Music music, which merely satisfies the hearing. The most worthy thing is that which endures longest; therefore music, which is continually dying as soon as it is born, is less worthy than painting, which lasts eternally with the colours of enamel. The most excellent thing is that which is the most universal and contains the greatest variety of things; therefore painting must be set above all other arts, because it contains all the forms which exist and also those which are not in nature, and it should be glorified and exalted more than music, which deals with the voice only.

With it images are made to the gods; around it divine worship is conducted, of which music is a subservient ornament; by means of it pictures are given to lovers of their beloved; by it the beauties are preserved which time, and nature the mother, render fitful; by it we retain the images of famous men. And if thou wert to say that by committing music to writing you render it eternal, we do the same with letters.

Therefore, since thou hast included music among the liberal arts, thou must either exclude it, or include the art of letters. And if thou wast to say : Painting is used by base men, in the same way is music spoilt by him who knows it not. If thou sayest that sciences which are not mechanical are mental, I will answer that painting is mental. And just as music and geometry deal with the proportions of continuous quantities, and arith-

metic deals with discontinuous quantities, painting deals with all quantities and the qualities of the proportions of shadows, lights and distances, Music in its perspective.

26.

The musician says that his art can be compared with that of the painter because by the art of the painter a body of many members is composed, and the spectator apprehends its grace in as many harmonious rhythms . . . as there are times in which it lives and dies; and by these rhythms . . . its grace plays with the soul, which dwells in the body of the spectator. But the painter replies that the body composed of human limbs does not afford the delectable harmonious rhythms in which beauty must live and die, but renders it permanent for many years, and is of such great excellence that it preserves the life of this harmony of concordant limbs which nature with all her force could not preserve.

Painter
er and
Musici-
cian

How many pictures have preserved the semblance of divine beauty of which time or death had in a brief space destroyed the living example; and the work of the painter has become more honoured than that of nature, his master!

If thou, O musician, sayest that painting is mechanical because it is wrought by the work of the hands, music is wrought by the mouth, but

Paint- not by the tasting faculties of the mouth; just
er and as the hand is employed indeed in the case of
Musi- painting, but not for its faculties of touch.

cian Words are less worthy than actions. But thou, writer of science, dost thou not copy with thy hand, and write what is in thy mind, as the painter does? And if thou wast to say that music is formed of proportion, by proportion have I wrought painting, as thou shalt see.

27.

Poet There is the same difference between the representation of the embodied works of the painter and those of the poet as there is between complete and dismembered bodies, because the poet in describing the beauty or the ugliness of any body reveals it to you limb by limb and at diverse times, and the painter shows the whole at the same time. The poet cannot express in words the true likeness of the limbs which compose a whole, as can the painter, who places it before you with the truth of nature. And the same thing befalls the poet as the musician, who sings by himself a song composed for four singers; and he sings the treble first, then the tenor, then the alto and then the bass, whence there results no grace of harmonious concord such as harmonious rhythms produce. And the poet is like a beautiful countenance which reveals itself to you feature by feature, that by so doing you may never be

satisfied by its beauty, which consists of the divine proportion of the limbs united one with another, and these compose of themselves and at one time the divine harmony of this union of limbs, and often deprives the gazer of his liberty. Music, again, by its harmonious rhythm, produces the sweet melodies formed by its various voices, and their harmonious division is lacking to the poet; and although poetry enters into the abode of the intellect by the channel of the hearing, as does music, the poet cannot describe the harmony of music, because it is not in his power to say various things in one and the same moment as can the harmonious concord of painting, which is composed of various members which exist simultaneously, and the beauty of these parts is apprehended at the same time, individually and collectively,—collectively with regard to the whole, individually with regard to the component parts of which the whole is formed; and for this reason the poet is, as far as the representation of bodily things is concerned, greatly inferior to the painter, and as far as invisible things are concerned he is far behind the musician. But if the poet borrows the aid of the other sciences, he can appear at the fair like the other merchants, bearers of divers goods made by many artificers; and the poet does this when he borrows the science of others, such as that of the orator, the philosopher, the astrologer, the cosmographer and

Poet
Painter
and
Musician

Poet Painter and Musician the like; and these sciences are altogether alien to the poet. Therefore he is an agent who brings together diverse persons in order to strike a bargain; and if you wish to know the true function of the poet, you will find that he is no other than an assembler of goods stolen from other sciences, with which he makes a deceptive mixture, or more honestly said, a fictitious mixture. And with regard to this fiction the poet is free to compete with the painter, since it constitutes the least part of the painting.

28.

The painter emulates and competes with nature.

29.

Painting a second Creation He who blames painting blames nature, because the works of the painter represent the works of nature, and for this reason he who blames in this fashion lacks feeling.

30.

The Painter Lord of All If the painter wishes to see beautiful things which will enchant him he is able to beget them; if he wishes to see monstrous things which terrify, or grotesque and laughable things, or truly piteous things, he can dispose of all these; if he wishes to evoke places and deserts, shady or dark retreats in the hot season, he represents them, and likewise warm places in the cold season. If he wishes valleys, if he wishes to descry a great

plain from the high summits of the mountains, The
and if he wishes after this to see the horizon of Paint-
the sea, he can do so; and from the low valleys er
he can gaze on the high mountains, or from the Lord
high mountains he can scan the low valleys and of All
shores; and in truth all quantities of things that
exist in the universe, either real or imaginary, he
has first in his mind and then in his hands; and
these things are of so great excellence that they
beget a harmonious concord in one glance, as do
the things of nature.

31.

We can safely say that those people are under
a delusion who call that painter a good master
who can only draw well a head or a figure. Cer-
tainly there is no great merit if, after studying
a single thing during a whole lifetime, you attain
to a certain degree of perfection in it. But know-
ing, as we do, that painting includes and com-
prehends all the works produced by nature, or
brought about by the fortuitous action of man,
and in fact everything that the eye can see, he
seems to me to be a poor master who can only
do one thing well. Now seest thou not how many
and diverse acts are performed by men? Seest
thou not how many various animals there are,
and likewise trees, plants and flowers; what a va-
riety of mountainous or level places, fountains,
rivers, cities, public and private buildings, instru-

Paint- ments suitable for human use; how many diverse
ing & costumes and ornaments and arts? All these
Na- things should be considered of equal effect and
ture value when used by the man who can be called
a good painter.

32.

If you despise painting, which is the only imitator of the visible works of nature, you will certainly despise a subtle invention which with philosophy and subtle speculation apprehends the qualities of forms, backgrounds, places, plants, animals, herbs and flowers, which are surrounded by light and shade. And truly this is knowledge and the legitimate offspring of nature, because painting is begotten by nature. But to be correct, we will say that it is the grandchild of nature, because all visible things are begotten by nature, and these her children have begotten painting. Therefore we shall rightly say that painting is the grandchild of nature and related to God.

33.

Were a master to boast that he could remember all the forms and effects of nature, he would certainly appear to me to be graced with great ignorance, inasmuch as these effects are infinite and our memory is not sufficiently capacious to retain them. Therefore, O painter, beware lest in thee the lust of gain should overcome the honour of thy art, for the acquisition of honour is a much

greater thing than the glory of wealth. Thus, for Paint-
this and for other reasons which could be given, ing &
first strive in drawing to express to the eye in a Na-
manifest shape the idea and the fancy originally ture
devised by thy imagination; then go on adding
or removing until thou art satisfied; then arrange
men as models, clothed or nude, according to the
intention of thy work, and see that, as regards di-
mension and size, in accordance with perspective
there is no portion of the work which is not in
harmony with reason and natural effects, and this
will be the way to win honour in thy art.

34.

I have myself practised the art of sculpture as Paint-
well as that of painting, and I have practised both ing &
arts in the same degree. I think, therefore, that I Sculp-
can give an impartial opinion as to which of the ture
two is the most difficult: the most perfect re-
quires the greater talent, and is to be preferred.

In the first place sculpture requires a certain
light, that is to say, a light from above, and paint-
ing carries everywhere with it its light and shade;
sculpture owes its importance to light and shade.
The sculptor is aided in this by the relief which
is inherent in sculpture, and the painter places
the light and shade, by the accidental quality of
his art, in the places where nature would natu-
rally produce it. The sculptor cannot diversify his
work by the various colours of objects; painting

Painting & Sculpture is complete in every respect. The perspective of the sculptor appears to be altogether untrue; that of the painter can give the idea of a distance of a hundred miles beyond the picture. The sculptors have no aerial perspective; they can neither represent transparent bodies nor reflections, nor bodies as lustrous as mirrors, and other translucent objects, neither mists nor dark skies, nor an infinity of objects which it would be tedious to enumerate. The advantage [of sculpture] is that it is provided with a better defence against the ravages of time, although a picture painted on thick copper and covered over with white enamel, painted with enamel colours and then put in the fire again and baked, is equally resistant. Such a work as far as permanence is concerned exceeds sculpture. They may say that where an error is made it is not easy to correct it. It is poor reasoning to try and prove that the irremediability of an oversight renders the work more honourable. But I say to you that it will prove more difficult to mend the mind of the master who commits such errors than to repair the work he has spoilt. We know well that an experienced and competent artist will not make mistakes of this kind; on the contrary, acting on sound rules, he will remove so little at a time that his work will be brought to a successful close. Again, the sculptor, if he works in clay or wax, can remove and add, and when the work is finished it can be easily

cast in bronze, and this is the last and most permanent operation of sculpture, inasmuch as that which is merely of marble is liable to destruction, but this is not the case with bronze. Therefore the picture painted on copper, which with the methods of painting can be reduced or added to, is like bronze, which when it was in the state of a wax model could be reduced or added to. And if sculpture in bronze is durable, this copper and enamel work is more imperishable still; and while the bronze remains black and ugly, this is full of various and delectable colours of infinite variety, as we have described above. If you wish to confine the discussion to painting on panel I am content to pronounce between it and sculpture, saying, that painting is the more beautiful, the more imaginative and the more copious, and that sculpture is more durable, but has no other advantage. Sculpture with little labour shows what in painting seems to be a miraculous thing to do: to make impalpable objects appear palpable, to give the semblance of relief to flat objects, and distance to objects that are near. In fact painting is full of infinite resources of which sculpture cannot dispose.

35.

Sculpture is not a science, but a mechanical art, because it causes the brow of the artist who practises it to sweat, and wearies his body; and for

Painting & Sculpture such an artist the simple proportions of the limbs, and the nature of movements and attitudes, are all that is essential, and there it ends, and shows to the eye what it is, and it does not cause the spectator to wonder at its nature, as painting does, which in a plane by its science shows vast countries and far-off horizons.

36.

The only difference between painting and sculpture is that the sculptor accomplishes his work with the greater bodily fatigue, and the painter with the greater mental fatigue. This is proved by the fact that the sculptor in practising his art is obliged to exert his arms and to strike and shatter the marble or other stone, which remains over and above what is needed for the figure which it contains, by manual exercise, accompanied often by profuse sweating, mingled with dust and transforming itself into dirt; and his face is plastered and powdered with the dust of the marble, so that he has the appearance of a baker, and he is covered with minute chips, and it appears as if snow had fallen on him, and his dwelling is dirty and full of chips and the dust of stone.

The contrary occurs in the case of the painter, —we are speaking of excellent painters and sculptors,—since the painter with great leisure sits before his work well clothed, and handles the light brush dipped in lovely colours. He wears

what garments he pleases; his dwelling is full of beautiful pictures, and it is clean; sometimes he has music or readers of diverse and pleasant works, which, without any noise of hammers or other confused sounds, are heard with great pleasure.

37.

There can be no comparison between the talent, art and theory of painting and that of sculpture, which leaves perspective out of account,—perspective which is produced by the quality of the material and not of the artist. And if the sculptor says that he cannot restore the superabundant substance which has once been removed from his work, I answer that he who removes too much has but little understanding and is no master. Because if he has mastered the proportions he will not remove anything unnecessarily; therefore we will say that this disadvantage is inherent in the artist and not in the material. But I will not speak of such men, for they are spoilers of marble and not artists.

Artists do not trust to the judgement of the eye, because it is always deceptive, as is proved by him who wishes to divide a line into two equal parts by the eye, and is often deceived in the experiment; wherefore the good judges always fear—a fear which is not shared by the ignorant—to trust to their own judgement, and on this account they proceed by continually checking the

Painting & Sculpture height, thickness and breadth of each part, and by so doing accomplish no more than their duty. But painting is marvellously devised of most subtle analyses, of which sculpture is altogether devoid, since its range is of the narrowest. To the sculptor who says that his science is more lasting than that of painting, I answer that this permanence is due to the quality of the material and not to that of the sculptor, and the sculptor has no right to give himself the credit for it, but he should let it redound to nature which created the material.

38.

Painting has a wider intellectual range and is more wonderful and greater as regards its artistic resources than sculpture, because the painter is by necessity constrained to amalgamate his mind with the very mind of nature and to be the interpreter between nature and art, making with art a commentary on the causes of nature's manifestations which are the inevitable result of its laws; and showing in what way the likenesses of objects which surround the eye correspond with the true images of the pupil of the eye, and showing among objects of equal size which of them will appear more or less dark, or more or less clear; and among objects equally low which of them will appear more or less low; or among those of the same height which of them will appear more or less high; or among objects of equal size

placed at various distances one from the other, Paint-
why some will appear more clearly than others. ing &
And this art embraces and comprehends within Sculp-
itself all visible things, which sculpture in its po- ture
verty cannot do: that is, the colours of all objects
and their gradations; it represents transparent
objects, and the sculptor will show thee natural
objects without the painter's devices; the painter
will show thee various distances with the grada-
tions of colour producing interposition of the air
between the objects and the eye; he will show
thee the mists through which the character of ob-
jects is with difficulty desried; the rains which
clouded mountains and valleys bring with them;
the dust which is inherent to and follows the con-
tentation between these forces; the rivers which
are great or small in volume; the fishes disport-
ing themselves on the surface or at the bottom of
these waters; the polished pebbles of various col-
ours which are collected on the washed sands at
bottom of rivers surrounded by floating plants
beneath the surface of the water; the stars at di-
verse heights above us; and in the same manner
other innumerable effects to which sculpture can-
not attain.

39.

Sculpture lacks the beauty of colours, the per-
spective of colours; it lacks perspective and it
confuses the limits of objects remote from the

Paint- eye, inasmuch as it represents the limits of ob-
ing & jects that are near in the same way as those of
Sculp- distant objects; it does not represent the air which,
ture interposed between the eye and the remote ob-
ject, conceals that object but as the veils in draped
figures, which reveal the naked flesh beneath
them; it cannot represent the small pebbles of
various colours beneath the surface of the trans-
parent waters.

40.

To the And thou, painter, who desirest to achieve the
Paint- highest excellence in practice, understand that
er unless thou build it on the solid foundations of
nature, thou shalt reap but scant honour and gain
by thy work; and if thy foundation is sound, thy
works shall be many and good, and bring great
honour to thee, and be of great profit.

41.

When the work exceeds the ideal of the artist,
the artist makes scant progress; and when the
work falls short of his ideal it never ceases to im-
prove, unless avarice be an obstacle.

42.

He is a poor disciple who does not surpass his
master.

43.

He is a poor master whose work is exalted in his

own opinion, and he is on the road to perfection Coun-
in art whose work falls short of his ideal. sels

44.

Small rooms or dwellings help the mind to concentrate itself; large rooms are a source of distraction.

45.

The painter should be solitary, and take note of what he sees and reason with himself, making a choice of the more excellent details of the character of any object he sees; he should be like unto the mirror, which takes the colours of the objects it reflects. And this proceeding will seem to him to be a second nature.

46.

In order that the favourable disposition of the mind may not be injured by that of the body, the painter or the draughtsman should be solitary, and especially when he is occupied with those speculations and thoughts which continually rise up before the eye, and afford materials to be treasured by the memory.

If thou art alone, thou wilt belong to thyself only; if thou hast but one companion, thou wilt only half belong to thyself, and ever less in proportion to the indiscretion of his conduct; and if thou hast many companions, thou wilt encounter

The Paint-er in his Studio the same disadvantage. And if thou shouldst say: "I will follow my own inclination, I will withdraw into seclusion in order the better to study the forms of natural objects" — I say thou wilt with difficulty be able to do this, because thou wilt not be able to refrain from constantly listening to their chatter; and, not being able to serve two masters, thou wilt play the part of a companion ill, and still worse will be the evil effect on thy studies in art. And if thou sayest: "I will withdraw myself, so that their words cannot reach and disturb me" — I, with regard to this, say thou wilt be regarded as a madman; but seest thou not that by so doing thou wilt be alone also?

47.

Ad-vice to the Paint-er The mind of the painter must be like unto a mirror, which ever takes the colour of the object it reflects, and contains as many images as there are objects before it. Therefore realize, O painter, that thou canst not succeed unless thou art the universal master of imitating by thy art every variety of nature's forms, and this thou canst not do save by perceiving them and retaining them in thy mind; wherefore when thou walkest in the country let thy mind play on various objects, observe now this thing and now that thing, making a store of various objects selected and chosen from those of lesser value. And thou shalt not do as some painters, who, when weary of plying

their fancy, dismiss their work from their mind Ad-
and take exercise in walking for relaxation, but vice
retain fatigue in the mind, which, though they see to the
various objects, does not apprehend them, but Paint-
often when they meet friends and relations and er
are saluted by them, they are no more conscious
of them than if they had met empty air.

48.

And thou, O painter, seek to bring about that Pre-
thy works may attract those who gaze upon them cepts
and arrest them with great admiration and de-
light; and so that they may not attract and forth-
with repel them, as the air does to him who in the
night season leaps naked from his bed to gaze
upon the cloudy and serene sky and forthwith
is driven back by the cold, and returns to the bed
whence he rose. But let thy works be like the air
which draws men from their beds in the hot sea-
son, and retains them to taste with delight the
cool of the summer; and he who will do well by
his art will not strive to be more skilful than
learned, nor let greed get the better of glory.
Seest thou not among human beauties that it is
the beautiful faces which stop the passers-by,
and not the richness of their ornaments? And this
I say to thee who adornest thy figures with gold
and other rich ornaments: Seest thou not splen-
did, youthful beauties, who diminish their ex-
cellence by the excess and elaboration of their

Pre- ornaments? Hast thou not seen women of the
cepts mountains dressed in rough and poor clothes
richer in beauty than those who are adorned?
Make no use of the affected arrangements and
headdresses such as those adopted by loutish
maids, who, by placing one lock of hair more on
one side than the other, credit themselves with
having committed a great enormity, and think
that the bystanders will forget their own thoughts
to talk of them alone, and to blame them. For
such persons have always the looking-glass and
the comb, and the wind, which ruffles elaborate
headdresses, is their worst enemy. In thy heads let
the hair sport with the wind thou depictest around
youthful countenances, and adorn them grace-
fully with various turns, and do not as those who
plaster their faces with gum and make the faces
seem as if they were of glass. This is a human
folly which is always on the increase, and the
mariners do not satisfy it who bring arabic gums
from the East, so as to prevent the smoothness
of the hair from being ruffled by the wind,—but
they pursue their investigations still further in
this direction.

49.

I cannot but mention among these precepts a
new means of study, which, although it may
seem trivial and almost ridiculous, is nevertheless
extremely useful in arousing the mind to va-

rious inventions. It is as follows: when you look Pre-
at walls mottled with various stains or stones cepts
made of diverse substances, if you have to in-
vent some scene, you may discover on them the
likeness of various countries, adorned with moun-
tains, rivers, rocks, trees, plains, great valleys and
hills in diverse arrangement; again, you may be
able to see battles and figures in action and
strange effects of physiognomy and costumes,
and infinite objects which you could reduce to
complete and harmonious forms. And the effect
produced by these mottled walls is like that of
the sound of bells, in the vibrating of which you
may recognize any name or word you choose
to imagine. I have seen blots in the clouds and in
mottled walls which have stimulated me to the
invention of various objects, and although the
blots themselves were altogether devoid of per-
fection in any one of their parts, they lacked not
perfection in their movement and circumstance.

50.

Obtain knowledge first, and then proceed to prac-
tice, which is born of knowledge.

51.

Knowledge is the captain, and practice the sol-
diers.

The-
ory &
Prac-
tice

52.

The painter who draws by practice and by the

The- eye, without the guide of reason, is like the mir-
ory & ror, which reflects all the objects which are placed
Prac- before it and knows not that they exist.
tice

53.

Many will consider they can reasonably blame me by alleging that my proofs are contrary to the authority of many men held in great esteem by their inexperienced judgements: overlooking the fact that my works are solely and simply the offspring of experience, which is the veritable master.

54.

They who are enamoured of practice without knowledge are like the mariner who puts to sea in a vessel without rudder or compass, and who navigates without a course. Practice should always be based on sound theory; perspective is the guide and the portal of theory, and without it nothing can be well done in the art of painting.

55.

Course The youth should first learn perspective, and of then the measurements of every object; he **Study** should then copy from some good master to accustom himself to well-drawn forms, then from nature to acquire confirmation of the theories he has learnt; then he should study for a time the works of various masters, and finally attain the

habit of putting into practice and producing his Course
art.

56.

of
Study

Mathematics, such as appertain to painting, are necessary to the painter, also the absence of companions who are alien to his studies; his brain must be versatile and susceptible to the variety of objects which it encounters, and free from distracting cares. And if in the contemplation and definition of one subject a second subject intervenes,—as happens when the mind is filled with an object,—in such cases he must decide which of the two objects is the more difficult of definition, and pursue that one until he arrives at perfect clearness of definition, and then turn to the definition of the other. And above all things his mind should be like the surface of the mirror, which shows as many colours as there are objects it reflects; and his companions should study in the same manner, and if such cannot be found he should meditate in solitude with himself, and he will not find more profitable company.

57.

In the study of natural causes and reasons light affords the greatest pleasure to the student; among the great facts of mathematics the certainty of demonstration most signally elevates the mind of the student. Perspective must therefore be

Per-
spec-
tive &
Mathe-
matics

Per- placed at the head of all human study and dis-
spec- cipline, in the field of which the radiant line is
tive & rendered complex by the methods of demonstra-
Mathe- tion; in it resides the glory of physics as well as
mat- of mathematics, and it is adorned with flowers
matics of both these sciences.

The laws of those sciences which are capable of extensive analysis I will confine in brief conclusions, and according to the nature of the material I will interweave mathematical demonstrations, at times deducing results from causes, and at times tracing causes by results. I will add to my conclusions some which are not contained in these, but which can be deduced from them, if the Lord, the Supreme Light, illuminates me, so that I may treat of light.

58.

Of the When you will have thoroughly mastered per-
Me- spective and have learnt by heart the parts and
thod forms of objects, strive when you go about to ob-
of serve. Note and consider the circumstances and
Learn- the actions of men, as they talk, dispute, laugh
ing or fight together, and not only the behaviour of
the men themselves, but that of the bystanders
who separate them or look on at these things;
and make a note of them, in this way, with slight
marks in your little note-book. And you should
always carry this note-book with you, and it
should be of coloured paper, so that what you

write may not be rubbed out; but (when it is used up) change the old for a new one, since these things should not be rubbed out, but preserved with great care, because such is the infinity of the forms and circumstances of objects, that the memory is incapable of retaining them; wherefore keep these sketches as your guides and masters.

Of the
Me-
thod
of
Learn-
ing

59.

These rules are only to be used in correcting the figures, since every man makes some mistakes in his first composition, and he who is not aware of them cannot correct them; but thou being conscious of thine errors wilt correct thy work and amend errors where thou findest them, and take care not to fall into them again. But if thou attemptest to apply these rules in composition thou wilt never finish anything, and confusion will enter into thy work. Through these rules thou shalt acquire a free and sound judgement, since sound judgement and thorough understanding proceed from reason arising from sound rules, and sound rules are the offspring of sound experience, the common mother of all the sciences and arts. Hence if thou bearest in mind the precepts of my rules thou shalt be able, merely by thy corrected judgement, to judge and recognize any lack of proportion in a work, in perspective, in figures or anything else.

Of the I say that the first thing which should be learnt Method is the mechanism of the limbs, and when this knowledge has been acquired their actions should come next, according to the external circumstances of man, and thirdly the composition of subjects, which should be taken from natural actions, made fortuitously according to circumstances; and pay attention to them in the streets and public places and fields, and note them with a brief indication of outlines; that is to say, for a head make an O, and for an arm a straight or a bent line, and the same for the legs and body; and when thou returnest home work out these notes in a complete form. The adversary says that to acquire practice and to do a great deal of work, it is better that the first course of study should be employed in copying diverse compositions done on paper or on walls by various masters, and that thus rapidity of practice and a good method is acquired; to which I reply that this method will be good if it is based on works which are well composed by competent masters; and since such masters are so rare that but few of them are to be found, it is safer to go to nature, than to what to its deterioration is imitated from nature, and to fall into bad habits, since he who can go to the fountain does not go to the water-vessel.

Every bough and every fruit is born above the insertion of its leaf, which serves it as a mother, giving it water from the rain and moisture from the dew which falls on it from above in the night, and often it shields them from the heat of the sun's rays. Therefore, O painter, who lackest such rules, be desirous, in order to escape the blame of those who know, of copying every one of thy objects from nature, and despise not study after the manner of those who work for gain.

And you who say that it would be better to see practical anatomy than drawings of it, would be right if it were possible to see all the things which are shown in such drawings in a single drawing, in which you, with all your skill, will not see nor obtain knowledge of more than a few veins; and to obtain true and complete knowledge of these veins I have destroyed more than ten human bodies, destroying all the other limbs, and removing, down to its minutest particles, the whole of the flesh which surrounds these veins, without letting them bleed save for the insensible bleeding of the capillary veins. And as one body did not suffice for so long a time I had to proceed with several bodies by degrees until I finished by acquiring perfect knowledge, and this I re-

On peated twice to see the differences. And if you
Anatomy have a love for such things you may be pre-
vented by disgust, and if this does not prevent
you, you may be prevented by fear of living at
night in company with such corpses, which are
cut up and flayed and fearful to see; and if this
does not prevent, you may not have a sufficient
mastery of drawing for such a demonstration, and
if you have the necessary mastery of drawing, it
may not be combined with the knowledge of
perspective; and if it were you might lack the
power of geometrical demonstration, and the cal-
culation of forces, and of the strength of the mus-
cles, and perhaps you will lack patience and con-
sequently diligence. As to whether these qualities
are to be found in me or not the hundred and
twenty books I have composed will pronounce
the verdict Yes or No. Neither avarice nor negli-
gence, but time has hindered me in these. Fare-
well.

63.

On I have myself proved that it is useful when you
Study are in bed in the dark to work with the imagina-
tion, summing up the external outlines of the
forms previously studied or other noteworthy
things apprehended by subtle speculation; and
this is a laudable practice and useful in impress-
ing objects on the memory.

We are well aware that faults are more easily recognized in the works of others than in our own, and often in blaming the small faults of others thou wilt ignore great ones in thyself. And to avoid such ignorance see that in the first place thy perspective be sound, then acquire a complete knowledge of the measurements of man and other animals, and of good architecture; that is to say, as far as the forms of buildings and other objects which are on the earth are concerned, and these are infinite in number. The more of them that thou knowest, the more praiseworthy will be thy work; and in cases where thou hast no experience do not refuse to draw them from nature.

Certainly while a man is painting he should not be loth to hear every opinion: since we know well that a man, although he be not a painter, is cognizant of the forms of another man, and will be able to judge them, whether he is hump-backed or has a shoulder too high or too low, or whether he has a large mouth or nose, or other defects. And if we know that men are capable of giving a correct judgement on the works of nature, much more ought we to acknowledge their competence to judge our faults, since we know how greatly a man may be deceived in

Advice his own work; and if thou art not conscious of to the this in thyself, study it in others and thou wilt profit by their faults. Therefore be desirous to bear with patience the opinions of others, and consider and reflect well whether he who blames has good ground or not to blame thee, and if thou thinkest that he has, amend thy work; and if not, act as though thou hadst not heard him, and if he should be a man thou esteemest show him by reasoning where his mistake lies.

66.

There is a certain generation of painters who, owing to the scantiness of their studies, must needs live up to the beauty of gold and azure, and with supreme folly declare that they will not give good work for poor payment, and that they could do as well as others if they were well paid. Now consider, foolish people! Cannot such men reserve some good work and say, "This is costly; this is moderate, and this is cheap work," and show that they have work at every price?

67.

The
Paint-
er and
the
Mirror

When thou wishest to see whether thy picture corresponds entirely with the objects thou hast drawn from nature, take a mirror and let the living reality be reflected in it, and compare the reflection with thy picture, and consider well

whether the subject of the two images are in har- The
mony one with another. Paint-

And above all thou shouldst take the mirror for er and thy master,—a flat mirror, since on its surface the the objects in many respects have the same appear- Mirror
ance as in painting. For thou seest that a painting done on a flat surface reveals objects which appear to be in relief, and the mirror consisting of a flat surface produces the same effect; the painting consists of one plane surface and the mirror likewise; the picture is impalpable, in so far as that which appears to be round and prominent cannot be grasped by the hands, and it is the same with the mirror; the mirror and the painting reveal the semblance of objects surrounded by light and shade; each of them appears to be at a distance from its surface.

And if thou dost recognize that the mirror by means of outlines, lights and shadows gives relief to objects, and since thou hast in thy colours lights and shadows stronger than those of the mirror, there is no doubt that if thou compostest thy picture well, it will also have the appearance of nature when it is reflected in a large mirror.

68.

The mind of the painter should continually trans- The
mute the figure of the notable objects which Painter's
come before him into so many discourses; and Mind
imprint them in his memory and classify them

The and deduce rules from them, taking the place,
Vari- the circumstances, the light and the shade into
ety of consideration.
Nature

69.

I say that the universal proportions must be observed in the height of figures and not in their size, because in the admirable and marvellous things which appear in the works of nature there is no work of whatsoever character in which one detail is exactly similar to another; therefore, O thou imitator of nature, pay heed to the variety of features.

70.

Radically wrong is the procedure of some masters who are in the habit of repeating the same themes in the same episodes, and whose types of beauty are likewise the same, for in nature they are never repeated, so that if all the beauties of equal excellence were to come to life again they would compose a larger population than that now existing in our century, and since in the present century no one person is precisely similar to another, so would it be among the beauties mentioned above.

71.

You must depict your figures with gestures which will show what the figure has in his mind, otherwise your art will not be praiseworthy.

No figure will be admirable if the gesture which expresses the passion of the soul is not visible in it. The most admirable figure is that which best expresses the passion of its mind.

and
Ex-
pres-
sion

The good painter has two principal things to depict: man and the purpose of his mind. The first is easy, the second is difficult, since he must do it by the gestures and movements of the limbs, and this is to be learnt from the dumb, who more than all other men excel in it.

The figures of men have gestures which correspond to what they are doing, so that in seeing them you understand what they are thinking of and saying; and these will be learned well by him who will copy the gestures of the dumb, for they speak by the gestures of their hands, their eyes, their brows and their whole person, when they wish to express the purpose of their mind. And do not mock me because I suggest a dumb teacher for the teaching of an art of which he is himself ignorant, because he will teach you better by his gestures than all the others with their words. And despise not such advice because they are the masters of gesture, and understand at a

The
Dumb
Man
guides
the
Painter

Advice distance what a man is talking of if he suits the
to the actions of the hands to the words.

Painter

75.

It is a great fault in painters to repeat the same movements, the same faces and manners of stuffs in one subject, and to let the greater part of his faces resemble their creator; and this has often been a source of wonder to me, for I have known some who in all their figures seem to have depicted themselves. And in the figures the actions and ways of the painter were visible. And if they are prompt in action and in their ways the figures are likewise prompt; and if the painter is pious, the figures with their twisted necks appear pious likewise, and if the painter is lazy the figures seem like laziness personified, and if the painter is deformed so are his figures, and if he is mad it is amply visible in figures of his subjects, which are devoid of intention and appear to be heedless of their action, some looking in one direction, some in another, as though they were dreaming; and therefore every manifestation in the picture corresponds to a peculiarity in the painter. And as I have often thought over the cause of this fault, it seems to me that we must conclude that the spirit which directs and governs everybody is that which forms our intellect, or rather, it is our intellect itself. It has de-

vised the whole figure of man according as it has Advice thought fit that it should be, either with long or to the a short and turned-up nose, and thus it has de- Painter termined its height and figure; and so powerful is the intellect that it gives motion to the arms of the painter and causes him to reproduce himself, since it appears to the spirit that this is the true method of portraying man, and he that does otherwise is in error. And should this spirit find any one who resembles its body, which it has formed, it loves it and becomes enamoured with it, and for this reason many men fall in love and marry wives which resemble themselves, and often the children which are born of the issue resemble their parents.

76.

The painter should portray his figure according to the measurements of a natural body, which shall be of universal proper proportions; in addition to this he should measure himself and see in which part his own figure varies greatly or less from the aforesaid pattern of excellence, and when he has ascertained this he should try his utmost to avoid the defects which exist in his own person in the figures he portrays.

And know that thou must contend with all thy might against this fault inasmuch as it is a defect which originated with the intellect; because the

Advice spirit which governs thy body is that which is to the thine own intellect, and it is inclined to take pleasure in works similar to that which it accomplished in forming its body. And this is the reason that there is no woman, however ugly, who does not find a lover, unless she be monstrous. So remember to ascertain the defects of thy person and to avoid reproducing them in the figures thou dost compose.

77.

That painter who has coarse hands will portray the like in his works, and the same thing will occur in every limb unless he avoids this pitfall by long study. Therefore, O painter, look well on that part of thy person which is most ugly, and by thy study make ample reparation for it, because if thou art bestial, bestial and without intellect will be thy figures, and similarly both the good and ill which thou hast in thee will be partially visible in thy compositions.

78.

Men and words are already made, and thou, painter, who knowest not how to make thy figures move, art like the orator who knows not how to employ his words.

79.

The movements of men are as varied as the cir-

cumstances which pass through their minds; and Power men will be more or less actuated by every cir- of Ex-
cumstance in itself according as they are more pres-
or less powerful and according to age; because sion in
in the same circumstance an old man or a youth Paint-
will make a different movement. ing

80.

The imagination does not perceive such excellent things as the eye, because the eye receives the images or semblances from objects, and transmits them to the perception, and from thence to the brain; and there they are comprehended. But the imagination does not issue forth from the brain, with the exception of that part of it which is transmitted to the memory, and in the brain it remains and dies, if the thing imagined is not of high quality. And in this case poetry is formed in the mind or in the imagination of the poet, who depicts the same objects as the painter, and by reason of the work of his fancy he wishes to rival the painter, but in reality he is greatly inferior to him, as we have shown above. Therefore with regard to the work of fancy we will say that there is the same proportion between the art of painting and that of poetry as exists between the body and the shadow proceeding from it, and the proportion is still greater, inasmuch as the shadow of such a body at least penetrates to

Power the brain through the eye, but the imaginative of Ex- embodiment of such a body does not enter into pres- the eye, but is born in the dark brain. Ah! What sion in a difference there is between imagining such a Paint- light in the darkness of the brain and seeing it ing in concrete shape set free from all darkness.

If thou, O poet, dost represent the battle and its bloodshed enveloped by the obscure and dark air, amid the smoke of the terrifying and deadly engines, together with the thick dust which darkens the air, and the flight in terror of wretches panic-stricken by horrible death; in this case the painter will surpass thee, because thy pen will be used up before thou hast scarcely begun to describe what the art of the painter represents for thee immediately. And thy tongue shall be parched with thirst and thy body worn out with weariness and hunger before thou canst show what the painter will reveal in an instant of time. And in this painting there lacks nothing save the soul of the things depicted, and every body is represented in its entirety as far as it is visible in one aspect; and it would be a long and most tedious matter for poetry to enumerate all the movements of each soldier in such a war, and the parts of their limbs and their ornaments which the finished picture places before you with great accuracy and brevity; and to such a representation nothing is wanting save the noise of the engines, and the cries of the terrifying victors,

and the screams and lamentations of those awe-stricken; neither again can the poet convey these things to the hearing.

We will say, therefore, that poetry is an art which is supremely potent for the blind, and the painting has the same result on the deaf. Painting, therefore, excels poetry in proportion as the sense to which it ministers is the nobler. The only true function of the poet is to represent the words of people who talk among each other, and these alone he represents to the hearing as if they were natural, because they are natural in themselves and created by the human voice; and in all other respects he is surpassed by the painter. Still more, incomparably greater is the width of range of painting than that of speech, because the painter can accomplish an infinity of things which speech will not be able to name for want of the appropriate terms. And seest thou not that if the painter wishes to depict animals and devils in Hell with what richness of invention he proceeds?

And I once chanced to paint a picture which represented a divine subject, and it was bought by the lover of her whom it represented, and he wished to strip it of its divine character so as to be able to kiss it without offence. But finally his conscience overcame his desire and his lust and he was compelled to remove the picture from his house. Now go thou, poet, and describe a beautiful woman without giving the semblance of

Power the living thing, and with it arouse such desire
of Ex- in men! If thou sayest: I will describe then Hell
pres- and Paradise and other delights and terrors,—the
sion in painter will surpass thee, because he will set be-
Paint- fore thee things which in silence will [make thee]
ing give utterance to such delight, and so terrify thee
as to cause thee to wish to take flight. Painting
stirs the senses more readily than poetry. And if
thou sayest that by speech thou canst convulse a
crowd with laughter or tears, I rejoin that it is not
thou who stirrest the crowd, it is the pathos of
the orator, and his mirth. A painter once painted
a picture which caused everybody who saw it
to yawn, and this happened every time the eye
fell on the picture, which represented a person
yawning. Others have painted libidinous acts of
such sensuality that they have incited those who
gazed on them to similar acts, and poetry could
not do this.

And if you write the description of certain de-
ties the description will not be held in the same
veneration as the picture of the Deity, because
prayers and votive offerings will always be made
to the picture, and many peoples from diverse
countries and from across the Eastern seas will
flock to it. And they will invoke the picture, and
not the writing, for succour. Who is he who
would not lose hearing, smell and touch rather
than sight? Because he who loses his sight is like
the man who is driven from the world, because

he sees neither it nor anything else any longer. Land-
And this life becomes the sister of Death. scapes

81.

I have been to see a variety of cloud effects, and lately over Milan towards Lake Maggiore I saw a cloud in the form of a huge mountain full of fiery scales, because the rays of the sun, which was already reddening and close to the horizon, tinged the cloud with its own colour. And this cloud attracted to it all the lesser clouds which were around it; and the great cloud did not move from its place, but on the contrary retained on its summit the light of the sun till an hour and a half after nightfall, such was its immense size; and about two hours after nightfall a great, an incredibly tremendous wind arose.

82.

The grasses and plants will be paler in proportion as the soil which nourishes them is leaner and devoid of moisture; the earth is leaner and less rich in moisture on the rocks of which the mountains are formed. And the trees will be smaller and thinner in proportion as they are nearer to the summit of the mountain; and the soil is leaner in proportion as it is nearer to the said summit, and it is richer in proportion as it is nearer the hollow valleys. Therefore, O painter,

Vege- thou shalt represent rocks on the summits of the
tation mountains—for they are composed of rocks—for
of a the greater part devoid of soil, and the plants
Hill which grow there are small and lean and for the
greater part withered and dry from lack of mois-
ture, and the sandy and lean earth is seen through
the faded plants; and the small plants are stunted
and aged, exiguous in size, with short and thick
boughs and few leaves; they cover for the greater
part the rust-coloured and dry roots, and are in-
terwoven in the strata and the fissures of the
rugged rocks, and issue from trunks maimed by
men or by the winds; and in many places you
see the rocks surmounting the summits of the
high mountains, covered with a thin and faded
moss; and in some places their true colour is laid
bare and made visible owing to the percussion
of the lightnings of Heaven, whose course is often
obstructed to the damage of these rocks.

And in proportion as you descend towards the
base of the mountains the plants are more vigor-
ous and their boughs and foliage are denser; and
their vegetation varied according to the various
species of the plants of which such woods are
composed, and their boughs are of diverse ar-
rangement and diverse amplitude of foliage, va-
rious in shape and size; and some have straight
boughs like the cypress, and some have widely
scattered and spreading boughs like the oak and
the chestnut tree, and the like; some have very

small leaves, others have a spare foliage like How
the juniper and the plane tree, and others; some to re-
plants born at the same time are divided by wide pre-
spaces, and others are united with no division of sent
space between them. Night

83.

That which is entirely devoid of light is all dark-
ness; as the night is like this and you wish to re-
present a night subject, represent a great fire, so
that the object which is nearest to the fire may
be tinged with its colour, since the object which
is nearest the fire will participate most in its na-
ture. And as you will make the fire red, all the
objects which it illuminates must be red also, and
those which are farther off from the fire will be
dyed to a greater extent by the dark colour of
night. The figures which are between you and the
fire appear dark from the obscurity of the night,
not from the glow of the firelight, and those which
are at the side are half dark and half ruddy, and
those which are visible beyond the edge of the
flames will be altogether lighted up by the red
glow against a black background. As to their ac-
tion, make those which are near shield themselves
with their hands and cloaks against the intense
heat with averted faces as though about to flee;
with regard to those who are farther off, repre-
sent them chiefly in the act of raising their hands
to their eyes, dazzled by the intense glare.

If you wish to represent well a storm, consider and weigh its effects when the wind, blowing across the surface of the sea and the earth, removes and carries with it those things which are not stable in the universal drift. And in order to represent this storm adequately, you must in the first place represent tattered and rent clouds rushing with the rushing wind, accompanied by sandy dust caught up from the seashores, and boughs and leaves torn up by the force and fury of the wind, and dispersed in the air with many other light objects. The trees and the plants bent towards the earth almost seem as though they wished to follow the rushing wind, with their boughs wrenching from their natural direction and their foliage all disordered and distorted. Of the men who are to be seen, some are fallen and entangled in their clothes and almost unrecognizable on account of the dust, and those who remain standing may be behind some tree, clutching hold of it so that the wind may not tear them away; others, with their hands over their eyes on account of the dust, stoop towards the ground, with their clothes and hair streaming to the wind. The sea should be rough and tempestuous, and full of swirling eddies and foam among the high waves, and the wind hurls the spray through the tumultuous air like a thick and swathing mist.

As regards the ships that are there, you will depict some with torn sails and tattered shreds fluttering through the air with shattered rigging; present some of the masts will be split and fallen, and the ship lying down and wrecked in the raging waves; some men will be shrieking and clinging to the remnants of the vessel. You will make the clouds driven by the fury of the winds and hurled against the high summits of the mountains, and eddying and torn like waves beaten against rocks; the air shall be terrible owing to deep darkness caused by the dust and the mist and the dense clouds.

85.

In the first place you must represent the smoke of the artillery mingled with the air, and the dust, and tossed up by the stampede of the horses and the combatants. And you must treat this confusion in this way: dust being an earthly thing has weight, and although owing to its fineness it is easily lifted up and mingled with the air, it nevertheless falls readily to the earth again, and it is its finest part which rises highest, therefore that part will be the least visible and will seem to be almost of the same colour as the air; the higher the smoke, which is mingled with the dusty air, rises towards a certain height, the more it will seem like a dark cloud, and at the summit the smoke will be more visible than the dust.

How
to de-
scribe
a Bat-
tle

How to de-
scribe a Bat-
tle

The smoke will assume a bluish colour, and the dust will retain its colour: this mixture of air, smoke and dust will seem much brighter on the side whence the light proceeds than on the opposite side; the more densely the combatants are enveloped in this confusion the less distinctly will their lights and shadows be visible. You must cast a glowing light on the countenances and the figures, the atmosphere, the musketeers and those who are near them, and this light diminishes in proportion as the distance between it and its cause increases; and the figures which are between you and the light will appear dark against a bright background, and their legs will be less visible in proportion as they are nearer to the earth, because the dust there is coarsest and thickest. And if you depict horses galloping beyond the crowd, make little clouds of dust, distant one from the other in proportion to the strides made by the horses, and the cloud which is farthest away from the horse will be the least visible; it must be high, scattered and thin, and the nearer clouds will be more conspicuous, smaller and denser. The air must be full of arrows falling in every direction: some flying upwards, some falling, some on the level plane; and smoke should trail after the flight of the cannon-balls. The foremost figures should have their hair and eyebrows clotted with dust; dust must be on every flat portion they offer capable of retaining it.

The conquerors you should make as they charge, How with their hair and the other light things apper- to de- taining to them streaming to the wind, their scribe brows contracted and the limbs thrust forward a Bat- inversely, that is, if the right foot is thrust for- ward the left arm must be thrust forward also. And if you portray a fallen man you must show where he has slipped and been dragged through the blood-stained mud, and around in the wet earth you must show the imprint of the feet of men and the hoofs of horses that have passed there. You will also represent a horse dragging its dead master, and in the wake of the body its track, as it has been dragged along through the dust and the mud; you must make the van- quished and beaten pale, their brows knit and the skin surmounting the brow furrowed with lines of pain. On the sides of the nose there must be wrinkles forming an arch from the nostrils to the eyes and terminating at the commencement of the latter; the nostrils should be drawn up, whence the wrinkles mentioned above; the arched lips show the upper row of teeth. The teeth should be apart, as with crying and lamentation. One hand shields the frightened eyes, the palm being held towards the enemy; the other [hand] rests on the ground to sustain the raised body. You shall portray others shouting in flight with their mouths wide open; you must depict many kinds of weapons lying at the feet of the com-

**How to de-
scribe a Bat-
tle**

batants, such as broken shields, lances, shattered swords and other similar objects; you must portray dead men, some half covered, some entirely covered, by the dust which is mingled with the spilt blood and converted into red mud, and the blood is seen by its colour flowing in a sinuous stream from the body to the dust; others in their death-agony are grinding their teeth, rolling their eyes and clenching their fists against their bodies and their distorted legs. Some might be represented disarmed and thrown by the enemy, turning upon him with teeth and nails to wreak cruel and sharp revenge; a riderless horse might be represented charging with his mane streaming to the wind amidst the enemy, and inflicting great damage with his hoofs. Some maimed man might be seen fallen to the earth and protecting himself with his shield, while the enemy, bending over him, tries to kill him. You might show a number of men fallen together over a dead horse. You would see some of the conquerors leaving the battle and issuing from the crowd, clearing with their hands their eyes and cheeks of the mud made by the watering of their dust-besattered eyes. You would see the reserves standing full of hope and caution, with brows alert, shading them with their hands and gazing through the thick and confused darkness, attentive to the orders of their captain; and likewise the captain, with his staff raised, is rushing towards these re-

serves and points out to them the spot where How
they are needed; and you may add a river with to de-
horses charging into it and stirring up the water scribe
all round them into seething waves of mixed a Bat-
foam and water, which is spurted into the air and tle
among the legs and bodies of the horses. And
there must not be a level place that is not tram-
pled with gory footsteps.

86.

Envy offends with false infamy, that is to say, Envy
by detraction which frightens virtue. Envy must
be represented with the hands raised to heaven
in contempt, because if she could she would use
her power against God. Make her face covered
with a goodly mark; show her as wounded in
the eye by a palm-branch, and wounded in the
ear by laurel and myrtle, to signify that victory
and truth offend her. Draw many thunderbolts
proceeding from her as a symbol of her evil-
speaking. Make her lean and shrivelled up, be-
cause she is continual dissolution. Make her heart
gnawed by a swelling serpent. Make her a quiver
full of tongues for arrows, because she often of-
fends with these. Make her a leopard's skin, be-
cause the leopard kills the lion through envy and
by deceit. Place a vase in her hand full of flow-
ers, and let it be full also of scorpions, toads and
other reptiles. Let her ride Death, because Envy,
which is undying, never wearies of sovereignty.

Envy Make her a bridle loaded with divers arms, because her weapons are all deadly. As soon as virtue is born it begets envy which attacks it; and sooner will there exist a body without a shadow than virtue unaccompanied by envy.

87.

Fame Fame alone rises towards heaven, because God looks with favour on virtuous things; infamy must be represented upside down, because its works are contrary to God and move towards hell. Fame should be depicted covered with tongues instead of with feathers and in the form of a bird.

88.

**The Ex-
pres-
sive
Pic-
ture** A picture or a representation of human figures should be done in such a way that the spectator can easily recognize the purpose that is in their minds by their attitudes. If you have to represent a man of high character, let his gestures be such as harmonize with fair words; likewise, if you have to represent a man of low character, let his gestures be fierce, let him thrust his arms towards the listener, and let his head and chest be thrust forward in front of his feet, following the hands of the speaker. It is thus with a dumb man, who seeing two speakers, although he is deprived of hearing, nevertheless, owing to the attitudes and gestures of the speakers, under-

stands the subject of their argument. I once saw The
at Florence a man who had become deaf by an Ex-
accident, who, if you spoke loud to him, did not pres-
understand you, but if you spoke gently, with-
out making any noise, he understood you merely ^{sive} Pic-
by the movement of the lips. Now you can say,
Does not one who talks loudly move his lips like
one who talks softly? In regard to this I leave
experiment to decide: make a man speak gently
to you and note his lips.

89.

How the ages of man should be depicted: that ^{The} Ages
is, infancy, childhood, youth, manhood, old age, ^{of}
decrepitude. How old men should be depicted ^{of} Man
with lazy and slow movements, their legs bent
at the knees when they stand still, and their feet
placed parallel and apart, their backs bent, their
heads leaning forward and their arms only slight-
ly extended.

How women should be represented in modest
attitudes, their legs close together, their arms
folded together, their heads bent and inclined to
one side. How old women should be represented
with eager, vehement and angry gestures, like
the furies of Hades; the movement of the arms
and the head should be more violent than that
of the legs. Little children with ready and twisted
movements when sitting, and when standing up
in shy and timid attitudes.

You will do as follows if you wish to represent a man talking to a number of people: you must consider the matter which he has to treat, and suit his action to the subject; that is to say, if the matter is persuasive, let his action be appropriate to it; if the matter is argumentative, let the speaker hold one finger of the left hand with two fingers of the right hand, closing the two smaller ones, and with his face turned towards the people and his mouth half open, let him seem to be about to speak, and if he is sitting let him appear as though about to rise, with his head forward; if you represent him standing up, let him lean slightly forward, with his body and head towards the people. You must represent the people silent and attentive, looking at the orator's face with gestures of admiration, and depict some old men with the corners of their mouths pulled down in astonishment at what they hear, their cheeks drawn in and full of lines, their eyebrows raised, and thus causing a number of wrinkles on the forehead; again, some must be sitting with the fingers of their hands clasped and resting on their knee; another, a bowed old man, with one knee crossed over the other, and on the knee let him hold his hand, and let his other elbow rest on his hand, and let the hand support his bearded chin.

91.

You must represent an angry man holding some one by the ear, beating his head against the ground, with one knee on his ribs, his right arm raising his fist in the air; his hair must be dishevelled, his eyebrows low and narrow, his teeth clenched and the two corners of his mouth set, his neck swelled and [his brow] wrinkled and bent forward as he leans over his enemy.

92.

The desperate man must hold a knife and must have torn open his garments, and with one hand he must be tearing open the wound; and you must represent him with extended feet and the legs slightly bent and his body leaning towards the earth, his hair flying and dishevelled.

93.

One who was in the act of drinking leaves his glass in its place, and turns his head towards the speaker. Another, twisting the fingers of his hands together, turns with stern brows to his companions. Another, with his hands spread out, shows their palms, and shrugs his shoulders towards his ears; his mouth expresses amazement. Another speaks in the ear of his neighbour, and he, as he listens to him, turns towards him, lending him his ear, while he holds a knife in one hand and

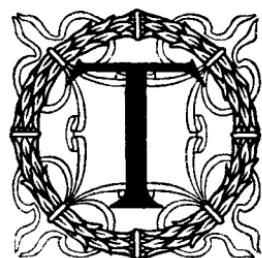
Notes
on the
Last
Supper

Notes a piece of bread in the other, half cut through
on the by the knife. Another, in turning with a knife in
Last his hand, has upset a glass on the table. Another
Supper lays his hands on the table and looks fixedly. An-
other puffs out his cheeks, his mouth full. Another
leans forward to see the speaker, shading his eyes
with his hand. Another draws back behind him
who is leaning forward and sees the speaker be-
tween the wall and the man who is leaning for-
ward.

III
THOUGHTS ON SCIENCE

III THOUGHTS ON SCIENCE

* * *



HERE is no human experience that can be termed true science unless it can be mathematically demonstrated. And if thou sayest that the sciences which begin and end in the mind are true, this cannot be conceded, but must be denied for many reasons, and firstly because in such mental discourses experience is eliminated, and without experience there can be no certainty.

Neces-
sity of
Experi-
ence
in Sci-
ence

2.

You must first propound the theory and then explain the practice.

The-
ory
and
Prac-
tice

3.

Let no man who is not a mathematician read the principles of my work.

4.

In the course of scientific exposition the demonstration of a general rule derived from a previous conclusion is not to be censured.

Cer-
tainty
of
Mathe-
matics

He who blames the supreme certainty of mathematics feeds on confusion and will never be able to silence the contradictions of sophistical sciences which lead to an everlasting clamour.

5.

Of Sci-
ence

There is no certainty [in science] where one of the mathematical sciences cannot be applied, or in those [sciences] which are not in harmony with mathematics.

6.

From
Leo-
nardo's
Dic-
tion-
ary

Syllogism: to speak doubtfully.
Sophism: to speak confusedly; falsehood for truth.
Theory: knowledge without practice.

7.

Defini-
tion of
Sci-
ence

Science is that discourse of the mind which derives its origin from ultimate principles beyond which nothing in nature can be found which forms a part of that science: as in the continued quantity, that is to say, the science of geometry, which, starting from the surfaces of bodies, has its origin in the line, which is the end of the superficies; and we are not satisfied by this, because we know that the line terminates in the point, and the point is that which is the least of things. Therefore the point is the first principle of geometry, and nothing else can exist either

8.

in nature or in the human mind from which the Defini-point can issue. Because if you say that the con-tact between a surface and the extreme point Sci- of an iron instrument is the creation of the point, ence it is not true; but let us say that this point of contact is a superficies which surrounds its centre, and in the centre the point dwells. And such a point is not a part of the substance of the superficies, neither it nor all the points of the universe can, even if combined,—it being granted that they could be combined,—compose any part of a superficies. And granted, as you imagined, a whole composed of a thousand points, if we divide any part of this quantity of a thousand, we can very well say that this part shall equal its whole; and this we can prove by zero, or naught, that is, the tenth figure of arithmetic, which is represented by a cipher as being nothing, and placed after unity it will signify 10, and if two ciphers are placed after unity it will signify 100, and thus the number will go on increasing by ten to infinity whenever a cipher is added, and the cipher in itself is worth nothing more than naught, and all the naughts in the universe are equal to one naught alone, in regard to their substance and value.

9.

Knowledge which is the issue of experience is termed mechanical; that which is born and ends

**True
Sci-
ence
based
on the
Testi-
mony
of the
Senses**

in the mind is termed scientific; that which issues from science and ends in manual work is termed semi-mechanical. But I consider vain and full of error that science which is not the offspring of experience, mother of all certitude, and which does not result in established experience, that is to say, whose origin, middle and end do not pass through any of the five senses. And if we doubt of everything we perceive by the senses, should we not doubt much more of what is contrary to the senses, such as the existence of God and of the soul, and similar matters constantly under dispute and contention?

And it is truly the case that where reason is lacking it is supplemented by noise, which never happens in matters of certainty. On account of this we will say that where there is noise there is no true science, because truth has one end only, which, when it is made known, eternally silences controversy, and should controversy come to life again, it is lying and confused knowledge which is reborn, and not certainty. But true science is that which has penetrated into the senses through experience and silenced the tongue of the disputers, and which does not feed those who investigate it with dreams, but proceeds from the basis of primary truths and established principles successively and by true sequence to the end; as, for instance, what comes under the heading of elementary mathematics,

Science
based
on the
Testi-
mony
of the
Senses

that is, numeration and measurement, termed True arithmetic and geometry, which treat with the highest truth of the discontinued and continued quantity. Here there will be no dispute as to whether twice three make more or less than six, nor whether two angles of a triangle are less than two right angles, but eternal silence shall ignore all controversy, and the devotees of the true science will finish their studies in peace, which the lying mental sciences cannot do. And if thou sayest that true and established science of this kind is a species of mechanics, because they can only be completed by the hand, I will say the same of all the arts, such as that which passes through the hand of the sculptor, which is a kind of drawing, a part of painting; and astrology and the other sciences pass through manual operation, but they are mental in the first place, as painting, which first of all exists in the mind of the composer, and cannot attain to fulfilment without manual labour. With regard to painting, its true and scientific principles must be established: what constitutes a shaded body, what constitutes a primary shade, a derivative shade, what constitutes light: that is, darkness, light, colour, size, shape, position, distance, propinquity, motion, rest, which are comprehended by the mind only, and without manual labour. And this is the science of painting which remains in the mind of those who meditate on it, from which

Me- issues the work in due time, and is infinitely su-
chanics perior to the aforesaid contemplation or science.

10.

Mechanics are the paradise of scientific mathematics, because with them we arrive at the fruits of mathematics.

II.

Me- Experience is indispensable for the making of
chanics any instrument.
and

12.

Expe- Proportion is not only to be found in figures and
rience measurements, but also in sound, weight, time
and position, and in whatever power which ex-
ists.

13.

Rea- The power of the projecting force increases in
son proportion as the object projected is smaller; the
and acceleration of the motion increases to infinity
Expe- proportionately to this diminution. It would fol-
rience low that an atom would be almost as rapid as the
imagination or the eye, which in a moment at-
tains to the height of the stars, and consequently
its voyage would be infinite, because the thing
which can be infinitely diminished would have
an infinite velocity and would travel on an infi-
nite course (because every continuous quantity
is divisible to infinity). And this opinion is con-

demned by reason and consequently by experience.

Thus, you who observe rely not on authors and who have merely by their imagination wished to be interpreters between nature and man, but on those alone who have applied their minds not to the hints of nature but to the results of their experience. And you must realize the deceptiveness of experiments; because those which often appear to be one and the same are often different, as is shown here.

14.

A spherical body which possesses a dense and resisting superficies will move as much in the rebound resulting from the resistance of a smooth and solid plane as it would if you threw it freely through the air, if the force applied be equal in both cases.

Oh, admirable justice of thine, thou first mover! thou hast not permitted that any tone should fail to produce its necessary effects, either as regards order or quantity. Seeing that a force impels an object which it overcomes a distance of one hundred arms' length, and if in obeying this law it meets with resistance, thou hast ordained that the force of the shock will cause afresh a further movement, which in its various bounds recuperates the whole sum of the distance it should have travelled. And if you measure the distance

Effects correspond to the Force of their Cause

Effects accomplished by the aforesaid bounds you will correspond to the Force of their Cause find that they equal the length of distance through which a similar object set in motion by an equal force would travel freely through the air.

15.

Every action must be caused by motion.

16.

Motion is the cause of all life.

17.

Of Force What is force? Force, I say, is a spiritual virtue, an invisible power, which by accidental external violence is caused by motion, and communicated and infused into bodies which are inert by nature, giving them an active life of marvellous power.

18.

What is force? I say that force is a spiritual, incorporate and invisible power, which for a brief duration is produced in bodies that by accidental violence are displaced from their natural state of inertia.

19.

Origin of Force Force arises from dearth or abundance; it is the child of physical motion and the grandchild of spiritual motion, and the mother and origin of gravity. Gravity is confined to the elements of

water and earth, and this force is infinite, because Origin infinite worlds could be moved by it if instruments could be made by which the force could Force be generated. Force, with physical motion, and gravity, with resistance, are the four accidental powers by which all mortal things live and die. Force has its origin in spiritual motion, and this motion, flowing through the limbs of sentient animals, enlarges their muscles, and thus enlarged the muscles are shrunk in length and contract the tendons with which they are connected, and this is the cause of the strength in human limbs. The quality and quantity of the strength of a man can generate a further force, which will increase in proportion to the duration of the motions produced by them.

20.

Gravity, force and casual motion together with As-
resistance are the four external powers by which pects
all the visible actions of man live and die. of
Force

21.

A motion tends to be continuous; a body set in Of motion continues to move as long as the impres- Inertia sion of the motive power lasts in it.

22.

The bird is an instrument which operates by mathematical laws, and man can reproduce all

Can the movements of this instrument, but cannot Man attain to the intensity of its power; and can only imitate succeed in acquiring balance. Thus we will say a Bird's that such an instrument constructed by man lacks Flight? only the soul of the bird, and the soul of man must counterfeit the soul of the bird. The spirit in the frame of the bird doubtless would respond to needs of that frame better than would the spirit of man, whose frame is different, more especially in the almost insensible motions of balance; and since we see the bird make provision for the many sensible varieties of movement, we can conclude by such experience that man can acquire knowledge of the more markedly sensible of these movements, and that he will be able to make ample provision against the destruction of that instrument of which he has made himself the spirit and the guide.

23.

Of Inertia A natural and continuous motion seeks to preserve its course along the line of its starting-point, that is to say, let us call starting-point whatever place in which it varies.

24.

Everything maintains itself by motion. And if it were possible to describe a diameter of air on the sphere of the earth, like to a well, which would extend from one superficies to the other,

and if a weighty body were dropped into this Of
well, the body would seek to remain stationary Inertia
at the centre, but so strong would be the im-
petus that for many years it would prevent it
from so doing.

25.

Impetus is a virtue created by motion and com- Trans-
municated by the motive force to the object mis-
moved, and this object acquires motion in pro- sion of
portion to the energy of the impetus. Motion

26.

No lifeless matter moves of itself, but its motion Matter
is caused from without. is Inert

27.

All elements displaced from their natural place
seek to return to it, and more especially fire,
water and earth.

28.

All matter universally seeks to maintain itself
in its natural state; hence, water in motion seeks
to maintain its course according to the force by
which it is propelled, and if it meets with oppo-
sition it finishes the length of the course it began
in a circular and reflex motion.

29.

Impetus is the impression of motion conveyed by
the motive power to the object moved. Every

Con- impression tends to permanence or seeks to at-
cep- tain permanence. That every impression seeks
tion of after permanence is proved by the impression
En- made by the sun on the eye which regards it,
ergy and in the impression of sound made by the
hammer which strikes a bell. Every impression
seeks after permanence, as is shown in the image
of impetus communicated to the object moved.

30.

A weight seeks to fall to the centre of the earth
by the most direct way.

31.

In Praise of the Sun If you look at the stars, warding off the rays (as may be done by looking through a small hole made by the extreme point of a fine needle placed so as almost to touch the eye), they will appear so small as to seem as though nothing could be smaller; it is owing to their great distance that they appear so small, for many of them are very many times larger than the star which is the earth with its water. Now reflect what appearance this our star must have from so great a distance, and then consider how many stars might be placed—both in longitude and latitude—between those stars which are sown in the dark space. I can never refrain from blaming many of the ancients who said that the size of the sun was no greater than

it appears; among whom was Epicurus. I believe he founded his reasoning on a light placed Praise in our atmosphere equidistant from the centre of the of the earth, which, to any one looking at it, never Sun appears to diminish in size from whatever distance it is seen.

32.

I shall reserve the reasons of its size and power for later. But I greatly marvel that Socrates should have depreciated such a body, and that he should have said that it resembled an incandescent stone; and he who opposed him as regards this error acted rightly. But I wish I had words to blame those who seek to exalt the worship of men more than that of the sun, since in the universe there is no body of greater magnitude and power to be seen than the sun. And its light illuminates all the celestial bodies which are distributed throughout the universe; and the vital spark descends from it, because the heat which is in living beings comes from the soul, and there is no other centre of heat and light in the universe, as will be shown later; and it is certain that those who have elected to worship men as gods—as Jupiter, Saturn, Mars, &c.—have fallen into a profound error, since even if a man were as great as our earth, he would have the appearance of a little star, which appears like a dot in the universe; and moreover these men are mortal, and decay and corrupt in their sepulchres.

Epicurus perhaps saw the shadows of columns on the walls in front of them equal to the diameter of the column which cast the shadow; and since the breadth of the shadows are parallel from beginning to end he considered that he might infer that the sun also was directly opposite to this parallel, and consequently no broader than the column; and he did not perceive that the diminution of the shadow was insensibly small owing to the great distance of the sun. If the sun were smaller than the earth, the stars in a great portion of our hemisphere would be without light —in contradiction to Epicurus, who says the sun is only as large as it appears to be.

Epicurus says the sun is the size it seems to be; hence, as it seems to be a foot in breadth, we must consider that to be its size. It follows that when the moon eclipses the sun, the sun ought not to appear the larger, as it does; hence, the moon being smaller than the sun, the moon must be less than a foot in breadth, and consequently when the earth eclipses the moon it must be less than a foot by a finger's breadth; inasmuch as if the sun is a foot in breadth, and the earth casts a conical shadow on the moon, it is inevitable that the luminous cause of the conical shadow

must be greater than the opaque body which In
causes it. Praise
of the
Sun

35.

Measure how many times the diameter of the sun will go into its course in twenty-four hours. And thus we can see whether Epicurus was correct in saying the sun was only as large as it appeared to be; for as the apparent diameter of the sun is about a foot, and as the sun would go a thousand times into its course in twenty-four hours, it would have travelled a thousand feet, that is, three hundred arms' length, which is the sixth of a mile. Thus the course of the sun during twenty-four hours would have been the sixth part of a mile, and this venerable snail, the sun, would have travelled twenty-five arms' length in an hour.

36.

They say that the sun is not hot because it is not the colour of fire but whiter and clearer. And the answer to this is that when molten bronze is hottest it resembles the colour of the sun, and when it is less hot it has the colour of fire.

The
Sun's
Heat

37.

It is proved that the sun is by nature hot and not cold, as has already been stated. If rays of fire play on a concave mirror when it is cold, the rays refracted by the mirror will be hotter than

The Sun's Heat the fire. The rays emitted from a sphere of glass filled with cold water, which are reflected from a fire, will be warmer than the fire. It follows from these two experiments that the heat of the rays reflected by the mirror or the sphere of cold water are hot by virtue, and not because the mirror or the sphere is hot; and in this case it occurs that the sun, passing through these bodies, heats them by its virtue. And owing to this they have inferred that the sun is not hot,—which by the aforesaid experiments has been proved to be exceedingly hot, by the experiment of the mirror and the sphere, which are cold in themselves, and reflect the hot rays of the fire and render them hotter, because the first cause is hot; and the same thing occurs as regards the sun, which, being hot in itself, and passing through these cold mirrors, refracts great heat. It is not the light of the sun which gives warmth, but its natural heat.

38.

Rays of the Sun The rays of the sun pass through the cold region of the air without any change being effected in their nature, they pass through glasses full of cold water without suffering change; through whatever transparent spot they pass, it is as though they passed through so much air.

39.

Some writers allege that the stars shine of them-

Light
of the
Stars

selves, saying that if Venus and Mercury did not shine of themselves, when their light comes between them and the sun they would darken as much of the sun as they could hide from our eye; this is false, because it is proved that a dark body placed against a luminous body is enveloped and altogether covered by the lateral rays of the remaining part of that body, and thus remains invisible; as may be proved when the sun is seen through the boughs of a leafless tree at a long distance, the boughs do not hide any portion of the sun from our eyes. The same thing occurs with the above-mentioned planets, which, though they have no light in themselves, do not, as has been said, hide any portion of the sun from our eyes.

Second proof. They say that the stars shine most brightly at night in proportion as they are high; and that, if they did not shine of themselves, the shadow cast by the earth between them and the sun would darken them, since they would not see nor be seen by the sun. But these have not taken into consideration that the conical shadow of the moon does not reach many of the stars, and even for those it does reach the shadow is diminished to such an extent that it covers very little of the star, and the remaining part is illumined by the sun.

On the
Na-
ture
of the
Moon

40.

The moon having density and gravity, how does it stand?

41.

i. No very light object is opaque.
ii. Nothing light can remain beneath that which is heavier.
iii. Whether the moon is the centre of its elements or not. And if it has no fixed position like the earth in the centre of its elements, why does it not fall to the centre of our elements? And if the moon is not in the centre of its elements and does not fall, it must then be lighter than any other element. And if the moon is lighter than the other elements, why is it opaque and not transparent?

42.

No body which has density is lighter than the air. Having proved that the part of the moon which shines consists of water which mirrors the body of the sun and reflects for us the splendour it receives from the sun, and that if there were no waves in these waters, it would appear small, but almost as bright as the sun—it must now be shown whether the moon is a heavy or a light body; if it is a heavy body—admitting that from the earth upwards with every grade of distance lightness must increase, so that water is lighter than earth, air is lighter than water, and

fire lighter than air, and so on in succession—On the would seem that if the moon had density, as it Na- has, it must have gravity, and if it has gravity ture the space in which it lies could not contain it, and of the consequently it would fall towards the centre of Moon the universe and be joined to the earth, or if not the moon itself, its waters would fall from the moon and strip it and fall towards the centre, leaving the moon bare and lustreless; whence, as this could not happen, as reason would tell us, it is manifest that the moon is surrounded by its elements, that is to say, water, air and fire, and thus it sustains itself by itself in that space as our earth is suspended with its elements in this part of space; heavy bodies act in their elements there just as other heavy bodies act in ours.

43.

A sound is produced by the movement of the air in friction against a dense body, and should it be produced by two weighty bodies it is owing to the atmosphere which surrounds them, and this friction consumes the bodies, so that it follows that the spheres in their friction, owing to there being no atmosphere between them, do not generate sound. And if this friction were a fact, during the many centuries the spheres have revolved they would be consumed by the immense velocity expended daily; and even if they produce sound, the sound could not travel,

On the
Har-
mony
of the
Spheres

On the because the sound caused by percussion under
Har- water is scarcely noticeable, and it would be less
mony than noticeable in the case of dense bodies. The
of the friction of polished bodies produces no sound, and
Spheres a similar result would be produced in the contact
or friction of the spheres; and if the spheres are
not polished in their contact and friction, it fol-
lows that they are rough.

Again, their contact is not continuous; this be-
ing the case a vacuum is produced, which it has
been proved does not exist in nature. There-
fore we conclude that friction would have con-
sumed the ends of each sphere, and in propor-
tion as a sphere has a greater velocity in the cen-
tre than at the poles, it would be consumed to
a higher degree at the centre than at the poles;
and then the friction would cease, and the sound
would cease also, and the spheres would cease
to revolve unless one sphere revolved eastward
and the other northward.

44.

Worlds gravitate in the midst of their own ele-
ments. The yellow or yolk of an egg remains in
the middle of the albumen without moving on
either side, and is lighter or heavier or equal to
this albumen; and if it is lighter it ought to rise
above all the albumen and stop in contact with
the shell of the egg; and if it is heavier it ought

to sink; and if it is equal to it, it can stand at one of the ends as well as in the centre or below. The Earth

ap-
pears
a Star

45.

The object of my book is to prove that the ocean, with the other seas, by means of the sun causes our world to shine like the moon and to appear as a star to other worlds; and this I will prove.

46.

In your discourse you must prove that the earth is a star like the moon, and thus you will bear witness to the glory of our universe! And thus you must discourse on the size of many stars.

The
Earth
a Star

47.

How the earth is a star. The earth, in the midst of the sphere of water which clothes the greater part of it, taking its light from the sun and shining in the universe like the other stars, shows itself to be a star as well.

48.

First of all define the eye; then show how the twinkling of a star exists really in the eye, and why one star should twinkle more than another, and how the rays of the stars are born in the eye. Say, that if the twinkling of the stars were, as it appears to be, really in the stars, that this twin-

To
prove
the
Earth
a Star

To kling appears to extend in proportion to the body prove of the star. The star, therefore, being larger than the Earth the earth, this motion made in an instant of time would in its velocity double the size of the star. a Star Then prove that the surface of the atmosphere, contiguous to fire and the surface of fire, where it ends, is the point in which the rays of the sun penetrate and bear the image of the celestial bodies which are large when they rise and set, and small when they are on the meridian.

49.

Earth The earth is not the centre of the orbit of the not the sun, nor the centre of the universe, but in the Centre centre of its companion elements and united of Uni- with them; and if any one were to stand on the verse moon when the moon and the sun are beneath us, our earth, with its element of water, would appear and shine for him just as the moon ap-pears and shines for us.

50.

The earth, shining like the moon, has lost a great part of its ancient splendour by the decrease of the waters.

51.

The Nothing is generated in a place where is no sen-
Earth tient vegetable and rational life; feathers grow
a great on birds and change every year; coats grow on
Ani- animals and are changed every year, with some
mal

exceptions, like the lion's beard and the cat's fur, The and such; grass grows in the fields and leaves Earth on the trees; and every year they are renewed a great in great part. Thus we can say that the spirit of Ani-growth is the soul of the earth, the soil its flesh, mal the ordered arrangement of rocks its bones, of which mountains are formed, the tufa its tendons; its blood the veins of water which surround its heart, which is the ocean; its breathing and increase and decrease of blood in the pulses the ebb and flood of the sea; and the heat of the spirit of the world is fire which pervades the earth, and the vital soul dwells in the fires which from various apertures of the earth issue in springs and sulphur minerals and volcanoes, as at Mount Etna in Sicily and in many other places.

52.

The ancients called man the world in miniature, and certainly the name is a happy one, because man being composed of earth, water, air and fire, the body of the earth resembles the body of man. As man has in him bones for the support and framework of his flesh, likewise in the world the rocks are the supports of the earth; as man has in him a pool of blood in which the lungs rise and fall in their breathing, so the body of the earth has its ocean which rises and falls every six hours as if the world breathed; as from the aforesaid pool of blood veins issue which

The ramify throughout the human body, so does the Earth ocean fill the body of the earth with innumerable a great veins of water. The body of the earth lacks sinews, which do not exist because sinews are made An- for movement, and the world being in per- mal-
petual stability no movement occurs, and there being no movement, sinews are not necessary; but in all other points they resemble each other greatly.

53.

Water is the driver of nature.

54.

Expe- In explaining the action of water remember to
rience cite experience first and then reason.
the

Basis
of Sci-
ence

55.

Do not forget that you must put forward pro-positions adducing the above-mentioned facts as illustrations, not as propositions,—that would be too simple.

56.

Water in itself has no stability and cannot move of its own accord, save to descend. Water of its own accord does not cease to move unless it is shut in.

57.

The body of the earth, like the body of animals, is intersected with ramifying veins, which are all

united and constructed for the nourishment and life of the earth and of its creatures.

Water
is the
Blood
of the
World

58.

The water which rises in the mountains is the blood which keeps the mountain alive, and through this conduit or vein, nature, the helper of her creatures, prompt in the desire to repair the loss of the moisture expended, proffers the desired aid abundantly; just as in a stricken spot in man you will see, owing to the aid which is brought, the blood abound under the skin in a swelling, so as to succour the spot which has been stricken; likewise, in the case of the vine, when it is cut at its extremity, nature causes its moisture to rise from the lowest root to the end of the extremity which has been cut, and when this moisture has been expended nature ceases not to supply it with vital moisture to the end of its life.

59.

Water is that which is given to supply vital moisture to this arid earth; and the cause which propels it through its ramifications against the natural course of weighty matter is the same which stirs the humours in every kind of animal body.

Water
on
Moun-
tains

60.

Water, the vital moisture of the earthly machine, moves by reason of its natural heat.

Water of Rivers Rivers, with their ruinous inundations, seem to me the most potent of all causes of terrestrial losses, and not fire, as some have maintained; because the violence of fire is exhausted where there is nothing forthcoming to feed it. The flowing of water, which is maintained by sloping valleys, ends and dies at the lowest depth of the valley; but fire is caused by fuel and the movement of water by incline. The fuel of fire is disunited, and its damage is disunited and isolated, and fire dies where there is no fuel. The incline of valleys is united, and damage caused by water is collective, along with the ruinous course of the river, until with its valley it winds into the sea, the universal base and sole haven of the wandering waters of rivers. But what voice or words shall I find to express the disastrous ravages, the incredible upheavals, the insatiable rapacity, caused by the headstrong rivers? What can I say? Certainly I do not feel myself equal to such a demonstration, yet by experience I will try to relate the process of ruin of the rivers which destroy their banks and against which no mortal bastion can prevail.

62.

The recesses of the bottom of the sea are perennial, the summits of mountains are transitory, whence it follows that the earth will become

spherical and covered with waters, and will be uninhabitable.

Trans-
for-
ma-
tions
in Past
and
Future

63.

The shores of the sea continually increase in soil, towards the middle of the sea; the cliffs and promontories of the sea are continually being ruined and consumed; the mediterranean seas will dry up and all that will remain will be the channel of the greatest river which enters into them; this will flow to the ocean and pour out its waters together with that of all the rivers which are its tributaries.

64.

The subterranean courses of water, like those which are made between the air and the earth, are those which continually consume and deepen the beds of their currents. The earth which is carried by rivers is discharged at the end of their course, that is to say, the earth carried from the highest part of the river's course is discharged at the lowest depth of its course. Where fresh water arises in the sea, the miracle of the creation of an island is manifest, which will be discovered sooner or later in proportion as the quantity of water is greater or less. And an island of this kind is formed by the deposit of earth and stones made by the subterranean current of water in the channels through which it passes.

On the
Earth's
Vibra-
tion

Na-
ture's
Law

65.

Nature never breaks her laws.

66.

Nature is constrained by the cause of her laws
which dwells inborn in her.

67.

Without reason no effect is produced in nature;
understand the reason and you will not need ex-
perience.

68.

Cause
dis-
cov-
ered
by
Effect

Before I proceed further I will make some ex-
periments, because it is my intention to cite the
experiment first and then to demonstrate by rea-
soning how such an experiment must necessarily
take effect in such a manner. And this is the true
rule by which investigations of natural pheno-
mena must proceed; and although nature her-
self begins from the reason and ends in the result,
we must pursue the contrary course and begin,
as I said above, from experience and by it seek
out the reason.

Repe-
tition
of Ex-
peri-
ment

69.

Before deducing a general rule from this case re-
peat the experiment two or three times and see
if the same results are produced.

If several bodies of equal weight and shape are dropped one after another at equal intervals of time, the distances between each successive body will be equally increased.

Exam-
ple
of pre-
ced-
ing
Rule

The experiment to prove the above-mentioned theorem respecting motion must be made thus: Take two balls of equal weight and shape and let them fall from a great height so that when they start falling they touch one another, and let the investigator stand on the ground and watch whether the contact is maintained during their fall. This experiment must be repeated several times, so that the trial may not be marred by any accident and the experiment vitiated and the spectator deceived.

We know definitely that sight is infinitely swift and in an instant of time perceives countless shapes, nevertheless it only sees one object at a time. Let us take an example. You, O reader, will see the whole of this written page at a glance, and you will instantly realize that it is full of various letters, but you will not realize at that moment what these letters are nor what they signify; wherefore you will have to proceed word by word and line by line to take cognizance of these letters. Again, if you wish to reach the summit of a building you must mount step by step,

Neces-
sity of
Ana-
lysis

Neces- otherwise it will be impossible for you to reach
sity of the summit. And therefore I say to you whom
Ana- nature has drawn to this art, if you wish to attain
lysis to a thorough knowledge of the forms of objects,
you will begin by studying the details, and not
proceed to the second until you have committed
the first to memory and mastered it in practice,
and if you do otherwise you will be wasting your
time and protracting your studies. And remem-
ber first of all to acquire diligence, which signifies
speed.

72.

Vision Of the nature of the eye. Here are the forms,
here the colours, here the form of every part of
the universe are concentrated in a point, and that
point is so great a marvel! O marvellous and
stupendous necessity! thou dost compel by thy
law, and by the most direct path, every effect
to proceed from its cause. These things are verily
miracles! I wrote in my Anatomy how in so small
a space the visual faculty can be reproduced and
formed again in its whole expanse.

73.

In many cases one and the same thing is at-
tracted by two violent forces,—necessity and
power. The water falls in rain and by necessity
the earth absorbs the humidity; the sun causes
it to evaporate, not of necessity, but by power.

The pupil of the eye in the air expands and contracts according to every degree of motion made by the sun. And with every dilation or contraction the same object will appear of a different size, although frequently the relative scale of surrounding circumstances does not allow us to perceive these variations in any single object we look at.

The pupil of the eye dilates and contracts in proportion to the variety of bright and dark objects which are reflected in it. In this case nature has afforded compensation to the visual faculty by contracting the pupil of the eye when it is offended by excess of light and by causing it to dilate when offended by excess of darkness, like the opening of the purse. And nature here behaves like the man who has too much light in his house and closes half the window, or more or less of it according to need; and when night comes he opens the window altogether so as to see better inside his house, and nature here adopts a continued process of compensation, by continually regulating and readjusting the expansion and contracting of the pupil, in proportion to the aforesaid obscurity and light which are continually reflected in it.

sur-
round-
ing the
Globe
Spher-
ical

When you collect facts relating to the science of the motion of water, remember to place under every proposition the uses to which it may be applied, in order that this knowledge may not be fruitless.

This is a difficult question to answer, but I will nevertheless state my opinion. Water, which is clothed with air, desires naturally to cleave to its sphere because in this position it is without gravity. This gravity is twofold,—the gravity of the whole which tends to the centre of the elements, and the gravity which tends to the centre of the waters of the spherical orb; if this were not so the water would form a half sphere only, which is the sphere described from the centre upwards. But I see no means in the human mind of acquiring knowledge with regard to this. We must say, as we say of the magnet which attracts iron, that such a virtue is an occult property of which there is an infinite quantity in nature.

In the motion of earth against earth the reper-
cussion of the portion struck is slight.

Water struck by water, eddies in circles around the spot where the shock has taken place.

The reverberation of the voice continues for a

great distance through the air; for a greater distance through fire. The mind travels for a still sur-
greater distance through the universe; but since round-
it is finite it does not penetrate into infinity.

Water
rounding the
Globe
Spherical

79.

If the water which rises on the summits of the mountains comes from the sea, whence it is propelled by its weight to a greater height than that of the mountains, why has this portion of the element of water the power to elevate itself to such an altitude and to penetrate the earth by so great an expenditure of labour and time, when the residue of the element of water, whose only obstacle is the air which does not impede it, is not able to raise itself to a similar altitude? And thou who didst devise this theory, go and study nature, so that thou mayst cease to acquire such opinions of which thou hast made so great a collection, together with the capital and interest which thou dost possess.

80.

The sphere of the earth has gravity which increases in proportion to the lightness of the ele- On the
ment which contains it.

Law
of Gra-
vity

Fire is light in its sphere and its lightness increases in proportion to the weight of the ele-
ment which contains it.

On the Law of Gravity No primary element has gravity or lightness in its own sphere.

81.

The motion made by bodies which possess gravity to the common centre is not produced by the tendency of the body to find this centre, nor is it caused by attraction made by the centre, as by a magnet, drawing the weight towards it.

82.

Why does not the weight remain in its place?
It does not remain because it has no resistance.

And whither will it tend?

It will tend to the centre of the earth.

And why not along other lines?

Because the weight which meets with no resistance will descend by the shortest way to the lowest depth, and the lowest depth is the centre of the earth.

And how does a weight find the centre of the earth with such directness?

Because it does not proceed at random, wandering by diverse courses.

Phe-
nom-
ena go-

83.

verned by Me- Laws Instrumental science, that is to say, mechanics, is the most noble and most useful of sciences, in- chanicalasmuch as by means of it all living bodies which have movement act; and this movement has

its origin in the centre of gravity which is placed in the middle, dividing unequal weights, and it has dearth and wealth of muscles and lever also and counter-lever.

84.

Since these things are far more ancient than letters, it is no wonder if in our day no records exist to tell how these seas filled so many countries. But if some record had existed, conflagrations, floods, wars, changes of tongues and laws have consumed all that is ancient; sufficient for us is the testimony of objects born in the salt waters and found again in the high mountains far off from the seas of those times.

Phe-
nom-
ena go-
verned
by Me-
chanical
Laws

85.

Heat causes moisture to move, and cold arrests it; as is seen in a cold country which arrests the motion of the clouds in the air. Where there is life there is heat, where there is vital heat there is movement of moisture.

Heat
the
Vital
Princi-
ple

86.

The act of cutting out the nostrils of a horse is a piece of ludicrous folly. And the foolish indulge in this practice as though they considered nature had failed to supply necessary wants, and man had therefore to supplement her work. Nature made two apertures in the nose, which each in

Against
those
desir-
ing to
correct
Nature

Against itself is half as large as the lung pipe whence those breath proceeds, and if these apertures did not desir- exist the mouth would abundantly suffice for ing to breathing purposes. And if you said to me, Why correct has nature thus provided animals with nostrils Nature if respiration through the mouth is sufficient?—I would answer that nostrils are made to be used when the mouth is employed in masticating its food.

87.

Of
Trees

If a tree has been stripped of its bark in some spot, nature makes provision for this and gives a greater supply of nourishing sap to the stripped portion than to any other, so that in place of what has been taken away the bark grows thicker than in any other spot. And so impetuous is the motion of the sap that when it reaches the spot which is to be healed, it rises higher like a bounding ball, in bubbles, not unlike boiling water.

88.

The
Leaves
of
Plants

Nature has so placed the leaves of the latest shoots of many trees that the sixth leaf is always above the first, and thus in continued succession unless the rule is obstructed. And this she has done for two useful purposes in the plant: firstly, since the branches and the fruit of the following year spring from the bud or eye which is above and in contact with the juncture of the leaves,

the water which feeds the shoot may be able to run down and nourish the bud, through the drop Leaves being caught in the hollow whence the leaf of springs. And the second advantage is that as these Plants buds shoot in the following year, one will not be covered by the other, since the five shoots spring on five different sides.

89.

In order to arrive at knowledge of the motions of birds in the air, it is first necessary to acquire knowledge of the winds, which we will prove by the motions of water in itself, and this knowledge will be a step enabling us to arrive at the knowledge of beings that fly between the air and the wind.

90.

The reason of this is that small birds being without down cannot support the intense cold of the high altitudes in which the vultures and eagles and other great birds, well supplied with down and clothed with many kinds of feathers, [fly]. Again, the small birds, having delicate and thin wings, support themselves in the low air, which is denser, and they could not bear up in the rarer air, which affords slighter resistance.

91.

The shafts formed in the shoulders of the wings of birds have been so devised by ingenious nature

On the as to occasion a convenient pliancy in the direct
Struc- impetus which often occurs in the swift flight
ture of of birds, since she found it more practical to bend
Wings a small part of the wing in the direct flight than
the whole of it.

92.

On a O time! swift devourer of all created things!
Fossil How many kings, how many nations, thou hast
Fish overthrown, how great changes of kingdoms and
diverse vicissitudes have succeeded one another,
since the marvellous body of this fish, which per-
ished in the caverns and intricate recesses [of the
mountain]. Now undone by time, thou liest pa-
tient in this confined spot; with thy fleshless and
bare bones thou hast built the framework and the
support of the mountain that is above thee.

93.

We live Unconscious life remains in what is dead, which
by when reunited to the stomach of living men, re-
Others' acquires sentient and conscious life.
Death

94.

Against Men are chosen to be physicians in order to min-
Doctors ister to diseases of which they are ignorant.

95.

Every man wishes to amass money in order to give it to the physicians who are the destroyers of life; they ought therefore to be rich.

96.

Against
Doctors

Take pains to preserve thy health; and thou wilt all the more easily do this if thou avoidest physicians, because their drugs are a kind of alchemy, and there are as many books on this subject as there are on medicine.

97.

Oh! meditators on perpetual motion, how many vain projects of similar character you have devised! Go and join the seekers of gold.

98.

The water which flows in a river moves either because it is summoned or driven, or because it moves of its own accord. If it is summoned,—and I mean sought after,—who is the seeker? If it is driven, who is the driver? If it moves of its own accord, it gives evidence of reasoning; and reasoning in bodies which continually change their shape is impossible, because in such bodies there is no consciousness.

99.

I wish to work miracles. I may have less than other and less energetic men; and those who wish to grow rich in a day live a long time in great poverty, as happens, and will always happen, to alchemists, who seek to make gold and silver, and to the engineers who wish from still

Of Astrology water to obtain life and perpetual motion, and to the supreme fool,—the necromancer and the magician.

100.

There is no part of astronomy which does not depend on the visual lines and on perspective, the daughter of painting; because the painter is he who by the necessity of his art has begotten perspective, and it is impossible to do without lines which include all the various figures of the bodies begotten by nature and without which the art of geometry is blind. And while the geometrist reduces every surface surrounded by lines to a square, and each body to the figure of the cube, and mathematics do the same with their cube roots and square roots, these two sciences deal only with the continuous and discontinuous quantity, but they do not deal with the quality which constitutes the beauty of the works of nature and the ornament of the world.

101.

Here the adversary will say that he does not want so much knowledge, and the mere skill of depicting nature will suffice him. To which I make reply that there is no greater error than to trust to our judgement without other reasoning, as experience, the enemy of alchemists, necromancers and other foolish intellects, has in all times proved.

180

The lying interpreters of nature affirm that quicksilver is the common seed of all metals. They do not bear in mind that nature raises substances according to the diversity of things which she wishes to produce in the world.

The belief in necromancy is reputed to be the most foolish of all human opinions. It is the sister of alchemy which gives birth to simple and natural things; but it is all the more reprehensible than alchemy, inasmuch as it brings forth nothing but what is like itself, that is, lies. This is not the case with alchemy, which is confined to the simple products of nature, and whose function cannot be performed by nature herself, because in it there are no organic instruments with which it can work, such as the hands are to man and which have enabled him to make glass, &c. But necromancy, the flag and flying banner, blown hither and thither by the winds, is the guide of the silly multitude, which constantly bears witness with gaping wonder to the countless effects of this art; and whole books are written which declare that incantations and spirits are efficacious and speak without tongues and without vocal organs, without which it is impossible to speak, and carry the heaviest weights, raising tempests and rain and

Against transforming men into cats, wolves and other
Necro- beasts, although they who affirm such things are
mancy the first to be transformed into beasts. And cer-
tainly if such necromancy existed, as is believed
by lower intellects, there is nothing on the earth
which would be so effectual both as regards the
service and detriment of man; because if it is
true that this art has the power to disturb the
calm serenity of the atmosphere, changing it into
night and producing sparks and winds, with fear-
ful thunder and lightnings that fly through the
darkness, and overthrowing high buildings with
violent winds and uprooting forests and striking
armies and shattering and overwhelming them,
and producing, in addition to this, devastating
storms which rob the peasants of the fruits of
their toil, what kind of warfare is there so deadly
to the enemy? Who in naval warfare can be com-
pared with him who commands the winds and
generates storms which ruin and sink any fleet
whatsoever? Certainly he who could dispose of
such violent forces would be the lord of nations,
and no human skill could resist his deadly power.
The hidden treasures and gems concealed in the
body of the earth would be manifest unto him.
He would let himself be borne through the air
from the east to the west, and through all the op-
posed regions of the universe. But why should I
proceed further? What thing is there which could
not be effected by such an art? Nothing, save

the discovery of immortality. And if it is true, Against why has it not remained among men who so Necro-greatly desired it, and led them to disregard any mancy deity? And I know that there are many who to satisfy a whim would destroy God and the universe. And if necromancy has not remained with man in spite of its being so necessary to him it can never have existed, nor will it ever exist according to the definition of the spirit which is invisible in the body, for in the elements there are no incorporate things, for where there is no body there is a vacuum, and a vacuum cannot exist in the elements because it would be immediately filled by them.

104.

The eye in its given distances and by its given means deceives itself in the performance of its functions less than any other sense, because it sees in straight lines which form a cone, the base of which is the object it perceives, and transmits it to the eye, as I intend to prove. But the ear greatly deceives itself as to the position and distance of the objects it apprehends, because the sonorous waves do not reach it in straight lines, like those of the eye, but by tortuous and reflex lines, and often the most remote seem to be nearest, owing to the peregrinations of such waves, although the voice of the echo is transmitted to the sense by straight lines only. The smell is less certain of the spot whence the odour arises, but

Decep-tive-ness of the Senses

On the taste and touch alone come into direct contact
Con- with the object which they apprehend.
cep-
tion of

105.

No-thing-ness The smallest natural point is larger than all mathematical points, and the proof of this is that the natural point has continuity, and everything which has continuity is infinitely divisible; but the mathematical point is indivisible because it is not a quantity. Every continuous quantity is mentally infinitely divisible. Among the magnitude of things which are among us, the chief of all is nothingness; and its function extends to matter that does not exist, and its essence is in time in the past or in the future, and it has nothing of the present. This nothingness has its part equal to the whole and the whole to the part, and the divisible to the indivisible, and produces the same result by addition or subtraction, or if it be divided or multiplied,—as is proved by arithmeticians by their tenth character, which represents nothing. And its power does not extend to the things of nature.

That which is called nothingness is found only in time and in words: in time it is found in the past and future, and not in the present; and thus in words among things which are said to be non-existent or impossible. In time nothingness dwells in the past and the future, and not at all in the present, and in nature it resides among the things

which are impossible. Whence from that which On has been said, it has no being, because where Spirits there is nothingness there would be a vacuum.

106.

With regard to this matter, we have said on the previous page that the definition of a spirit is a power united with a body, because it cannot move of its own accord nor acquire any kind of motion. And if you say that it moves itself, this cannot be within the elements, because if the spirit is an incorporate quantity this quantity is a vacuum and the vacuum does not exist in nature, and if it did exist it would be immediately filled by the rushing in of the element in which the vacuum was formed. So according to the definition of weight which runs: "Gravity is an accidental power created by one element attracted to or suspended in another," it follows that no element, weighing nothing in its own element, can have weight in the element which is above it and lighter than it; for instance, no one part of water has no more gravity or lightness than any other part, but if you were to draw it up into the air, it would acquire weight, and this weight cannot sustain itself by itself; and it must therefore inevitably fall, and thus wherever there is a vacuum in water it will fall in. The same thing would happen with a spirit among the elements where it would continuously generate a vacuum

Has in whatever element it might find itself, for which
the reason it is inevitable that it would move in a con-
Spiritu stant flight to the sky until it had quitted these
Body? elements.

107.

We have proved that a spirit cannot exist in the elements without a body, nor move of itself by voluntary motion unless it be to rise upwards. But now we will say that if such a spirit took a body made of air it would inevitably melt into air, because if it remained united it would be separated and fall and form a vacuum, as we have described above. Therefore if it desired to remain in the air it is necessary that it should blend with a quantity of air, and if it were united with the air, two difficulties arise: that is, that it will rarefy that portion of air with which it is mingled, and this rarefied air will fly upwards and will not remain in the air which is heavier than itself; and besides this the ethereal spiritual essence is disunited, and its nature is changed, for which reason that nature loses some of its first virtue. There is in addition to these a third difficulty, and this is that a body of this kind, made of air and assumed by the spirits, is exposed to the penetrating winds which continually sunder and scatter the united portions of the air, eddying and whirling amidst the rest of the atmosphere; therefore the spirit who would pervade

this air would be dismembered or rent and broken Has
up with the rending of the air of which it formed the
part.

Spirit a
Body?

108.

It is impossible that the spirit, incorporated with a certain quantity of air, should move this air; and this is proved by the passage where it is said that "the spirit rarefies that portion of the air with which it is mingled." This air therefore will rise high above the other air, and the air will be set in motion by its own lightness and not by the volition of the spirit, and if this air encounters a wind, the air will be moved by the wind and not by the spirit which is incorporated in it.

109.

In order to show whether the spirit can speak or not it is first necessary to define the voice and the manner of its origin. The following will be our definition: The voice is the movement of air in friction against a dense body, or a dense body in friction against the air (which is the same idea), and by this friction of the dense and the rare what is rare is condensed, and resistance is caused; and again, when the rare in swift motion and the rare in slow motion come into contact, they condense one another and produce sound, and a great noise is made. The sound or murmur made by the rare moving through the rare

Can
the
Spirit
speak?

Can the Spirit speak? with slow motion is like the great flame whence sounds issue in the air; the exceedingly great noise made by the rare, when the air which is rare and swift mingles with that which is rare and in [slow] motion, is like the flame of fire issuing from a great gun and striking against the air; likewise the flame when it issues from a cloud strikes the air as it begets the thunderbolt. Therefore we will say that the spirit cannot produce a voice unless the air be set in motion, but since there is no air within, it cannot discharge what it does not possess; and if it wishes to move that air in which it is incorporated, it is necessary that the spirit should multiply itself; but that which has no quantity cannot be multiplied. In the fourth place it is said, that no rare body can move if it has not a stable spot whence it may take its motion, and more especially is this the case when an element must move in its own element, which does not move of itself, excepting by uniform evaporation at the centre of the thing evaporated; as occurs in the case of the sponge squeezed in the hand under water, whence the water escapes in every direction with equal motion through the spaces between the fingers of the hand which squeezes it. As to whether the spirit has an articulate voice and can be heard, and as to what are hearing and sight—the wave of the voice travels through the air as the images of objects travel to the eye.

O mathematicians, clear up this error! The spirit cannot have a voice, for where there is a voice there is a body, and where there is a body there is occupation of space, which prevents the eye seeing what is behind that space; therefore a body fills all the surrounding air, that is to say, with its own image.

III.

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 such thing as an immaterial instrument; and this being so, a spirit can have neither voice, nor shape, nor force; and if it assumes a shape it can neither penetrate nor enter where the issues are closed. If any one were to say that a spirit may take bodies of various shapes by means of concentrated and compressed air, and by means of this instrument speak and move with force—I reply to this argument that where there are no nerves or bones, no force can be expended in any movement made by these imaginary spirits.

BIBLIOGRAPHICAL NOTE
AND
TABLE OF REFERENCES

BIBLIOGRAPHICAL NOTE

* * *

Only of late years have the manuscripts of Leonardo da Vinci seen the light and the many difficulties been overcome which long proved an obstacle to their publication. The labour of editing, deciphering and translating his many scattered and fragmentary codices was beyond the efforts of any single man. The gratitude of the cultivated world is therefore due to those who, like J. P. Richter, C. Ravaisson-Mollien, Luca Beltrami, Piumati, Sabachnikoff, and, last but not least, the scholars of the Academia dei Lincei, have so faithfully devoted themselves to this task, which alone has made possible the present little work.

It was unavoidable that the form in which these manuscripts have been published should practically restrict their possession to the great libraries. But an excellent volume of selections from the writings of Leonardo, which are found in so hap-hazard a manner scattered through his codices and intermingled with his drawings and diagrams, has been published in Italy (*Leonardo da Vinci: Frammenti Letterari e Storici*. Florence, 1900). By kind permission of its editor, Dr. Solmi, this has served as a basis for the text of the present translation. The references, however, have

Table of References been verified with the complete editions of Leonardo's works, while a different arrangement has been made of the text.

L. E.

TABLE OF REFERENCES

- [A] Les manuscrits de Léonard de Vinci. Le manuscrit A de la Bibliothèque de l'Institut. Edit. Ravaïsson-Mollien, vol. i. Paris, 1880.
- [ASH I] Les manuscrits de Léonard de Vinci. Les manuscrits H de la Bibliothèque de l'Institut; 2038 (Ash I) et 2037 (Ash II) de la Bibliothèque Nationale. Edit. Ravaïsson-Mollien, vol. vi. Paris, 1891.
- [ASH II] Idem.
- [B] Les manuscrits de Léonard de Vinci. Les manuscrits B et D de la Bibliothèque de l'Institut. Edit. Ravaïsson-Mollien, vol. ii. Paris, 1883.
- [C] Les manuscrits de Léonard de Vinci. Les manuscrits C, E et K de la Bibliothèque de l'Institut. Edit. Ravaïsson-Mollien, vol. iii. Paris, 1888.
- [CA] Il Codice Atlantico di Leonardo da Vinci nella Biblioteca Ambrosiana di Milano. Rome; Milan, 1891. (Still in course of publication.)
- [D] See B.
- [E] See C.
- [F] Les manuscrits de Léonard de Vinci. Les manuscrits F et I de la Bibliothèque de l'Institut. Edit. Ravaïsson-Mollien, vol. iv. Paris, 1889.

[G] Les manuscrits de Léonard de Vinci. Les Table
manuscrits G, L et M de la Bibliothèque de l'Insti- of
tut. Edit. Ravaission-Mollien, vol. v. Paris, 1890. Refer-
ences

[H] See Ash I.

[I] See F.

[L] See G.

[Lu] Leonardo da Vinci: Das Buch vom Malerei.
Herausgegeben v. H. Ludwig. 3 vols. Berlin, 1882.

[M] See G.

[R] The Literary Works of Leonardo da Vinci.
Compiled and edited from the original manu-
scripts by J. P. Richter. 2 vols. London, 1883.

[S] Leonardo da Vinci: Frammenti Letterari e
Filosofici. Trascelti dal Dr. Edmondo Solmi. Flo-
rence, 1900.

[T] Il codice di Leonardo da Vinci nella Biblio-
teca del Principe Trivulzio. Edit. L. Beltrami.
Milan, 1892.

[V U] Leonardo da Vinci. Il codice del volo degli
uccelli ed altre materie. Edit. Sabachnikoff e Piu-
mati. Paris, 1893.

THOUGHTS ON LIFE

Page.	N ^o .	Reference.	Page.	N ^o .	Reference.	On Life
3	1	R 4	4	4	CA 119 r	
3	2	R 1339	5	5	Lu 9	
4	3	R 841	5	6	R 1169	

On Life	Page.	No.	Reference.	Page.	No.	Reference.
5	7	7	S 69	14	36	R 838
6	8	8	CA 119 r	14	37	Lu 16
6	9	9	CA 91 v	15	38	Lu 65
6	10	10	CA 119 r	15	39	S 96
6	11	11	S 71	15	40	B 4 v
7	12	12	R 1178	15	41	F 96 v
7	13	13	S 72	15	42	CA 79 r
7	14	14	T 2 v	15	43	S 98
8	15	15	CA 112 r	15	44	S 99
8	16	16	Lu 65	16	45	G 47 r
9	17	17	S 74	16	46	CA 119 v
9	18	18	S 336	16	47	R 837
9	19	19	S 74	17	48	R 1210
9	20	20	R 1175	19	49	I 18 r
9	21	21	M 58 v	19	50	S 67
10	22	22	VU 12 r	19	51	R 1135
10	23	23	S 76	19	52	CA 169 v
10	24	24	CA 119 r	20	53	S 114
11	25	25	CA 117 r	20	54	S 115
11	26	26	CA 76 r	21	55	Ash II 4 r
11	27	27	CA 117 r	21	56	CA 59 r
12	28	28	CA 76 r	21	57	T 6 r
12	29	29	F 27 v	21	58	G 74 v
12	30	30	S 83	22	59	S 121
12	31	31	R 1150	22	60	S 122
12	32	32	CA 154 r	22	61	S 123
13	33	33	CA 154 r	23	62	H 89 v
13	34	34	CA 86 r	23	63	S 168
13	35	35	T 20 v	23	64	F 49 v

Page.	No.	Reference.	Page.	No.	Reference.	On Life
24	65	S 169	36	94	CA 29 v	
24	66	R 846	36	95	CA 12 r	
24	67	R 1219	36	96	CA 71 v	
25	68	R 1187	37	97	S 205	
25	69	R 838	37	98	T 34 r	
27	70	CA 90 r	37	99	T 34 r	
28	71	CA 119 v	37	100	T 27 r	
29	72	R 839	37	101	CA 71 r	
29	73	Lu 499	38	102	Lu 77	
30	74	T 7 v	38	103	R 1132	
30	75	S 180	39	104	R 1133	
30	76	R 916	39	105	S 208	
31	77	R 798	39	106	T 340	
31	78	S 187	39	107	T 14 v	
32	79	CA 119 r	39	108	C 117 v	
32	80	R 1	39	109	G 49 r	
32	81	Lu 292	40	110	S 209	
33	82	S 201	41	111	H passim	
34	83	H 60 r	44	112	S 214	
34	84	H 32 r	45	113	H 48 v	
34	85	S 202	45	114	S 216	
34	86	CA 76 r	45	115	R 827	
35	87	S 202	46	116	R 844	
35	88	H 33 v	47	117	R 816	
35	89	S 203	47	118	S 221	
35	90	T 33 v	48	119	S 221	
35	91	T 23 v	48	120	S 229	
35	92	Ash I 34 v	48	121	C 15 v	
36	93	CA 76 r	50	122	R 1358	

On Life	Page.	No.	Reference.	Page.	No.	Reference.
	51	123	S 217	54	127	R 300
	52	124	R 1355	55	128	S 382
	52	125	Lu 24	55	129	S 199
	53	126	Lu 16			

THOUGHTS ON ART

On Art	59	1	CA 141 v	85	24	Lu 29
	60	2	S 274	85	25	Lu 31
	60	3	Lu 438	87	26	Lu 30
	60	4	Lu 27	88	27	Lu 32
	60	5	Lu 34	90	28	S 276
	61	6	Lu 7	90	29	Lu 9
	62	7	Lu 8	90	30	Lu 13
	64	8	Ash II 19 v	91	31	S 275
	65	9	Lu 2	92	32	Ash II 20 r
	66	10	Lu 7	92	33	Ash II 26 r
	66	11	Lu 14	93	34	Ash II 25 r
	68	12	Lu 10		24	v
	68	13	Lu 46	95	35	Lu 35
	68	14	Lu 18	96	36	Lu 36
	69	15	Lu 20	97	37	Lu 38
	71	16	Lu 21	98	38	Lu 40
	72	17	Lu 22	99	39	Lu 41
	73	18	S 251	100	40	Lu 405
	77	19	S 257	100	41	Lu 62
	80	20	Lu 27	100	42	R 498
	82	21	Lu 27	100	43	Lu 57
	82	22	Lu 26	101	44	Ash II 16 v
	83	23	Lu 28	101	45	Lu 58

Page.	No.	Reference.	Page.	No.	Reference.	On Art
101	46	R 103	116	70	Lu 107	
102	47	R 104	116	71	S 337	
103	48	Lu 404	117	72	S 338	
104	49	Ash II 22 v	117	73	S 336	
105	50	Lu 54	117	74	S 337	
105	51	I 130 v	118	75	Lu 108	
105	52	CA 76 v	119	76	Lu 109	
106	53	CA 119 v	120	77	A 23 r	
106	54	G 8 v	120	78	K 110 v	
106	55	Ash II 17 v	120	79	S 338	
107	56	CA 181 v	121	80	Lu 15, 25	
107	57	S 200	125	81	R 1021	
108	58	S 284	125	82	Lu 806	
109	59	S 78	127	83	Ash I 18 v	
111	60	S 283	128	84	Ash I 21 r	
111	61	G 33 r v	129	85	Ash I 30 v	
111	62	R 796	133	86	S 216	
112	63	Ash II 26 r	134	87	Ash II 22 v	
113	64	Ash II 28 r	134	88	S 335	
113	65	Ash II 26 r	135	89	S 338	
114	66	Ash II 25 r	136	90	S 339	
114	67	Ash II 24 v	137	91	S 341	
115	68	Lu 53	137	92	S 342	
116	69	S 122	137	93	S 340	

THOUGHTS ON SCIENCE

On
Science

141	1	Lu 1	141	3	R 3
141	2	R 110	141	4	R 6

On	Page.	No.	Reference.	Page.	No.	Reference.
Science	142	5	R 1157	154	34	F 6 r
	142	6	G 96 v	155	35	F 8 r
	142	7	T 12 r	155	36	F 34 v
	142	8	Lu 1	155	37	G 34 r
	143	9	Lu 33	156	38	F 85 v
	146	10	E 8 v	156	39	S 136
	146	11	R 1156	158	40	S 141
	146	12	K 49 r	158	41	S 139
	146	13	I 102 r, v	158	42	S 140
	147	14	A 24 r	159	43	S 128
	148	15	S 124	160	44	R 902
	148	16	T 36 v	161	45	S 138
	148	17	T 36 v	161	46	S 137
	148	18	H 141 r	161	47	S 137
	148	19	E 22 r	161	48	S 138
	149	20	I 68 r	162	49	S 139
	149	21	R 859	162	50	S 139
	149	22	F 52 r	162	51	S 142
	150	23	S 126	163	52	C A 80 r
	150	24	S 127	164	53	H 95 r
	151	25	B 63 r	164	54	H 90 r
	151	26	S 125	164	55	S 88
	151	27	C 26 v	164	56	F 30 v
	151	28	A 60 r	164	57	R 1000
	151	29	S 124	165	58	R 970
	152	30	C 28 v	165	59	H 77 r
	152	31	R 860	165	60	R 965
	153	32	S 131	166	61	R 953
	154	33	S 132	166	62	F 52 v

Page.	No.	Reference.	Page.	No.	Reference.	On
						Science
167	63	G 49 v	176	88	S 118	
167	64	K 22	177	89	E 54 r	
168	65	S 113	177	90	CA 66 v	
168	66	S 113	177	91	E 52 v	
168	67	CA 147 v	178	92	S 148	
168	68	E 55 v	178	93	S 167	
168	69	S 88	178	94	S 200	
169	70	M 57 r	178	95	S 200	
169	71	R 107	179	96	S 200	
170	72	CA 337 v	179	97	R 1206	
170	73	T 39 r	179	98	K 101 v	
171	74	I 202	179	99	R 796	
171	75	D 5 r	180	100	Lu 17	
172	76	F 2 v	180	101	S 66	
172	77	CA 75 v	181	102	S 122	
172	78	H 67 v	181	103	R 1213	
173	79	F 2 v	183	104	S 181	
173	80	F 69 v	184	105	Ash III 27 v	
174	81	S 129	185	106	S 192	
174	82	CA 153 v	186	107	R 1214	
174	83	VU 3 v	187	108	R 1215	
175	84	R 984	187	109	CA 187 v	
175	85	S 142	189	110	S 196	
175	86	CA 76 r	189	111	B 4 v	
176	87	CA 76 r				

OF THIS VOLUME
TRANSLATED BY MAURICE BARING
AND EDITED BY LEWIS EINSTEIN
WITH TYPES & DECORATIONS
BY HERBERT P. HORNE
CCCIII COPIES WERE
PRINTED



BY D. B. UPDIKE
AT THE MERRYMOUNT PRESS
BOSTON MASSACHUSETTS
IN THE MONTH OF
SEPTEMBER
MCM
VI

