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THE  
**PRINCIPLES OF HEALTH,**

[ELEMENTS OF HYGIENE;]

OR,

**A TREATISE**

ON THE

**INFLUENCE OF PHYSICAL AND MORAL CAUSES**

**ON MAN,**

AND ON THE MEANS OF PRESERVING HEALTH.

**BY ETIENNE TOURTELLE,**

*Professor of the Special School of Medicine of Strasburg; Member of several National and Foreign Academies; and an Associate of the Institution of Health and Salubrity for the Prefecture of the Guard sitting at Nimes.*

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*Valetudo sustentatur notitiâ sui corporis, et observatione quæ res aut prodesse soleant, aut obesse, et continentia in victu omni atque cultu corporis tuendi causâ, et prætermittendis voluptatibus, &c.*

CICERO, DE OFFIC.

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FROM THE SECOND FRENCH EDITION, CORRECTED AND AUGMENTED.

TRANSLATED

**BY G. WILLIAMSON, L. M. C. F. M.**

Member of the Medical and Chirurgical Faculty of Maryland, and Honorary member of the Medical Society of Baltimore, &c. &c.

WITH NOTES AND APPENDICES BY THE TRANSLATOR,

IN TWO VOLUMES.

VOL. I.

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ANNEX  
Hygiene, Pub.

RECOMMENDATIONS

ELEMENTS OF HYGIENE

**DISTRICT OF MARYLAND, ss.**

BE IT REMEMBERED, That on this twenty-first day of July, in the  
+ + + + + forty-third year of the Independence of the United States of Amer-  
SEAL. ica, George Williamson, of the said District, hath deposited in this  
+ + + + + office, the Title of a Book, the right whereof he claims as Proprietor,  
in the words and figures following, to wit:

“The Principles of Health, [Elements of Hygiene;] or, a treatise on the influence of physical and moral causes on man, and on the means of preserving health. By Etienne Tourtelle, professor of the Special School of Medicine of Strasburg; member of several National and Foreign Academies; and an associate of the Institution of Health and Salubrity for the Prefecture of the Guard sitting at Nimes,

“*Valetudo sustentatur notitiâ sui corporis, et observatione quæ res aut prodesse soleant, aut obesse, et continentia in victu omni atque cultu corporis tuendi causa, et prætermittendis voluptatibus, &c.—Cicero, De Offic.*

“From the second French edition, corrected and augmented.

“Translated by G. Williamson, L. M. C. F. M. member of the Medical and Chirurgical Faculty of Maryland, and honorary member of the Medical Society of Baltimore, &c. &c. with notes and appendices by the Translator.”

In conformity to an Act of the Congress of the United States, entitled, “An Act for the encouragement of Learning, by securing the copies of Maps, Charts, and Books, to the authors and proprietors of such copies, during the times therein mentioned,” and also to the Act, entitled, “An Act supplementary to the Act, entitled, ‘An Act for the encouragement of learning, by securing the copies of Maps, Charts, and Books, to the authors and proprietors of such copies during the times therein mentioned,’ and extending the benefits thereof to the arts of Designing, Engraving, and Etching historical and other prints.”

PHILIP MOORE,  
Clerk of the District of Maryland.

MATTHANIEL POTTER

Baltimore, Sep. 5, 1817.

## RECOMMENDATIONS.

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Copy of a letter from Benjamin Rush, M. D. Professor of the Institutes and Practice of Medicine, and of Clinical Practice, in the University of Pennsylvania.

DEAR SIR,—I have read several chapters in Tourtelle's Hygiene, with pleasure and instruction, and have looked over other parts of it. It appears to be an excellent work, and calculated, in an English dress, to spread a great deal of useful knowledge, upon the means of preserving health throughout our country. I sincerely wish your translation of it a rapid sale, and an extensive circulation.

BENJAMIN RUSH.

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Copy of a letter from Nathaniel Potter, M. D. Professor of the Theory and Practice of Medicine in the University of Maryland.

DEAR SIR,—Some years ago I read Tourtelle, with equal pleasure and profit, and have often regretted that it had not been rendered into English. The most neglected part of our profession consists of the *prophylaxis morborum*, in which is necessarily comprehended the *predisposition* to diseases. We look in vain over the annals of medical literature for the *venienti occurrere morbo*, unless we consent to receive the Asthenologia of Dr. Struve, which is predicated principally upon the Sophisms of Dr. Brown. Tourtelle's Hygiene is calculated to reflect much light on this neglected department of medical science, and your translation merits the countenance of physicians, and all others disposed to investigate the means of preserving health.

NATHANIEL POTTER.

*Baltimore, Sept. 9, 1817.*

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Extract of a letter from Samuel L. Mitchill, M. D. Professor of Natural History, including Botany, Zoology, and Geology, in the University of New-York.

There is no people on earth, by whom professor TOURTELLE'S publication ought to be received with a more hearty welcome, than by the inhabitants of the United States. The writer has chosen a subject of great importance to every rational creature. It is

## RECOMMENDATIONS.

no less than a practical comment upon the ancient precept, KNOW THYSELF. This, according to my interpretation, is a direction, equally applicable to the physical and ethical constitution of man. The learned Doctor of Strasburg University, has proved himself an adept in these departments of knowledge. In his survey of man's constitution, he has contemplated both the body and the mind, and their action upon each other. He has contemplated human beings in the rude or savage state, and in all their gradations to modern luxury and fashionable refinement. Living manners and recorded transactions, seem to have been equally the objects of his research. I am exceedingly pleased with the manner in which he has distributed his materials, to wit: 1. The powers which produce animation. 2. The substances that act upon him, additionally, by means of the skin. 3. Those operating by and through the alimentary canal. 4. Actions, or the effect of exercise, and its correlative, rest; of wakefulness, and its correlative, sleep. I wish he had treated with equal skill, of the intermediate state of *somnium*, hitherto too much neglected by physiologists. 5. The materials, ingredients, or things retained in the body by the process of nutrition, growth, fatness and disease; and their opposites, the particles, substances, or things excreted from the body, and separated as unnecessary or noxious. 6. The reciprocal action of the body, or physical part of man, upon his mind, or intellectual part, and *vice versa*; including the whole doctrine of *sensations* and *passions*.

As to your share of the performance, as far as I can judge from the context, without a comparison with the original, you have rendered the sense and spirit of the author. You have offered to our fellow-citizens a work which they ought to prize. And, wild and foolish as the mode is, to lavish health as a matter of no moment, and to court death as a most desirable occurrence, I hope and expect, there will be a sufficient number of considerate and well-judging persons, to reward you for your toil, and themselves for the purchase and perusal. Your notes are good.

To the members of a free government life is peculiarly valuable, because they have so many enjoyments. In a nation more distinguished than any other for drinking ardent spirits, and eating animal food, the monitions which the author and the translator present, are most seasonable and weighty. May they be efficacious! and I say they will be, in the estimation of those who consider health and long life as blessings.

Accept, excellent sir, my friendly and cordial salutation.

SAMUEL L. MITCHILL.

New-York, Sept. 12, 1819.

## PREFACE

### To the American Edition.

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IN presenting this work to the American reader, the translator deems it correct to give a brief analytical view of its contents; this is the more necessary as it has not been done by the author.

If there is any part of this performance which may be considered as hypothetical; if the author has given play to a lively imagination, or to a rich fancy, it has been done in the parts relating to astronomy, which are to be found in the introduction, and in the chapter on sidereal influence. The course of medical studies have wonderfully changed within the last few ages, a knowledge of chemistry is now considered essential to a complete medical education, whereas in remote ages it was almost unknown and but little cultivated.

Several of the ancients, and among others the father of medicine, were industrious students of

the heavenly bodies. No doubt, they would have been as much surprised to have been told that astronomy would be considered an useless appendage to medical science in the eighteenth and nineteenth centuries, as they would have been, had they been informed that a philosopher would be raised up in a country then unknown, who would, in the eighteenth century, deprive the clouds of their fiery lights and render their flashes harmless.

The translator's knowledge of astronomy is too limited to justify a positive sentiment in relation to its effects on either matter or mind. He is not, however, prepared to believe that the moon, nor any of the planets, exert those wonderful effects on the human system that some writers have been pleased to ascribe to them; yet, he does believe that this subject is by far too much neglected by the votaries of the healing art. Both ancient and modern philosophers have predicted that certain effects would take place from the influence of the heavenly bodies in different periods of time; many of these predictions have been fanciful and entirely hypothetical; that the heavenly bodies have marked and regular effects on our planet is an established truth, and that they have a very powerful influence, not generally known, consequently not admitted, is a doctrine too probable to be questioned, by any person other than one of those

sceptics, who will not believe any thing which he cannot comprehend.

Our author takes man at a very interesting period of his life. He takes him at the moment of his birth, gradually advances with him to the age of virility, then to middle, and finally to old age and the solemn parting with sublunary concerns. His first chapters, which are on physiology, are very intelligent and ingenious. His division of the energies or forces, and his specification of the sensibility, are happy and instructive. His theory of digestion, &c. merits particular attention.

Our author has not been satisfied with noticing man in a civilized state, he has not confined himself to Europe but has given us the natural history of him in every climate. To be made acquainted with the whole human race, to know the habits and customs of man in the four quarters of the globe, and to be apprised of the effect which climate, education, &c. have upon him must be gratifying to every reader. Much of the information comprised in the second section is highly interesting. The influence of air, water, and the temperature of the seasons, is important to man. Clothing, exercise, &c. is not less so. To enhance the value of this part of the work to the American reader, the translator has given some additional matter in the appendix to the first volume

In the second volume, the author treats at large of diet, drinks, and seasonings. To render this part of his performance the more eminently interesting, he has given a concise natural history of the fruits, vegetables, grain, animals, fishes, condiments, or seasonings, &c. He has not confined himself merely to the method of cooking these articles, nor to their dietic qualities, but has also given some interesting remarks occasionally on culture, rearing, and preserving those articles which are so essential to life. The subjects of drink is generally noticed. He next proceeds to education. As education is of the first importance to every civilized community and as it is a subject on which I think our author might have advantageously said more than he has, I have given an article on it in the appendix to the second volume.

Exercise, rest, bodily labor, the secretions and excretions, all of which are interesting, are concisely and ingeniously noticed. The influence of the mind upon the body and *vice versa*, than which no subjects are more interesting as regards this state of action, introduces our author to the sensations, and he closes his performance with the regimen of the studious and with mental labours. To notice the peculiar merits of these various subjects in detail, would take us beyond the limits prescribed to a preface; but from the description thus given, the reader

will be forcibly struck with the correctness of the following extract from Tourtelle's biography, relative to this work.

“He has not been satisfied with taking man from his birth; following him through the different periods of life; considering him under latitudes the most opposite; remarking the influence which climate, government, religion, regimen, &c. have, not only upon his organization, but also the effects which these causes produce upon his mental faculties.”

There are two parts of this production, which are now less interesting to the American reader than it is presumed they will be at some future day. These are the detailed accounts of the means of preserving grain, and the culture of the vine, with a history of the various kinds of wine. Although the necessity of the former has never been experienced in our happy country and it is hoped never will be, the information is important and merits attention. As to the latter, however little interesting it may be at present, and it is not even now without some interest, it will, no doubt, at no distant period, become a subject of much importance.

In a country so vast in extent, so various in soil, and possessing almost all climates, it is fair to presume that all the vegetable productions of nature may be cultivated to advantage, and made tributary to our wants. From the experiments

made on the culture of the vine, there is no doubt that we have both soil and climate in our extensive territory well adapted to its growth. And it is to be feared that it will acquire a part of the attention that ought to be paid to articles more essential to life and health.

The translator has endeavored to give this work a complete English dress, and flatters himself that, if he has not entirely succeeded, the exceptions are but few and unimportant. A few passages occurred throughout the body of the work, in which the translator could not, in his judgment, use his own language, he has however, he trusts reduced these into English. Some few significant technical terms, which may be judiciously adopted into the English language have been retained; also some few words for which no synonyma could be found in our tongue. Had the translation been entirely designed for professional men, it should have been rendered more technical, but it is designed for all classes of readers, and men of science know how to appreciate important facts in a plain dress. The technical terms that it has been necessary to retain will be found explained in a glossary at the end of each volume. All the interesting Latin passages, both poetical and prose, have been rendered into English.

Although the translator has never read a scientific work with more pleasure, considering the

doctrines generally correct, and conceiving that the author has treated each of his subjects in a masterly manner, yet, he will not presume to say that there are not points which may not be controverted, nor in fact that are not incorrect.\* Perfection is not the lot of man, and to presume that a work of the extent and magnitude of this, would be entirely correct, would perhaps be presuming too much.

This work has been pronounced by the celebrated professor Halle† and other distinguished French authors, as the most superior popular book that has ever been published in this department of science; and the English, although not peculiarly partial to French literature, have indirectly pronounced it a production of very extraordinary merit: by referring to the preceding letters, the reader will see in what estimation it has been and is held by some of our countrymen, eminently distinguished for their literary and scientific acquirements.

\* However much the translator is disposed to admire Tourtelle's philosophical, political and moral opinions, he deems it correct to say, he cannot subscribe fully to his religious. Tourtelle lived in a period when the pestilential miasms of infidelity contaminated the religious atmosphere, not only of France but almost all the continent of Europe, that he should have been affected by it, was an event not so much calculated to excite condemnation as commiseration.

† Professor of the Philosophy of Medicine in the Royal University of France.

In regard to the new matter which the translator has thought proper to add, he doubts not but that the subjects will be admitted to be important. And the reader is left to judge of the ability with which they have been treated.

A solicitude for the extension of useful knowledge, and the promotion of a science whose object is to prevent diseases and alleviate the distresses of human nature, and enable man to pass happily through his earthly existence, prompted the translator to the execution of the present performance.

TRANSLATOR.

## INTRODUCTION.

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**M**AN is surrounded by dangers: his frail existence is incessantly threatened with a thousand destructive scourges; his organization is continually subject to alterations which expose him to a multitude of diseases. It is natural, then, that his first views be directed towards the means of preventing or remedying these evils: thence, the origin of medicine, which is lost in the night of time, and which is, perhaps, as ancient as the world. However, the first inhabitants of the earth could not be subject to so great a number of diseases, nor could those be so serious in their nature, as these are, to which the present race of man is subject. In those early days, nature was in her full vigour, consequently, capable of much greater energy, and her reaction against morbid agents was more powerful. Our forefathers were not subject to so many deliterious causes as we are; these causes have multiplied in an alarming manner with the revolutions that the globe has experienced, and the depravation that the manners of the people have undergone.

The ancient inhabitants of the earth, lived in a state of health, both as regarded the body and mind, and arrived at the most advanced age, as history attests.

By recurring to those happy centuries, we easily discover the reason why the poets have called this the golden age; it being an age in which man lived in a state of innocence, under a mild and clement sky, and only subjected to the laws of nature. Besides, the earth, still pure, produced its fruits without culture. In those days man knew not the irregularity and the inclemency of the seasons, which are, in our day, a fruitful source of disease: then the terrestrial globe gravitated equally in both hemispheres, and the axis of the equator was perfectly parrallel to the plane of the ecliptic. Properly speaking, there was but one season, spring was perpetual; and the days were constantly equal to the nights.

Geological and historical phenomena testify in favour of this parallelism of the axis of the equator, and of the plane of the ecliptic. The first indicates that there was formerly a higher temperature in countries which are now very cold; and we find in these situations a prodigious quantity of the wrecks of animals and vegetables, which can only live in very warm climates. A great many historical facts, also prove that some centaries ago the regions situated northerly possessed a mild temperature. According to the history of Justin, Tartary was formerly a temperate country. Iceland was covered with forests; in our days the cold is so excessive there as to prevent the growth of any other than stunted shrubs.

Other traditions inform us, that formerly the sun removed but little from the equator, and that there was a perpetual equinox. The Egyptians and the Chaldeans were of this opinion, if the history of Herodotus and Diodorus Siculus be correct. Plato

says, that every time a fruitful year recurred, the planets sat in the east, and rose in the west, that is to say, the east become the west and the setting the rising: this tradition still exists in Egypt. Empedocles, Diogenus and Anaxagoras, thought, according to Plutarch,\* “that the poles inclined, and that that of the north elevated whilst that of the south was depressed.”

Finally it has been demonstrated that, the obliquity of the ecliptic diminishes insensibly and that the inclination of the terrestrial axis becomes less every century.

Two hundred and fifty years before the christian era, Hipparchus observed this declension, and found it at twenty-three degrees, fifty-one minutes and twenty seconds. Astronomical observations fix, at present, the inclination to twenty-three degrees and twenty-eight minutes: during two thousand years it has consequently, diminished above twenty-three minutes. Whence it is very probable that the parallelism of the axis of the earth with that of the plane of the terrestrial orbit will be one day established, and that our posterity will have a perpetual equinox and and spring, as the ancient inhabitants of the globe had, and as those of Jupiter still possess. The astronomers of Egypt and of Chaldea, according to the relation of Herodotus and of Diodorus, have already conceived this hope; and the celebrated Lealand, after having compared the observations of the ancients with those of the moderns, has discovered that the angle of inclination diminishes twenty-six seconds every century. But those times are only perceivable at an ex-

\* Opinions of Philosophers, Book II. chap. viii.

treme distance; and in admitting with Louville that this angle diminishes one minute in every century, it will require for the complete re-establishment of the parallelism, a specific time of one hundred and forty thousand years.\*

\* The earth is not the only planet that has experienced revolutions, several others, and probably all the celestial bodies, have secular inequalities, which are the effect of their mutual attraction. (To the perturbations which alter the elements of the orbits at every revolution of an hundred years, has been given the name secular inequalities or equations.)

At present, it is demonstrated, that the action of the celestial bodies has insensibly changed the elements of the ellipsis that our globe describes around the sun. The moon has also its secular equation. Observations have proved its motion to be accelerated, this fact was noticed by an observation made by the astronomers of Chaldea before the formation of Babylon. This equation has for its base the action of the sun upon the moon, combined with the variations of the eccentricity of the terrestrial orbit. In our day, it is at such a point as to require myriads of centuries or it to cease.

The observations of the moderns, compared with those of the ancients give, according to La Caille, the following result; since about two thousand years, the motion of Saturn has become sensibly slower, and that of Jupiter accelerated. There is a difference of more than seven days in the revolution of Saturn around the sun, by the diminution of its mean motion. It has been discovered that the acceleration of Jupiter, in an interval of eight hundred and seventy-seven years, should be twenty minutes.

The orbits of comets are subject to much greater perturbations: they have much eccentricity; consequently, the more eccentricity a celestial body has, the more is it subject to alterations.

Among the fixed stars, variations in longitude and latitude is equally known, which is, probably, owing to the attraction of the celestial bodies which act upon them. These variations are particularly observed in the lustre of the Eagle, and in the Aldebaran.

The beautiful star Arcturus, has incessantly advanced for a century, towards the south; this advancement is estimated at eighty millions of leagues per year.

The nebulous appearance of Orion has changed its form, and augmented its density. Sirius has no longer the same colour as formerly; according to the history of Aratus, Seneca, and Ptolemy, in remote antiquity, it was very red, at present it excels in lustre.

James Cassini speaks of divers stars in the Scorpion, whose apparent magnitude has varied. He has seen them in the oriental basin which were only of the fifth magnitude, although they were marked for a fourth in the catalogue of Tycho Brahe.

The changing of the whale, discovered by Fabricius in 1596, has undergone the strangest revolutions. Its course, pretty uniform from 1687 until 1710, was in a little less than eleven months; but gradually diminished from this period. There

The revolutions that the globe has since experienced, especially, those occasioned by the volcanic eruptions and alluvions; revolutions which a multitude of natural monuments and the tradition of different nations attest, have changed the face of the earth, and created in some degree, a new world upon the old. They have, probably, heaped up the substances of one hemisphere into the other, and have changed the centre of gravity of the globe. But the principal cause of the inclination of the terrestrial axis is, as Lealand has demonstrated, the attraction that the globe exercises upon the different planets. However this may be, the sun no longer corresponds perpendicularly with the equator, and man has ceased to enjoy the same advan-

is nothing more irregular than the time of its appearance, for it is sometimes visible during three months, and at others during four and a half months.

It attains in fifteen or twenty days, its greatest size and clearness; and, after a kind of solstice, it takes thirty or forty days to diminish. Finally what confounds all astronomical calculations, is, its remaining so long without re-appearing. No person, according to the report of Hévelius, perceived it in the heavens, during the four years from 1672 to 1676, at the period in which the inhabitants of Europe expected it, it escaped all their telescopes.

We know, by written tradition, that the seventh of the *Pleiades* did not appear until after the burning of Troy, that is to say, 126 years before Jesus Christ.

In 389, there appeared a new star, near the Eagle, which after having been for seventy-one days the rival of Venus in lustre, terminated by disappearing entirely.

The most famous of all the new stars, is that of 1572, discovered by Tycho Braché, in the constellation of *Cassiopeia*, and which effaced Sirius in size and lustre, three months after its first appearance, it was smaller than Jupiter. It afterwards went through all the gradations of size, and its colour underwent at intervals, the same variations; at first a shining white, then a yellowish red, afterwards a tarnished leaden colour, and finally disappeared. Its reign was only six months.

La Caille has proved that our years diminish imperceptibly; he has demonstrated that the apogee of the sun was from ten to twelve minutes more advanced, at the period in which he wrote, than in the tables of Cassini and Hartley. Whatever may be the cause of the syderial perturbations, it is as certain that every thing in the heavens is subject to alterations and vicissitudes, as they are upon the planet which we inhabit, and that nothing is fixed and immoveable in the great theatre of nature. The celestial bodies, as well as man, have different ages; probably they will have an end. The necessity of decending to the tomb seems less frightful, by supposing that the space is inhabited by old stars, condemned as us to enter there.

tages as were enjoyed by our forefathers. To the inequality of the seasons thus produced, irregularities soon succeeded, from which period man became subject to a multitude of inevitable diseases, to which he was hitherto unacquainted. These diseases, have acquired, with time an increased energy. Certain meteors which have appeared more frequently latterly than they did formerly, have totally changed the constitution of the years; and in proportion as cold and moisture have augmented, chronic diseases have extended their empire. To the sixteenth century we may refer, the pituitous constitution, and it was produced by these causes. This constitution predominates at present in our country. During the period alluded to, the diseases peculiar to the pituitous constitution were seen prevailing, and impressing, in some measure, its seal upon those who were independent of it, so as to render them not easy to be recognized. This constitution gains strength daily, and constantly makes new progress. The quantity of rain that fell from 1702, to 1711, gave, for mean term, each year, eighteen inches; and that from 1751, to 1787, gave twenty inches; and the northern winds have sensibly predominated since 1740. Toaldo, who calculated with the greatest exactness, the degrees of heat and cold, in Lombardy, from 1745, until 1776, ascertained that the total cold is always augmenting, and that the weight of the atmosphere has become more considerable than it was formerly.

“Since the earthquake that took place at Jamaica, in 1692,” says this philosopher,\* “the face of nature

\* Essay on meteorology applied to agriculture, which gained the prize question at Montpellier, in 1774.

is less beautiful in that island, the heavens less pure, and the soil not so fertile. It is, perhaps, to the earthquake of Lisbon,\* which occurred in 1755, that we should attribute the frequency of storms, the sterility of the earth, and the disorders of the seasons, of which all Europe complains since that dreadful period."

Among the moral causes that have abridged the life of man, there is one which merits the attention of

\* Among the causes which have altered the globe and changed its surface, there is none, in my opinion, more powerful than the number of earthquakes that it has experienced in the different periods of the world. This destructive evil seems to have shook the earth to its extreme foundations, and the first ravages that it has exercised, is doubtless, as ancient as the world, and are buried in the night of ages. However it has left us, in the obscurity of ages, monuments to consult, which are as certain as tradition. The number of extinct volcanoes that cover the earth, is prodigious: one might say, in travelling over it, that it is almost the work of fire. We every where meet with lava of every species, in countries where the silence of the most ancient histories leaves us in the greatest uncertainty, respecting the origin of eruptions of which they are the cause. We walk, observed an ancient writer, justly, "upon the ruins of cities." "We navigate," said Seneca, "over towns which our ancestors knew, and of which history has transmitted to our age, the memory and information. How many are there, in other places, which have been submerged (by the effect of earthquakes?) how many nations have been swallowed up in the earth?"

In fact, we every where meet with the multiplied traces of disorder and confusion, produced by these terrible meteors. Our sea, is itself nothing but the remains of that ancient portion of the continent, detached from that which still exists, by earthquakes and the eruptions of the waves of the sea, which were the consequence. The vast sea of the Indies, Phillipines, the Mariannas isles, the Molucks, &c. the Antilles in the new world, the Persian gulf, that of Kamtschatka, those of Finland and of Bethina, are owing to no other cause. It is to the frequent encroachments of the sea, produced by violent earthquakes, that the separation of France from England is owing. The different beds and layers of earth are the same in these two countries; neither their nature nor inclination differ, more especially the white rocks near Dover and Boulonge. Sicily was formerly united to Calabria; the two promontories which are at the mouth of the straits, are now only a mile a part, and the layers of earth on the opposite sides of the strait of Messina, corresponds perfectly with each other. Formerly, Spain was contiguous to Africa, and it is very probable, that it was some earthquake which opened the communication of the ocean with the Mediterranean, as we observe a striking resemblance between the capes on the side of Spain with those of neighbouring Africa, and also, an infinite number of corresponding strata in both. The island of Cyprus has been thus separated from that part of the continent which the an-

the philosopher; it is civilization. Civilization by polishing man, and depriving him of his primitive rudeness, has made him purchase this advantage at the expense of a multitude of diseases, of which the first inhabitants of the world were ignorant, and with which the savages, who only give way to the impulses of nature, are still unacquainted. Man, in associating with his fellow beings, has, in some measure, relaxed

elements called Phenicia. The island of Sumatra from the peninsula of Malacca; and probably before the existence of the strait of Sangaar, Japan was united by the Eroam promontory to Kamtschatka; the land of the Papans to the isle of Gilolo, of the Celebes and of Borneo; the island of Ceylon to the coast of Coromandel; *Terra de feu* to that of Patagonia; and the Floridas to that of Cuba. It even appears, that formerly the western coasts of North America communicated with Asia; these two points of the world are, in fact, only separated by an inconsiderable strait; and moreover, an infinite number of words spoken in the old world have been found in use among the natives of the new; and the genius and the customs of the Americans, have the greatest resemblance with the genius and usages of the asiatic Tartars, and the inhabitants of Kamtschatka.

Perhaps we shall one day see the isthmus of Suez, which unites Africa to Asia broken by an earthquake. Such may also be the fate of the isthmus of Darien, and the straits which will be then formed, will divide America into two continents.

But if earthquakes are frequently devastative plagues, they do also sometimes develop productive forces. Several islands have been formed from the bosom of the waters. Two hundred and six years before J. C. a new island was raised in the gulf of Tuscany; eighteen years afterwards, a violent earthquake took place at Rhodes, and produced a new island near that of Tharamenia.

The island of Therasia, (at present Santorin,) appeared all on a sudden to the view of the mariners, in the time of Seneca. Pliny assures us that thirteen isles of the Mediterranean appeared at the same time, from the bowels of the waters, and that Rhodes and Delos are the principal of these isles. He speaks also of several other productions of the same nature. Such is, doubtless, the origin of the Azores, of the Canary isles, and several others of the South sea, and of those scattered in the Eastern ocean.

It is thus that volcanoes and earthquakes have raised some mountains and sunk others; they have made frightful abysses and separated continents; they have absorbed lakes and seas, produced violent eruptions, swallowed up towns and whole nations. These horrible convulsions of nature have, in our day, become much more common than they were formerly. Thence the irregularities of the seasons, which sensibly augment, and which will finally produce an obvious degeneration in minerals and in organized beings. But time only destroys to edify: it reduces all to the level of one common centre by a slow and insensible action: it does every thing for man and nothing for nature.

the ties of his existence. Society by extending the circle of his wants, by giving greater energy to his passions, and by generating those that are unknown to the man of nature, has become a fruitful and inexhaustible source of calamities.

In truth, man is born for society: his individual weakness and his severe wants, made him abandon at an early period, the wandering and vagabond life that he had led, in the forests and on the banks of large rivers, in the pursuit of wild beasts and fishes, and determined him to associate with other men, to protect his existence, secure his happiness, and expand his faculties. Besides, there exists no country, where they are not in a social state, this is the case even in the most arid and most frightful places. But societies of from twenty to thirty millions of persons, as Raynal has justly remarked, of cities of from four to five hundred thousand men, are deviations from the order of nature. In these places the air is infected with them, the waters corrupted, and the earth exhausted to a great distance. Here life is necessarily shorter, the sweets of abundance less sensible, and the horrors of want extreme. They are continually the seats of epidemic and nervous diseases. They are the asylums of crimes and immorality; for depravity is always a consequence of this enormous and fatal accumulation of people; the passions and the vices that result from them, degrade as well the body as mind, and prejudice as much the health of each individual as they injure social happiness.

When men first united it was in small bodies, and they spent their happy days in innocence and simplicity. We should not then be astonished if they were

robust, and if they arrived to a great age, exempt from the greater part of the diseases which afflict us. Those primogenitors had none but natural wants, and they satisfied these without fear and without remorse: Food, clothing, a cabin, and a *woman* in adult age, was all they required. But, in proportion as human associations have increased, they have generated a multitude of fictitious wants which continually torment us and render us unhappy.

Whence, instead of those simple aliments which deliciously prolong life, man had the poisons of the kitchen of Apicius, and the productions of all countries, served upon his table.\* A virtuous and sensible wife, could not gratify his desires, he required a seraglio; soon disgusted he returned to his criminal enjoyments: at length, entirely exhausted, he died prematurely borne down with infirmities, and devoured with remorse, imprecating curses on innocent nature whom he had outraged.

When we regulate our wants according to nature,  
A robust and healthy system is our recompense.

If to these destructive causes we add the bad education of children, the libertinism of fathers, who transmit to their posterity their vices and their enervation; and the epidemics of luxury which depraves the human machine, and prepares the germ of a multitude of diseases, we shall not be surprised to see our superb cities peopled with deformed beings, scarcely constituted, who, born weak, live under the yoke of pain, and perish prematurely.

\* "In society we have two orders of persons, physicians and cooks, of which, the former continually labour to preserve our health, and the latter to destroy it, with this difference, that the latter is surer to succeed than the former."

To our sad children, we our ills bequeath,  
Their fate's unhappy e'en when first they breathe;  
Our's is the lot their weakness to deplore,  
Which from our faults alone our offspring bore.

The cradle of infancy, as the elegant and sublime author of the *Philosophy of Nature* observes, is surrounded with dangers, to which our errors and our prejudices expose us. It is surprising that the destruction which is so great at this period, is not still greater. In the first place, a great number of children perish at delivery, owing, frequently, to the improper conduct of the accoucheur or midwife. These homicides might be prevented by leaving the labour to nature. The Chinese women and those of the Incas deliver themselves, and have not to complain of the unhappy consequences of their fecundity: The Peruvians had never heard of midwives before the arrival of the Spaniards into their country. There are but few cases in which art should assist women in labour.

No sooner is the child born than it is purged, to relieve it from the meconium; but the only remedy suitable at this period is the first milk of the mother. It is very singular that the first use which a child is compelled to make of its taste, is to try nauseous potions; and that its first step into the world, is into a pharmacy or an apothecary's shop.

The child requires the breast of its mother, in a short time after its birth. Nevertheless, certain physicians interdict it until the third day: Thus the milk, in consequence of its long stay in the breast, alters, and becomes injurious to the mother and child. To abandon the child to mercenary nurses is also pernicious both to it and the mother. From this practice

results the contempt of the principal ties of society, paternal love and filial piety; and the dreadful consequences of this contempt or slighting are incalculable. In every age of the world, philosophers have declaimed against this infraction of the laws of nature, which not only breaks or at least relaxes, the ties of families, but also occasions depopulation. Moreover, the mother who sacrifices the pleasure of maternal duties, is subject to as great physical evils, as those to which the infant that she deprives of her breast is, and she prepares for herself a long train of torments and pains.

In our country, notwithstanding the cries of humanity, they still bind the young child, and after some time compress its delicate body with stays. This custom is the source of an infinite number of evils; hence, we see so many deformed, lame and infirm persons among us, whilst there are scarcely any among the savages.

It is not less dangerous to keep children constantly in very warm apartments, to load them with clothes, and to prevent them from the motions and exercises of their age; these means cannot but render them valetudinarians and pusillanimous through life.

It is not less injurious, to permit them the too great use of animal nourishment and vinous drinks; in early life the abundant use of these articles are extremely prejudicial: this kind of life, which is contrary to the views of nature, promotes, too rapidly the development of the organs, and produces a multitude of diseases. Quite a different regimen ought to be observed; it is in the morning of life that the regimen of Pythagoras is especially proper.

If we consider the fatal effects of libertinage, and the great number of diseases to which enervation, occasioned by the abuse of pleasures, give place, we shall not be surprised to see these transmitted from the fathers to the children; and the offspring dragging out a miserable and languishing life, under the grievous weight of disease.

Feeble fathers can only beget infirm children and valetudinarians, and it would be as reasonable to expect a strong and robust progeny from parents exhausted by excess or disease, as it would be to expect a rich harvest from sterile ground.

See yonder wretch with tardy step advance,  
 The child of dissipation, not of chance;  
 (For howso'er we follow natures' rules,  
 High heaven will sometimes fashion sturdy fools.)  
 His altered visage effeminacy speaks,  
 And, good old age's sign, behold his streaks;  
 The hand of pleasure has those furrows made,  
 Youth, health and strength, will vanish with her aid.  
 Kind nature's office now at last such need,  
 And earth receives the cold and lifeless head.

And, to speak of the diseases which luxury beget. How many diseases do we not see brought on by the inaction in which the body and mind are kept, from those dangerous habits that the indolent rich contract, those who only breathe the stifled air of their apartments; who go out of their rooms but in carriages, remain awake during the night, and sleep in the day, who only use succulent aliments, and the most stimulating spirituous drinks, who give themselves up without care to every species of voluptuousness, even the most criminal; to the weariness to which their riches condemn them, and which alone, at first, renders ex-

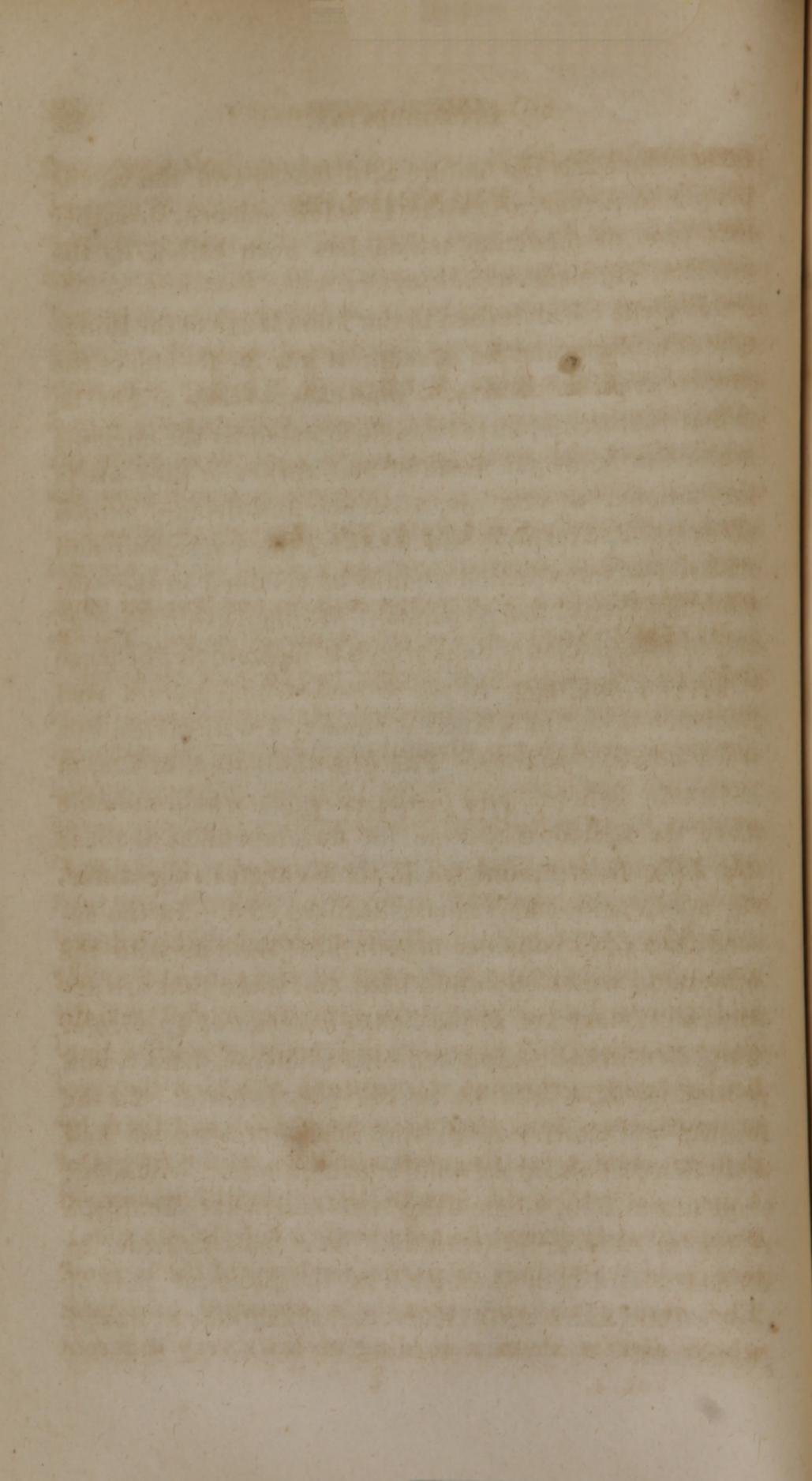
istence insipid and afterwards painful and fatiguing; finally, to a multitude of fictitious pleasures, which they substitute for real joys! Add to all these causes commerce, which by increasing luxury, has transmitted to us the diseases of other climates, such as plagues, small pox, &c. and you will see that the human species ought formerly to have enjoyed a more happy and longer life, and especially in the delightful climates of Asia and Africa, than are enjoyed by the inhabitants of the world.

I should not conclude, were I to undertake to enumerate all the causes of the diseases to which man finds himself exposed in our day, and the greater part of which were unknown to our forefathers. Let me be permitted to observe once more, that the greatest number of the diseases and infirmities which assail us from all parts, do not essentially depend upon our organization; but that they are of our own begetting, because we have infringed the healthy laws of nature, which does not create diseased beings. It is ourselves who have rendered our own existence unhappy, and who have abridged its length. "We have not received a short life, but have made it such by luxury; nor are we so much in want as wasteful and prodigal of it: Thus great riches in falling to the possession of a careless owner are soon squandered, when at the same time had a moderate fortune, been delivered to a careful keeper, it had increased by his use of it." Seneca de brevitate vita, chap. i.

From what I have just said, it results that the multitude of these diseases, of which some are inevitable, and others the work of man, rendered this subject the object of a science destined to enlighten human na-

ture, respecting the nature of diseases and the means proper to preserve health: It is this science, or rather this part of medicine which has been called by the Greeks, Hygiene.

Hygiene consists then in the knowledge of the things useful and pernicious to man; it has for its object the preservation of health. The causes that might be called *inevitable*, have been designated by the ancients under the improper name of *non-naturals*, they are of the number of six: air, aliments and drinks, motion and repose, sleeping and waking, the excretions and those substances which should be retained in the system, and lastly, the passions. Without confining ourselves to this distinction, which is incomplete, because it does not embrace all the causes which have a real influence upon the animal economy, I will divide this work into six sections: The first shall treat of life, of health in general, and of the energies which animate man; we will then pursue the developement of these energies, their direction, and their effects in the different ages, sexes, divers constitutions, &c. In the second, we shall consider man in his relations with the substances which surround him, and those that are applied to the surface of the body, *externa et applicata*. The third, shall comprehend the aliments, drinks, and seasonings of which he makes use, *ingesta*. In the fourth, we shall explain the effects of exercise and rest, those of sleeping and waking, *acta*. We shall treat in the fifth, of the excretions and what should be retained, *excreta et retenta*. We shall consider in the sixth and last, the action of the physical part of man on the mind and, vice versa, *sensations et animi pothemata*.



PRINCIPLES  
OF  
HEALTH.

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SECTION I.

ON LIFE, HEALTH, AND THE VITAL ENERGIES; ON THE DEVELOPEMENT AND THE DIRECTION OF THESE ENERGIES IN THE DIFFERENT AGES, SEXES, CONSTITUTIONS, &c.

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CHAPTER I.

*On Life, Health, and the Vital Energies in general.*

MAN is composed of various organs which have a motion, an action, and a life of their own, that act and feel more or less at certain times, and remain quiet at others. They are all penetrated with a particular faculty, through the medium of which they execute the functions that have been assigned them by nature. Galen justly compared them to the forges of Vulcan, of which the fire, bellows, anvil, hammer, in a word, every part was animated. Life is but a collection of the actions or particular lives of the organs. The organs are subjected to a sensitive principle, which directs them according to laws very different

from those that govern substances destitute of vitality. There are organs, the action of which are almost absolutely essential to the preservation of the general life: such are the brain, diaphragm, heart and lungs. There are others of which the action may be diminished or destroyed, without the general life being interrupted: such are the organs of generation, secretion, &c.: there are, lastly, such as the cellular tissue, the absorbent system, that of the muscular parts, &c. whose action survives that of the general life.

The body is composed of solids and fluids. The latter are in a much greater proportion than the former. According to the experiments of Hamberger, the relation of the fluids to the solids is as six to one.

In their origin, the solids have been fluids, and held in solution in the humors, as saline crystals in a menstruum: the solids are composed of fibres or small ligaments of a cylindrical form, and have for their base a double medium salt, the phosphat and carbonat of lime, for we not only obtain phosphor by disoxygenating the phosphoric acid which is combined with the lime, but we also produce, by means of acids, an effervescence which disengages the carbonic acid. The particles of this salt are united to the gelatin and albumin in the white and irritable parts, such as the bones, the cartilages, ligaments, membranes, &c. we do not meet with it in the gluten which is of all the substances that compose the body, the most *anama-lized*, except the blood and the muscular organs.

All the parts are endowed with sensibility by means of the nervous fibres, which extend and divide into an infinite number, and in which the faculty of feeling is essentially inherent. All possess, also, a tonic

force which is dependent upon the sensibility, or rather, is one of its ramifications. The muscular organs alone are provided with irritability, which is, perhaps, as Fouquet has said, but a *separate branch of the sensibility*. I shall make no remarks on the elasticity of which all the fibres are in a greater or lesser degree endowed, and which is independent of life.

We distinguish three kinds of solid parts: the nervous, which are sensible; the muscular, which are irritable, and the cellular organ or mucous tissue, which possesses only the tonic force, and the sensibility of which is consequently very obscure. It is upon the divers combinations of these three animal powers that the organic force depends, and it is by means of this force that every organ exercises the actions which are proper to it.

The nerves are the instruments of the sensibility: ten pair of the nerves come from the brain, and thirty from the spinal marrow. In addition to these, the ramifications of which are infinite, there is the *intercostal or great sympathetic nerve*, which possesses a very great influence in the animal economy, by the innumerable communications which it has with the other nerves. Some anatomists are of the opinion that the intercostal nerve originates from the sixth pair, others pretend that it terminates in this pair. It is only the medullary substance of the nerves—which is a continuation of the cerebral marrow, that possesses sensibility; their envelopement is entirely deprived of it, as has been proved by the experiments of Haller.

Amongst the organs, there are those which have a *patent* sensibility, always excitable in a natural state;

there are others in which it is *latent*, and require certain conditions and the action of specific stimulants to exhibit it. It was thus for example that the *dura mater*, irritated in the living animal, by a great many active stimulants, always appeared insensible to Haller, and his disciples; nevertheless, if it be slightly scratched with an iron brush or pencil, or if it be touched with the precipitate of a solution of the nitrat of silver, the animal gives signs of the most acute pain. It is thus that the tartarized antimony, as well as warm water, acutely effects the sense of the stomach, and does not produce any sensible impression on the eye, which is incommoded by the mildest oil. We know, from the experiments of Haller, that the iris is very sensible to light, while it remains motionless to the greater number of stimuli. Lastly, a multitude of facts which it would be too tedious to mention, reduce this truth to the highest degree of certainty.

Observation teaches us that the sensibility of the soft parts augments in proportion to their tension, as in inflammation: That hard parts become, on the contrary, so much the more sensible, when the cohesive force which unites their particles diminishes. The bones are insensible in a natural state, but in the *osteocophus*, a disease happily very rare, and in which they acquire the soft consistence of flesh, their sensibility is so great as to cause them to experience the most acute pains. Ligaments which are cut without exciting pain, become very sensible, at the end of a few days, when their tissue is softened.

The sensibility is, in general, in a direct proportion to the number of nervous fibres, and in an inverse proportion to the quantity and density of the cellular

layers which envelope those fibres. Hence, it is easily perceived why all the parts do not possess the same degree of sensibility.

Each organ has a sense which is proper to it, and all the motions that are performed in the animal economy, even the muscular and tonic, are the production of the sensibility put in action. This theory may be objected to, it may be said that the mind ought to be conscious of an infinite number of sensations continually experienced by the organs, and further, that the irritability survives the loss of sense in some paralysses, as well as the general life.

To reply to these objections, it is sufficient to observe, that the sense of feeling does not belong to the mind, that this only judges of, without experiencing it, and that sensations are not always accompanied with pleasure or pain. Sensation, properly speaking, is but the reaction of the organ of sense upon the object that makes the impression; and the impression is only accompanied with pleasure or pain when the reaction is carried to a certain point. Moreover, many sensations are not perceived by the mind, even in a natural state, either because they do not fix its attention, or are effaced by others that are more impressive. It is thus, for instance, that the action of light upon a healthy retina generally produces neither pleasure nor pain, whereas in certain diseases, as in the hydrophobia, its effects are very painful.

The contraction of the muscles is the production of the sense proper to these organs, which in a natural state is not sufficiently strong to excite pleasure or pain. It is in reality the effect of an impression felt by the muscles which is the cause of their motion.

Irritability also survives the general life, and does not become extinct in some incomplete paralysses; it continues in these cases, owing to the specific sensibility not being destroyed. It is only the *patent* sensibility which ceases to act, owing to the commerce of action between the *sensorum commune* and the organ that lives in part, being interrupted, and because the muscles are of the organs whose vitality exists sometime after the general life is entirely extinct.

The muscular fibres contain gluten or the fibrous part of the blood: this substance appears to be the principle of irritability. It is by means of the irritability that the muscles contract and dilate, alternately, in the living animal. The contractile power continues sometime after death, when a stimulus is applied to the muscle.

Experiments upon irritability have given the following results.

1. The muscular fibre is much more active in animals of cold blood, with pale muscles, than in those of warm blood and red muscles: the force of contraction is also much greater in the latter. The heart of a viper, separated from the body, and irritated by any stimulus whatsoever, contracts for twelve hours, and the contraction only ceases when the fibre has lost its flexibility and mobility by desiccation. The heart of man and of quadrupeds is totally deprived of irritability two hours after death.

2. It is not precisely the number of nerves which determines the degree of irritability of a muscle, for if those of the heart or of the intestines are cut, these organs are not the less irritable. But it appears that this force is the more active in proportion to the na-

kedness of the nerves. 3. The contact of air diminishes the irritability, by congealing the fat of the muscle, and by expending its caloric; a certain degree of heat is an essential condition to the duration of the contractions. 4. Irritability is in proportion to the agility and natural ferocity of the animal. 5. It appears to increase when the animal is expiring, as was observed by Caldani and Fontana, in the intestines. It has also been seen to revive in a portion of muscle, when cut after it was insensible in the entire muscle.

It appears that the convulsive motions which terminate the life of those who die at an early age are owing to this increase of energy which the irritability acquires at the moment of death. 6. Lastly, animals that die by a cause which suddenly destroys the irritability, as by strong electric shocks, the venom of a viper, asphyxia occasioned by a non-respirable gas, &c. putrify much sooner than those that preserve some irritability after death.

The tonic force is a strong one which acts by rendering the parts tense; it is inherent in all. It may be considered as the first degree of the sensibility. The tonic force is confined to the mucous tissue or cellular organ, and it varies more or less according to different circumstances, and the divers states of the organs: It is absolutely dependent upon life. Certain passions augment and diminish it; diseases alter it diversely according to their nature, and it does not survive the animal in all the organs. It is by the action of this force that the parts are rendered more tense in the living than in the dead subject, whilst awake than when asleep; during exercise than rest, in sthenic than in asthenic diseases; in strong passions, as in anger,

terror, &c. than when the mind is affected by sadness, chagrin, inquietude, fear, &c.

The cellular tissue is a sort of membrane or rather net work, composed of a prodigious multitude of cells or webs of different sizes and forms, and which communicate together. It serves as an envelopement to all the organs, and thus acts as the chain and medium of communication; it receives nerves and vessels of every species. It is very penetrable, and is continually imbued with a quantity of fluid in a state of vapour, which is principally absorbed by the absorbent vessels to which it is essentially united, and of which it is the origin. It is nourished and grows by juxtaposition, that is to say, by layers which are successively disposed upon one another.

Every portion of the cellular tissue, whether internal or external, communicate together; however, the parts situated above the diaphragm have not a very free communication with those below it. The diaphragm fixed between the superior and inferior cellular foot balls, naturally divides the body into two transversal halves. The manner of support and existence of the cavities formed by this division is different.\* This division was noticed by Hippocrates, (Aph. 18, sec. iv.) *Supra septum transversum, dolores (morbi) qui purgatione egent sursum purgante opus esse indicant; qui vero infra, deorsum.* Thus the diaphragm cuts the axis of the body into two parts, which make

\* "The diaphragm," says Buffon, "is in the animal what the collet is in the plant; both divide them transversely, both serve for points of support to the opposite forces; for the powers which in a tree force the parts above, that are to form the trunk and branches, extend and rest upon the collet, the same as the opposite forces which push the parts below that are to form the roots." Disc. Gener. sur L'hist. Natur.

mutual and contrary efforts by the resistance that the mass of the entrails oppose to its action.

There is also a division of the body into two lateral halves, which is formed by the cellular tissue. These halves are symmetrical and parallel to the axis of the body, and the parts of the same side communicate more among themselves than with those of the opposite side, as the liver with the right shoulder and leg, and the spleen with the left shoulder and leg. Moreover, the air or water that is injected into one of the lateral halves, does not pass into the other, unless a force is employed capable of destroying the partition which vertically separates them for the whole length of the body, as well anteriorly as posteriorly. The partition is formed by the indentation of two cellular layers. This same division, and a similar indentation is remarked in the internal parts of the head, breast, and abdomen. The cellular organ varies in the different regions of the body. It is contracted, and as strangled with short and small fibres in certain parts, as in the membranes, which are almost entirely composed of this species of tissue. In other parts it is loose, and presents long and distinct lamina, as in the breasts, misenterry, epiploon, &c.: this kind of cellular tissue serves for reservoirs to the fat, and contains the gelatin in early age.

The nervous, cellular and membranous organs, form the general system of the animal energies. These energies have a central point towards which they direct themselves, and from which they are reflected. This centre is the epigastrium, which comprehends the diaphragm, stomach and intestines. These viscera do not only act and react incessantly upon every

part; but they also oppose a mutual effort of action and of counterbalancing, which contributes to the harmony of the functions, as is proved by anatomical ocular demonstration, and the phenomenon of life, as well in a state of health as in that of disease. The epigastrium is then the point of support, the *hypomoclion* of the tonic forces, the rendezvous of the actions and of the motions, and the focus from which they are reflected. But of all the epigastric organs there is none more active than the diaphragm. The diaphragm possesses an extensive influence in the animal economy; its department of action embraces all the organs, and it is their antagonist. As soon as any of these organs cease to be subject to its sympathetic influence, so soon do they cease to sympathize with the rest of the system, but they may still enjoy their specific life. Its motion only ceases with life; it is the organ which at birth, sets in play the muscles subjected to the empire of the will. It is the boundary, the seat of the corporeal efforts and sensations, it is the theatre in which the nervous commotions commence, and in which are excited the play and storms of the passions. In a word, it is the organ of the greatest influence, and the vital sphere which radiates to the greatest distance and with the most energy.

The epigastrium is one of the principal centres of the sensibility, it forms with the heart and brain the triumvirate of human life. It is in this triple focus that the sensibility unites its active forces; it is from thence that it lances the numerous and useful radiations which vivify and animate the whole machine. The brain by the influence of the nerves, the heart by the circulation, and the epigastrium by its opposi-

tion of action, and its counterbalancing of the other organs. The general life depends upon the reciprocal and durable commerce of these organs, and it suddenly ceases when they are interrupted.

The state of each organ is the result of the equilibrium of the actions, which go off from these different focuses, or are retained in them. In a state of health there results from them a habitual distribution, which is performed in the most suitable order, in each of them. These actions diverge, as it were, from the centre to the circumference, and from the latter to the former: they, thus, diffuse throughout the nourishing juices, and carry out of the body the excremental humours. These being, throughout the system, determined to the skin, which is the most universal secretory organ.

In order fully to comprehend this theory, it is necessary to observe, that there are in the animal economy, or rather in every part of the living body, two orders of motion which, in health, incessantly cross and counterbalance each other; the one is directed from internally without, the other from externally within. The first is a motion of expansion or *eccentric*, which extends from the centre to the circumference, dilates and tumefies; it usefully predominates in the first period of life, for the development of the parts: the latter is a motion of condensation or *concentric*, which is performed in a contrary sense, and which brings back the humors from the circumference to the centre. This direction begins to prevail in the age of virility, and makes rapid progress in proportion as man passes the solstice of life, until extreme old age. Death is its last term.

It is by means of these two motions combined in just proportions, that the harmony of the functions is maintained, and that the organs transpire and absorb. Every part provided with life possesses a kind of respiration, as has already been said by the ancients. This double motion has been designated by Stahl, under the name of *flux and reflux of the little world*.

When the energies which perform these motions, and which produce in every part continual movements and vibrations; when, I say, these energies are arrested in a proper manner, that is to say, are justly divided between the centre and circumference, a perfect harmony prevails in the principal seats of life, and every organ executes freely the actions which are proper to it. From the combinations of the actions and the concord which reigns among them, results health, which is that state of the living body, in which the functions proper to each individual is constantly exercised with ease, with a sense of comfort, and in the most convenient or suitable order to the age and sex.

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## CHAPTER II.

### *Analysis of the Functions common to Animals and Vegetables.*

SENSIBILITY is the element of life. It is the nervous fibres which essentially compose the animals; the other parts are only as it were secondary. Consequently, an animal deprived of the latter, provided

the nerves are left, as Bordeu has very well remarked, will not cease to exist in an animal state, as it will enjoy the faculty of feeling, upon which solely depends vitality. All the functions of the living body are, then, depending on the sensibility: they are the object of physiology. As physiology is closely united to hygiene, we will take a cursory view of its principal functions; which are digestion, the circulation of the blood, the secretions and excretions, and respiration; we will now examine the analogy which exists between these functions and those of vegetables.

1. *Digestion.* It consists in the conversion of the alimentary substances into chyle, which requires divers preparations. The first operation in digestion is that which is performed in the mouth, and of which the saliva and teeth are the principal instruments. The aliments are not only bruised and triturated by the action of the teeth, but they are also penetrated by the saliva, which impresses them with the first characters of *animalization*. The effusion of this humor is not a mechanical effect and a necessary result of mastication, for, according to the experiment of Bordeu, chewing has but a very feeble action on the salivary organs: Moreover, the flow of saliva in the mouth is very frequently produced by the sight of a dish of meat which flatters the appetite.

The aliments thus prepared, are received into the stomach, which, from that period, becomes the seat of labour, and the centre where the forces necessary to digestion are about to concentrate. In the stomach the aliments are disposed to cede fully to the assimilating power of each living organ; there they mix with the gastric juices which not only dissolves them, but fully

penetrates and gives to them, as well as the organ in action, the interior and specific qualities attached to life. Thus the gastric juices, besides their dissolvent property, are, as well as the stomach, towards which a vital derivation takes place during digestion, animated with the same force which is constantly exercised in every part of the body. It is this force which defends the stomach and the neighbouring organs against the dissolvent action of these juices; it is it which counterbalances and diminishes, in the aliments and in the humors, their natural tendency to fermentation, and which, combined with these, makes them pass through all the changes proper to identify them with the substance of the animal; or rather, it is the vital principal itself, diffused every where, which displays its action upon the matter, organizes it, and disposes it to receive the sense of life.

The aliments having undergone the first degree of digestion in the stomach, pass into the duodenum, where they experience the action of the bile and pancreatic juice; and are impregnated with a new degree of vitality, and converted into chyle. That which cannot be assimilated, is precipitated by the bile, which combines with it, and changes it into excrements; then the peristaltic motion of the intestinal canal, excited by the bile, expels it out of the body, by the anus. It is the bile that colours the excrements.

The chyle which passes through the lacteal veins is absorbed by these and the mesenteric glands; thence it is carried successively into the thoracic canal, then to the left subclavian vein, where it mixes for the first time with the blood, afterwards to the heart, and lastly, to the lungs, where it is transformed into blood.

The chyle, as well as the other humors, incessantly experiences, whether in the circulatory vessels, or in the different organs, the labor of the digestive faculty, so that we may consider these as so many stomachs, in which the fluids are altered and changed by the double action of the chemical and organic forces. These forces always counterbalance each other, in such a manner, however, as causes the latter to be performed with the greatest advantage.

2. *Circulation of the blood.* The chyle, converted into blood, conveys to every organ the matter upon which it must exercise its actions; a part is assimilated with it, and the other acquires qualities that render it proper for particular uses, or it is thrown as useless or prejudicial out of the body, by an outlet proper to each excremental humor. The blood continually experiences an intestine or fermentatory motion, which moderates the action of the vital principle, and also a progressive motion, by means of which it circulates from the heart by the arteries, and returns to it by the veins. The laws of the circulation depend not only upon the vitality of the heart, but also upon the particular sensibility of each organ. The circulatory system of Harvey was founded on some experiments, which consisted in tying the arteries and veins. He saw that the first became distended by passing the ligature at the extremities, and the others by using it at the heart; he thought that the blood flowed from the arterial extremities into the veins, without being deposited in the middle cellular tissue, which divides the two. Lastly, he only admitted, the incessantly repeated contractions of the heart and arterial system, as the cause of the circulation.

In fact the heart is the centre whence flows the torrent of humors that is subdivided in the arteries, but which is lost in the tissue of the solid parts. The Harvenian circulation is only strictly performed in the large vessels; it is incessantly interrupted either by the arterical ramifications, or by the cellular tissue. To pretend to submit this function to hydraulic laws is erroneous and contradicted by every fact. One would suppose that the circulation of the blood in the ramifications of the large vessels, could not be performed without a deviation from the general laws, as the total orifices of these ramifications are larger than that of the artery from whence they ramify, and that the velocity of the fluids should change with the diameter of the tubes or vessels that admit them: but, according to the experiments of Leuwenhoek, Haller, &c. the swiftness of the circulation is nearly the same every where. In truth, the latter has sometimes observed it more considerable in the small vessels than in the large trunks. The tonic force with which the first is endowed, in an eminent degree, restores to the blood, or even augments the motion which it loses by a multitude of resistances that it continually meets with in its circulation.

To say that all the animal fluids obey the action of the heart is erroneous. There are some of them which circulate in the cellular tissue, without its influence; and the circulation in the capillary vessels is independent of this principal vital focus. This circulation, as well as that of the lymphatic and absorbent systems, continues some time after the heart has entirely ceased to move, and after the circulation is extinct in the large vessels. Besides the frequent

anastomosis of the arteries, and the plexus which they form, are so many passages opened to the humours to go, come, flow, reflow, stagnate and circulate in every direction.

The very frequent reflux of the blood into the arteries and veins, in a state of health, derogates also from the laws of hydraulics, to which the English physician wished to subject the circulation. Several other perturbations which Haller noticed in the arteries and veins, tend also to entirely destroy the plausibility of the Harvenian theory.

The general circulation, is the united effect of each organ; it is owing to their specific sensibility, and is diversely modified in them. The impression made upon the vessels of the stomach, is very different from that performed by the lungs; each part has a decided influence upon this function. Paralytic patients have been seen, who perspired abundantly on the side affected. Gatti reports having observed two hemeplegiac patients, covered with pimples only on the sound parts. This unequal distribution of the fluids, proves to a degree of certainty, that their circulation does not depend only upon the motion of the heart, but also upon the particular action of each organ, which increases or renders it slower according to the condition in which it finds them: the fact is proved besides, by partial fevers, examples of which are not rare.

Although, according to the vulgar theory, the arterial extremities terminate immediately in the veins without an intermediate cellular tissue, it has not been demonstrated, however, that this continuity does really take place, and that the arterial branches do

not deposit the blood, which they contain in the cellular tissue; it is very probable, on the contrary, that this fluid is subjected by the action of this tissue, to undulations which have the greatest influence upon the character of the pulse. This deposit of the blood in the cells intermediate to the arterial extremities and the first veins, is obvious in the spleen, corpus carvamosa, in the tissue of the cheeks, which the least emotion colours or turns pale according as the spasm strikes the tissue or effects the arterial vessels; and in many other parts.

3. *Secretions and excretions.* An essential object of the circulation is to present, successively, the humors to the secretory and excretory organs. These organs deprive the humors of the heterogeneous substances that they possess, and give to the residue the degree of elaboration, necessary to the performance of certain functions. The secretions and excretions furnish a very obvious proof of the specific vital sensibility, inherent in every part; for they are only affected by the action of the secretory organ, which secretes, from such a humor in preference to others, because it is that alone which affects its specific taste. It is in consequence of the excited sensibility of the organ that it is disposed, arranged, enters as it were, into an erect state, to regulate its motions according to the nature of the humor which is to be secreted. It then becomes a centre of action, around which an order of motion is established, that attracts a torrent of humors from which the organ selects those proper to its appetite.

Nutrition is performed in the same manner, it is a true secretion: each organ calls to it, and chooses the particular particles of which it has need. Conse-

quently, nutrition is not performed by a simple juxtaposition of the nourishing juices, but by the action of the part which is applied to the nutriment.

The urine is one of the most abundant secretions; it continues incessantly. The kidneys which secrete it, never cease to act. In this respect they are very different from several other organs. They have their time of active exercise and relaxation. They have their exacerbations and remissions, but are always operating, hence they receive two large arteries, (the emulgents,) which assiduously convey to them a great quantity of serum, charged with heterogeneous and excremental substances, whose pernicious qualities are obtunded in the aqueous fluid, that serves them for a vehicle: hence the serious diseases that result from the retention and reflux of this fluid.

The cutaneous organ is also a mean of general discharge for the excremental juices. It always discharges copiously when the eccentric force predominates. In this case, perspiration, and frequently sweat, flows from every part of the surface, and forms very abundant evacuations; when, on the contrary, the concentric force prevails, the skin excretes but very feebly, but attracts and absorbs the aeriform fluids diffused in the surrounding atmosphere. This absorption turns to the advantage of the body, when the air does not possess any qualities deliterious to the individual.

The secretion of the semen has for its principal object, the propagation of the species. This fluid is in reality excremental and recremental. It is produced by a mechanism similar to that which performs the other secretions. We remark the same analogy in its manner of evacuation, and that in which the other

fluids are thrown out of the system: the organ destined to procure the excretion of it, disposes itself, straightens, erects and becomes a centre, where the tonic force which accumulates and fixes, concentrates.

4. Respiration is also a function depending on the sensibility; its end is evidently to support the animal heat, and to give to the blood its vital qualities. It commences at birth. While the fetus remains in the body of its mother, it lives with her a life which is common to them both, by means of a particular circulation. But so soon as it is born, its blood makes a new rout; the sensibility becomes more active, it awakes in the epigastrium which was hitherto reduced to a tonic motion; it respire, and from that period the circle of its life extends and aggrandizes.

The diaphragm is the principal organ of respiration; it is the successive contracting and relaxing of this muscle, which puts in action the powers destined to augment and diminish alternately the capacity of the breast, for the introduction of air into, and expulsion from this cavity. This theory is proved by the kind of respiration, which takes place, when the diaphragm is struck with spasm, as in strong passions and fits of asthma. The diaphragm is the most active of all organs, and is in some measure, the balancer of the body: it is united by a close correspondence of action with the other organs; it is their antagonist, especially of the external organ or skin. So soon as the child is born, it becomes subject to causes of irritation, much more powerful than previously experienced; which are new to its sensibility. The cutaneous organ, the senses, and especially the pituitary membrane, are exposed to the action of light, electric

gas and the atmospheric air. The irritation produced by these causes, radiates towards the diaphragm; the motion of this organ commences, the capacity of the breast augments, the air falls by its specific gravity into the dilated lungs, and the successive order of inspiration and expiration is established, to end but with life.

Such is, in miniature, the picture of the principal functions of man. Let us now see their affinity with those of vegetables; this digression will lead me but a little from my subject. The analogy which exists between vegetables and animals, was known to the ancient philosophers; many of whom were persuaded of the animation of plants, and they included them in the rank of animals. Empedocles, Anaxagoras, Democritus, Zenon, Pythagoras, and Plato, were of this opinion, and it was reserved for modern philosophy to reduce this truth to the last degree of certainty.

First, the exterior organization, which is presented to our view, in vegetables as well as in animals, exhibits them both composed of divers parts, which have the most just and suitable proportions in a natural view; both are covered with a double envelopment, the epidermis and the skin. In plants, the latter takes the name of bark. They are both strewed with hairs and glands, very perceptible in some species, but which cannot be discovered in others without the aid of a microscope or magnifying glass. The wood of vegetables is alone comparable to the bones; the fibres, to the cellular tissue, fibres, vesicular and parynchamatus parts; the membranes, the spinal marrow, vessels and fluids are in vegetables as in animals; the roots perform the functions of the stomach, tra-

chea, and the lungs; vessels for the circulation or oscillation of the fluids; stamina and pistils organs of reproduction; grains or seed similar to the eggs; a fecundating pollen, the secretory and excretory organs, &c. All these essential parts present the most complete resemblance in the two great families.

We also remark in both the same functions. There is performed in plants, as in animals, a circulation, which ceases but with life; in fact it is not the same, for in the first, there exists a centre from which the fluids set out, and towards which they return; whereas in the latter it is limited to a continual oscillatory motion, from the roots to the trunks and branches, and from those to the roots.

The juices which circulate in plants from the superior to the inferior parts, are composed of the different substances disseminated in the atmospheric ocean, and absorbed by the aspiring mouths of the leaves, and all the external covering of the vegetable. It is the atmosphere that furnishes the greater part of their nourishment. The experiments of Van-Helmont, Boyle, Hales, and Duhamel, prove that a few ounces of earth are sufficient to keep alive the largest trees and preserve their growth. Boyle planted a branch of willow in a vessel, and filled it with earth, which he carefully weighed; at the end of five years this branch had become a tree of the weight of one hundred and sixty-five pounds, and the earth had lost two ounces. We know that the shrubs and bulbous plants vegetate and grow very well in water alone, although they meet with very little earth, and they furnish by analysis the same productions as those that have been only in earth. Moreover, the fungus, moss,

lichins, and many marine plants, absolutely have no root.

We find an indication of this double motion of the vegetable fluids, in Hippocrates: "When the roots attract nourishment, they communicate it to the tree, and the tree to the roots; thus in the tree there ought to be a certain mutual exchange from the roots to the branches, and from the latter to the former; therefore inferiorly and superiorly the tree grows, because it receives nourishment from the inferior and superior parts."

Respiration is performed by means of the double motion of inspiration and expiration. Vegetables perform this function; they inspire some aeriform fluids, and exspire others, the same as animals, after having changed and altered them. When vegetation is in full activity, and when plants are exposed to the solar light, they generally give out immense quantities of oxygen gas, especially soon after the sun has passed the meridian. When they are deprived of the rays of this beneficial planet, that vivifies nature, they exhale carbonic acid gas. Moreover, there are certain plants, and even flowers and fruits, whose odour is very sweet; as roses, tuberoses, &c. that exhale, day and night, deleterious gasses, which are different from their aroma, as this in general has no pernicious or unhealthy quality.\*

Animal heat is a vital production; it is nearly equal in opposite latitudes: it is the same with vegetable heat. From the experiments of Adonson, it appears, that every species of plant has the degree of heat,

\* The Fraxinelle exhales hydrogen gas, which inflames by the contact of an ignited body.

which is suitable to its entire development, and that this degree of heat remains the same in countries the temperature of which is very different.\* Moreover, during winter, the season in which plants sleep, they digest very little aliment, but they still produce a degree of heat, which keeps them from perishing.

Nutrition is common to animals and to vegetables. Vegetables are provided with organs, some of which absorb nourishment, and others elaborate and convert it into their own substance. They, as well as animals, grow and develop in every direction, and acquire a state of consistence, and finally pass by gradual shades to that of decay and death.

Secretions and excretions are functions which belong to all the organized kingdom. The juices which the digestive faculty is not able to assimilate to the plant, are thrown out as in the animal. We meet with fluids of a very different nature in the divers parts, which have particular uses. There are excretions under a solid form in some vegetables; as the pine, ash, olive tree, &c.; but the most ordinary are the perspirable fluids of an aqueous nature, which are exhaled under the form of vapours. This transpiration is more or less abundant, according to the state of the atmosphere and the species of plant; it most generally amounts to some pounds per day. Hales observed it in the annual helianthus, seventeen times greater than in man.

We observe the same analogy between vegetables and animals, in respect to reproduction; this takes place in three ways, to wit: by buds, young shoots,

\* Vegetable heat is generally at the eleventh or twelfth degree of Reaumur. Eighty-six degrees of Reaumur's scale, is equal to 212 of Fahrenheit's.

and by grains or seed. Trembley having attentively examined, that insect, known by the name of polypus, from the great number of granula upon its head, has remarked that it has no sex, and that it reproduces in the same manner that vegetables send forth their buds, with this difference, that the small polypus separates spontaneously from its parent, when it has attained the state of maturity. Moreover, into whatsoever number of parts this insect is transversely divided, each division acquires, in a very short time, what is necessary to complete its animal state; that is to say, the head acquires a body and tail, the tail produces a body, head, and granulas, and from each portion of the body originates a head and tail. If we cut one of these insects longitudinally into two portions, the lips approach cicatrize, and each half becomes an entire animal.\* If we invert one of these insects as we would a glove, it continues to live and reproduce as before. Since the time of the above naturalist, other insects have been discovered, which have some of the properties of the polypus; amongst which are certain worms, the nettle, and the star fish of the sea.

The most general manner of reproduction amongst vegetables and animals, is performed by means of seed, and it requires the concurrence of the sexes. In the first, the most of which are hermaphrodites, the

\* There are also vegetables that may be perpetuated by simple slips. We find an instance recorded in the Memoirs of the Academy of Sciences. Two sisters, after the death of their mother, inherited an orange tree; each of them claimed it, neither would cede to the other. They finally determined to divide it, and each to take a half. The tree experienced the fate to which the child was condemned by Solomon; it was divided, and each of the sisters replanted her half. The tree divided by fraternal hatred, was, by nature, covered with bark.

flowers serve for the nuptial bed; it is the pollen of the *anthera*, poured upon the stigma, that fecundates and vivifies the embryo. We meet with the sexual organs in all vegetables, whether androgyns or hermaphrodites, or in the unisexuals, even in those that constitute the class called cryptogamia by Linnæus, for they clandestinely celebrate their marriages, if I may use the expression of this great man. In fact, their flowers are concealed in the fruit, and escape the sight. Such are the byssus, mould, fern, flags, mushrooms, and mosses.

The vegetable grain, fecundated as the egg, gives birth to a new being. A delicate nourishment is prepared by the hands of nature, to nourish this foetus of vegetation. Some cotyledons, or seminal leaves, similar to the placenta of animals, is destined for this purpose. When the germ is a little developed, the vegetable breast, that it sucks dries up. And this first milk gives place to a more consistent nourishment. Finally, the plant passes, as the animal, through the successive states of softness and development, of desiccation and rigidity; it successively runs through the three ages of animal life—youth, virility, and old age. Observe that the softness, or rather the mucous state characterises all the productions of vegetable and animal nature in their first state, and that we may remark in vegetables as in animals, the same order and the same succession of motions. The eccentric force predominates in the age of growth in both; it diminishes by gradual shades, and finally gives way to the concentric, which progresses more or less rapidly, as the vital heat possesses a greater or less active energy, and produces that degree of dryness of the

organs, which permits them no longer to develop their vital faculties.

Observation has demonstrated, that there are animals, which are endowed with the faculty of reproduction, as far as several generations; the bivalves, which are deprived of sexual organs, the *vine fritter*, &c. There are also plants, according to the experiments of Spallanzani, which, although deprived of their stamina before fecundation, give birth to germs that produce others not less fruitful, and without marriage, of this number are the squash, water melon, hemp, and the spinage.

But it is said, that vegetables are deprived of the locomotive faculty, consequently, that there is but a very faint analogy between them and animals, and that this faculty establishes between these two kingdoms a line of demarkation, and an essential difference. This objection is of no consequence, if we consider that the locomotive faculty is not essentially inherent in animal life. How many animals are there which are condemned to remain eternally at the bottom of the abyss of the ocean, or upon vast and numerous rocks, which line the sea's immense shores, that are deprived of this faculty? These parasite shell fish, that remain motionless upon the first body, or fall from the germ, *glands de mer*, (a species of shell fish,) *anatiferous concha*, *pousse peids*, dails, madrepores, polypus, gale insects, &c. &c. have not the faculty of changing place, but remain constantly fixed in the point of space, where their peacable destiny has placed them.

These beings, which much resemble plants by the simplicity of their organization, and which for a great

while made a part of the vegetable kingdom, upon whose confines they are placed, are really animals that obviously manifest motions of desire, at the approach of the prey, which serves them as aliment, and of fear, when they perceive something dangerous. These sensations announce beings that are conscious of their existence, however limited it be.

Vegetables are not, however, entirely destitute of the faculty of moving themselves; they perform motions which are derived from the principle of irritability, and which is effected in the most unequivocal manner in the most of their parts, especially in those destined for reproduction; consequently, the moving of only some parts of an organized body, is the effect of locomotion, as well as the moving of the whole body.

1. When the roots meet with obstacles which they cannot penetrate, they give way, and contort around them, until they have found a suitable soil.
2. The stalk also manifests motions. We see herbivorous plants, which are in hot houses, obviously incline towards the light, and seek it. The tremelles (a species of moss) follow the course of the sun.\* The *apios Americana* and the *euphorbia apios* of Linnæus, stand so much in need of support, that their stalks turn spontaneously to one, when they meet with it.
3. The branches, leaves, and flowers, perform, by means of their articular capsules, obvious motions, and constantly turn towards the sun. We see them in the

\* The tremelles have the singular property of resuscitating several times after death. Gledrigh also resuscitated dead moss, after it had been dead one hundred years, and caused it to gain its primitive freshness, by macerating it for seven or eight hours in cold water.

morning directing themselves towards the east, at noon, southwardly, in the evening, to sun-set, and in the night to the north. These different determinations are more particularly remarked in some plants, such as the sunflower, turnsoil, woad, hops, the leaves of the willow, mallows, trefoil, the ear of wheat, the *semi floculosa*, &c. and they may be observed in all, although they are performed in a less obvious manner in some than in others. There are none of them that do not change the situation and form of their leaves during the night, that do not contract, and which do not, in fact, present signs of real sleep.\*

There are plants whose motion is manifested in consequence of contact. The mouse-trap contracts and kills an insect, as soon as one alights upon its leaves; the sensitive plant, the flowers of the berberies, of the Indian fig-tree, the sunflower, &c. erect their leaves, and fold them when touched, apparently to shun the body that approaches them.

On the banks of the Ganges, there is a plant called *hedysarum girons*, whose motion is spontaneous and continual; its leaves are always agitated, whether during the day or night, as well in the light as in the dark, but without observing a uniform or constant direction.

We perceive spontaneous motions in flowers; they open themselves, expand and contract at certain hours, during the day. Linnæus imagined a botanic horologe, composed of divers plants, whose flowers should open and shut at certain hours. This was an ingeni-

\* This phenomenon has been attributed to the coolness and moisture of the night, but the same thing occurs in hot houses.

ous emblem of time, which flies away with the same rapidity, as do the beauty and colour of flowers.

The motions of the filaments of the stamina, and the stigma of the pistils is equally effected. These parts, destined to reproduction, sensibly approach each other, during generation, and the anthera lance the fecundating powder upon the stigma of the pistils. This powder (pollen) is so mobile that it moves with rapidity in alcohol.

The fruits of many vegetables are shot forth by the parts that contain them. This phenomenon, may be remarked, amongst others in the socreie, balsam apple, wild cucumber, and in the plants called by Linnæus, *tetradynamia*, &c.

All the motions of which I have just spoken, are performed by a force analagous to that which produces the muscular action in animals, and which may be called vegetable irritability. From the experiments that have been made upon this irritability, the following conclusions may be drawn: 1. That it is very obvious in flowers about to blow or recently blown, but from that period it insensibly decreases. 2. As in animals, vegetable irritability is in proportion to the softness of the plants, and it diminishes in proportion to the progress of desiccation. 3. It manifests itself by the action of a stimulus. 4. The contraction of the irritable fibres of vegetables is followed by a relaxation, as in the muscles, and this alternate contraction and relaxation is in proportion to the degree of irritability and the stimulant action, 5. A warm and dry constitution promotes the irritability. 6. The irritable parts contract themselves not only when they are entire, but also when they have

been divided. 7. Plants are more irritable in the morning than in the evening. 8. They are less irritable than animals. 9. Lastly, the irritability is more sensible in the sexual organs than in other parts, although there are, notwithstanding, vegetables in which these organs are very slightly irritable. From these facts it is very obvious, that there is the greatest relation between vegetable and animal irritability.

To the eyes of the ignorant, vegetables appear entirely destitute of sense, because they do not give any indication of pleasure or pain, and because anatomy has not demonstrated any organ of sense in them. But if we pay attention to the sensibility of certain animals, such as the polypus, shell fish, nettle and sea flower, which are confined to motions of contraction and dilation, we shall see that it would be inconsistent to refuse to plants, which exhibit the same signs of sensibility, as the animals of which I have just spoken, the property of sense.

It appears to me, that plants are real animals of an inferior order; the greater part of which may be compared to the animals called in Latin, *animalia hibernantia*, (hibernating animals.) In fact, they are stripped of their attire, at the approach of winter; during this season, they seem to be in a state of sleep, similar to that in which we find the dormouse, hedge hog, marmot or mountain rat, swallow, bat, in a word, the sleeping animals that pass the cold season without taking any nourishment or exercise. I love to persuade myself, with the sublime author of the Contemplations of Nature, "that these flowers which appear in our fields and gardens in a lustre always new, these trees, whose fruit so agreeably effect our eyes

and our palates; the majestic trees which compose these vast forests, that time seems to have respected, are so many sensible beings, who taste in their manner, the pleasures of existence.”\* Perhaps, as the author of the *Philosophy of Nature* observes, vegetables have the sensation of their actual existence, and that animals unite to this sense the remembrance of the past, but that it belongs to man alone to combine these two sentiments with that of the future.

We cannot doubt then, but that there is the greatest analogy between vegetables and animals, since the differences we perceive in them are only accidental, and the constant relations that are observed between them are numerous, and founded upon the same nature of things. There only exists between them a line of demarkation. “Nature,” justly remarks the same author,” is a great scale, the intervals of which, are occupied by sensible beings, and which is bound at one extremity by the *Supreme Being*, and at the other by the elements of matter. Sensation becomes less by a finely shaded degradation from the first term until that which is filled by the atom, but it perishes not.”†

\* *Contempl. de la Nature*, tome, ii. p. 475.

† *Philosophie de la Nature*.

## CHAPTER III.

*On the Vital Principle.*

SENSIBILITY, upon which the life of animals depends, is not only the result of organization, but is also the effect of a principle which acts upon organized matter, to which it communicates all the vital qualities, of which its organization is susceptible. But what is the nature of this principle? This is a point on which it is scarcely possible to form a conjecture, as we know it only by its effects.

The ancient philosophers were divided in opinion respecting this principle; some of them thought it was air; others, fire; several, with Heraclites, pretended that it was formed of these two substances; the human soul and the principle of life was, according to them, the same thing, and constituted the universal soul, from which all organized beings drew life, and of which the latter is but an emanation, a particle.

Democritus, Epicurus, and many others, acknowledged but a single principle of life inherent in matter, incessantly co-existing with it, which has disposed the whole universe, and which presides in the formation of all bodies, whether inorganic or organic. It intimately mixes with the elements of created nature, and there develops the degree of action, of which created beings are capable. This was also the sentiment of Plato, Diogenus, Laertius, Lucretius; and the great Hippocrates\* thought that this same principle of life

\* Lib. de dicta.

was pure fire, not the destructive element of our hearths, but a fire of a superior nature, which, without altering the exterior forms of the bodies that it animates, communicates faculties to them, which they previously had not. Ovid expresses the same opinion when he says—

“Thus all things are but altered: nothing dies,  
 And here and there the unbodied spirit flies:  
 By time, or force, or sickness disposess’d,  
 And lodges where it lights, in bird or beast;  
 Or hunts without till ready limbs it find,  
 And actuates those according to their kind:  
 From tenement to tenement is toss’d:  
 The soul is still the same, the figure lost;  
 And as the soften’d wax new seals receives,  
 This face assumes, and that impression leaves:  
 Now called by one, now by another name;  
 The form is only chang’d, the wax is still the same:  
 So death, so call’d, can but the form deface;  
 The immortal soul flies out in empty space;  
 To seek her fortune in some other place.”

*Dryden’s Trans.*

This was also the sentiment of Virgil, as expressed in the following lines:

“First heaven, and earth, and ocean’s liquid plains,  
 The moon’s bright globe, the sun and shining stars  
 A soul within enlivens; and a mind  
 Diffused through all its parts, the general mass  
 Invigorates and mingles with the whole:  
 Thence man and beast and all the feathered kind  
 Proceed, and mountains of the boundless deep.

*Trapp’s Trans.*

Finally, every sect of the ancient philosophers, except the Peripatetics, regarded life as depending

upon a material principle. It is this principle that Hippocrates, called το εναρμασι, *impetum faciens, calidum, innatum*; and others, *vis vitæ, occult quality, sensitive soul, principe*. Non-organized matter cannot acquire organization, and passes from a state of inertia to that of life, without being penetrated with a substance, which contains within itself vital principles; and when this substance has once modified matter, so as to render it capable of being intimately penetrated by it, it does not cease to develop its energy, until it has entirely consumed the *pabulum* necessary to its activity. This substance is probably fire, as was thought by the greater part of the ancient philosophers, and among others Hippocrates, as their writings and the allegory of the torch of Prometheus proves. It is a fact, that without the action of fire, the development of germs cannot take place. Upon this globe, it is only in the surface enlightened and warmed by the sun, that we find the sense of life diffused. Without the heat of this beneficial planet, matter is dead, and in a state of inertia and inactivity.

This opinion is not destitute of probability, and even seems supported by a certain number of facts. 1. The formation of the embryo appears to be only a kind of chrysalization, which may be called *animal*, and which has some relation to that of salts, that is performed by evaporation. Add to this the absolute necessity of caloric in the fecundation of germs, to impregnate the juices with the oxygen, which is required to render them concrete. The hen in incubation only furnishes the egg with caloric, as is proved by artificial incubation; this may be accomplished by expos-

ing eggs to the thirty-second or thirty-third degree of Reaumur's thermometer. 2. An egg varnished and subject to incubation, will not produce; not that the varnish with which it is plastered, kills the germ, as eggs may be preserved without alteration in this state, for many years; but in consequence of the evaporation necessary to crystallization being prevented by the varnish, for if this is removed, incubation takes place.

3. We observe that in general, life is much more active and shorter in countries where caloric abounds, also where the atmosphere contains an abundance of oxygen. It consumes considerably less on the contrary, and makes much slower progress in temperate regions, and in those that are cold, provided always that the cold be not excessive. An atmosphere whose oxygen is mixed in just proportions with the other constituent principles, has a similar effect. The sensibility is more or less active according to the operations and energy of the vital flame. This is the reason why it is so great in southern countries, while it is nearly imperceptible in the northern regions. The illustrious Montesquieu has said, not without foundation, that the slightest cause is sufficient to excite the most acute sensations in warm countries, and that it is almost necessary to flea a Muscovite, to draw a cry from him.

But whatever be the nature of this vital gas which animates nature, it appears that the faculty with which it is endowed, can only be excited into action, when it is attached to bodies that it has organized. In minerals and other inorganic substances, it can only de-

velope the general properties of matter, but none of the vital qualities.\*

The vital principle displays its animating virtue in vegetables, which are organized beings; but as their organization is very inferior to that of animals, the vitality is reduced to irritability, and probably to the *latent* sensibility, by means of which the functions that are proper to them, are performed as in animals. Animals being endowed with a more perfect and less simple organization, permit the vital principle to make an expansion, which is greater and more free; they are provided with a patent sensibility, more or less acute, according as the organs of sense are more or less perfect.

The sensibility of an oyster, which occupies the last degree in the animal scale, is weak. It is greater in insects, whose motion is more combined, obtuse in reptiles, that have no other organs than those which serve for nutrition; it possesses a certain degree of activity in birds, to which it gives mild or vicious manners, habits, and affections; it is much more extended in quadrupeds, which are placed in the extremity of the scale, and especially in those which, as the ape, the elephant, &c. are endowed with the organ of touch. Finally, it is perfect in man, who possessing,

\* Nature sometimes attempts in one kingdom imperfect beings, which she can only complete in another. She imitates, in a known operation, the figure of a tree; but the tree of Diana has not life, fluids, nor circulation. It is the same with stones, which seem to increase under a form foreign to their own, and which are frequently confounded with plants and petrefied animals. Robinet, struck with this idea, thought that nature had endeavoured to form a man by figuring in the mineral productions, the most of his parts. But has the creative Power need to endeavour? Can the masterpiece of this power be the fruit of a perfection met with by chance?

by his exterior form and intelligence, all the advantages and the compliment of animal life, and who is upon the globe the last link of the immense and almost infinite chain that embraces all beings, and of which he alone can comprehend the relations.

It is true then, that there circulates in all the material world a vital fire, which produces, preserves, and renews every thing that exists; it penetrates every body, and developes with more or less energy its action, according as it is more or less modified. It is an element, which is at all times destructive and creative, but inextinguishable, which adheres the more feebly to bodies in proportion to the imperfection of their organization, and which never abandons a substance, except when it ceases to furnish the aliment necessary to its activity, or to penetrate a new one, to which it gives a more or less intense life.

The vital principle may exist in two different states, that of an active and that of a quiescent one. It sometimes remains in the latter state for a long time without manifesting its existence, otherwise than by preventing the decomposition of the body, in which it remains concealed. Seeds are preserved as well as eggs, for a whole year, without experiencing the least alteration; consequently, the vital gas is a preservative principle, which powerfully resists corruption, dissolution, and the deleterious effects of cold; and, in fact, the egg no more rots or putrifies, than the caterpillar in the chrysalis state, nor than the animal in a state of asphyxia, so long as this principle subsists in it. It is inconceivable that the human body, which has so great a tendency to putrefaction, can be exempt from it during sixty, eighty, or an hundred

years, which constitutes the duration of its existence. It resists dissolution, and impresses its activity upon the elements which compose the organs; it is it which preserves the interior parts of the stomach and intestines, and enables them to elude the dissolvent action of the gastric juices, bile, &c. which are efficaciously exercised on the aliments. It is equally opposed to the mortal effects of cold. Whilst it acts upon the body, frost is not injurious. Plants and animals are found upon the icy mountains of the two poles.

The *galanthus nivalis* grows in the ice, and its flower which comes out through the snow, resists the hardest frosts of the night. Moreover, living animals plunged in water prevent it from freezing. Hunter put fishes in cold water at the freezing point; so long as they lived the water preserved its fluidity around them, and it did not freeze entirely until they expired. There are, however, active causes of destruction, to which the vital principle opposes but a feeble resistance, and under the action of which it generally succumbs; such are strong concussions, certain miasmas, and some poisons: probably these deleterious agents produce such effects only by disuniting the vital fluid, and the medullary substance of the nerves to which it is specially adherent, and by entirely destroying the cohesive force which unites them; for, most frequently when these causes produce death, we find neither lesion nor any alteration whatsoever in any part of the body. It is only by the strong concussions produced by thunder that it kills whom it strikes. There are a number of examples of persons who have died, some in the first moments of an invasion, or of a plague, and others in consequence of certain deleterious miasmas,

to the action of which they were exposed. We have seen the most caustic poisons, introduced into the stomach, produce death without leaving any traces of inflammation. Morgagni and Sprogel observed this phenomenon in rats poisoned with arsenic, and in a rabbit to which they gave the oxygenated muriat of mercury. Opium has also produced death without passing from the stomach, and without having caused any sensible lesion.

In fact the vital gas is the instinctive principle of animals, it is by means of it that they act without any deliberation, independently of all experience, and in the most suitable manner to their preservation and their well being. On the different combinations of the vital fire with the different organs, in each species, depend those sympathies and antipathies, which they experience towards one another; the cunning they employ to seek their prey, and to avoid the danger with which they are threatened; and lastly, the discernment that they have in the choice of aliments and the remedies proper for them when diseased. It is in consequence of this instinct, produced by the action of the vital principle upon the organs of sense; that the new born child sucks before it is put to its mothers breast, and that it performs its different functions without knowing them, as if they were performed during the whole term of gestation. We derive this observation from Galen, who extracted a kid by an opening that he made in the belly of its dam. As soon as the animal respired, it instinctively chose the *base trefoil* from among divers herbs that were presented to it, and rejected those that are not eaten by these animals. It is this same instinct which makes

the butterfly scarcely formed, unfold its new wings, the bee just born collect honey and wax, and the bird scarcely hatched endeavour to quit its nest, and direct its flight like the older ones of its species. All animals are provided with a particular instinct, which they manifest from their birth, and which is not the effect of experience. The man of nature has also his instinct, but the civilized man loses it very soon; the latter but seldom gives it time to develope itself; whereas the former, like all other animals in a state of liberty, incessantly improves it.

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## CHAPTER IV.

### *On Life, considered in the different ages.*

THE fœtus whilst in the body of its mother is enveloped in the liquor amni. At its birth it passes into a very different medium, where it is affected by the air and light. These fluids, by their action upon the skin, and the organs of the external senses, determine sympathetically, the contraction of the diaphragm, of the muscles of respiration and of the voluntary muscles. From its birth there is established a new order in the circulatory system; the abdominal viscera are compressed and react alternately, and the excrements are for the first time, expelled from the intestines, and the urine from the bladder.

The greater part of animals are born with their eyes closed, and remain in this state for some days

after birth. The infant is born with its eyes open; but they are fixed and dull, and do not notice any object; the cornea is shrivelled, and the new born distinguishes nothing at first. Nevertheless, the pupil is sensible to the impressions of light, for it contracts and dilates as the rays are stronger or weaker. It appears that the other senses are not more advanced than that of sight, and when they have even attained the development necessary for the performance of their functions, much time still elapses, before the child has learned from experience, to make use of them itself, so as to have just and complete sensations. The sense of touch, which is the criterion and judge of the other senses, is imperfect in the new born infant. The child gives signs of pain by its looks, but they are not accompanied with tears; it has not yet any expression which indicates pleasure, and it is not until the expiration of forty days that it begins to weep, to see and to hear.

The ordinary length of a child at full term, is from eighteen to twenty inches, and the two extremities from sixteen to twenty-two, and even twenty-three inches. The weight of it is generally, from six to seven pounds. Its growth is prodigious whilst in the womb of its mother, for at first it is but an almost imperceptible particle. A child's head is more voluminous than the other parts, and this disproportion does not disappear until after the first period of infancy. The skin of the new born child is reddish; and is sufficiently transparent to enable us to see a slight shade of the colour of blood. The form of the body and members is not yet established; all the parts are swollen, and the breasts contain a milky substance which

may be pressed out with the fingers; this swelling diminishes in proportion to the growth of the child. A palpitation is seen in some new born children at the crown of the head, and at the opening of the forehead, &c.; which coincides with the motion of respiration. By placing the hand on the sinuses or openings, we may feel the pulsation of the arteries of the brain.

The liquor amni in which the child was contained, leaves a viscous and whitish humor upon the skin, which is washed off by lotions of soft water. Some whole nations, particularly those of the north, are in the practice of plunging their children immediately after birth, in freezing water: this custom has its advantages in cold countries; perhaps in the warm regions it would not be without danger.

The first milk of the mother, called *colostrum*, purges the infant, and enables it to expel the *mecconium*, which is a black and viscous excrement, resembling pitch. It also ejects by the mouth a slimy humor, with which its stomach and oesophagus are surcharged, and which is the same as that of the amnios.

Infants of the first age, require but a small quantity of nourishment, but it should be frequently repeated, and insensibly increased in proportion to their growth. Their sleep is long, but frequently interrupted by cries, which are sometimes the expression of want, and at others of pain.

The first dentition or teething, generally begins at the seventh month, and is completed at the age of two or three years. The first teeth called *milk teeth*, are twenty in number; eight incisors or cutting teeth, four canine, those next to the cutting, and eight molares or grinders. The first teeth fall out, and are replaced

by others about the seventh year. The incisors and canine are succeeded by an equal number, and the first and second molares are each succeeded by two, which makes twenty-eight teeth, instead of twenty. This shedding of the first teeth, and their being replaced, is generally finished during the first seven years; sometimes it is more tardy and does not take place until the ninth or even eleventh year. The incisors of the lower jaw fall out first, then the canine, and lastly the molares. There are two very remarkable periods in the labour of dentition; the teeth develop themselves in the first, and their coming out of the gum takes place in the second.

The child begins to prattle at the twelfth or fifteenth month. In all languages and among all nations it begins by pronouncing, *mama*, *papa*; these are the most easy sounds to articulate, because they require but a small degree of action, of the most of the vocal organs. We think we have observed, that children who do not begin to articulate until late, never speak so easily as others, and that those who speak early are generally able to read at the age of three years.

The heart beats much more frequently in children than in adults; it is generally observed that the frequency of the pulsations of the heart and arteries, is in an inverse proportion to the smallness of the animal, not only in the different, but also in the same species. The pulse of a child or of a man of a small stature, is more frequent than that of an adult or a man of an advantageous height; the pulse of an ox is slower than that of a man, that of a dog is more frequent; and the pulsation of the heart of one of the smallest animals,

as of a sparrow, succeed each other so rapidly that it is with difficulty they can be counted.

There is something very remarkable in the growth of the human body. In taking the fœtus a month after its formation, when all the parts are developed, it always grows in an increased proportion until the moment of its birth; from the time it is born, it always grows in an inverse proportion until puberty, a period when it launches forth and very soon obtains its destined height.

In infancy the solid parts are very soft, and the blood serous; the cellular and glandulous systems have a relative predominant action, and the mucous is abundantly secreted. Hence the mucous or pituitous diathesis, which is peculiar to this age, and which disposes to diseases depending upon this constitution. At this period of life the energies do not accumulate, nor fix in any point; they are particularly directed from the centre to the circumference, and pass with the greatest rapidity from the interior without, and from the exterior within. The child experiences many impressions from exterior objects, and consequently, performs a great number of motions, because the sensibility and the mobility are very great; but these impressions are not profound nor durable, and the motions are neither constant nor meditated.

In proportion as life progresses, the body habituates itself to the impressions that are made upon it, and this habit blunts their sensible effect. The nervous fibres being covered with cellular layers, that become thicker and more compact, acquire more force, but lose at the same time, their sensibility in the same proportion.

The stomach, superabounding with life in infancy, and incessantly irritated, continually experiences the sense of hunger; it is at this period that the eccentric force predominates, and that the stomach has not only to labor for the support of the body, but also for its growth. The motions are also directed towards the head, nevertheless, the life of the brain has not yet a sufficiency of activity for the exercise of the intellectual functions. We may thence easily conceive why those children, among whom the energies necessary to digestion are diverted from the stomach, in order to draw them towards the brain by premature studies, become infirm and valetudinarians for the remainder of life.\*

Children are very subject to convulsions and spasmodic affections, in consequence of the great mobility of their fibres, which are very easily agitated, but which are attended with a certain debility: consequently, if their sensibility is irritated by the slightest cause, it is soon appeased by the mildest means; this is the reason why they are not susceptible of strong passions. In fact the phrenic centre is actively affected; but it does not retain the action, and every effect which produces the passions of this age, such as joy, anger and terror, is most frequently limited to promoting the circulating of the energies, and to rendering the play of the oscillations more facile.

\*"Nature," says J. J. Rousseau, (Emile) "intended that children should be children before they are men. If we wish to pervert this order, we will produce premature fruit, which will have neither maturity nor savour, and which soon spoils, we shall have young learned men and old children. Infancy has an order of seeing, thinking and feeling, which is proper to it. Nothing is more foolish than to wish to make children substitute ours for theirs, and I would as soon require a child to be five feet high, as to require judgment at ten years of age."

Life is uncertain until the third year, but in the two or three succeeding years it becomes confirmed, and the child of six or seven years has a greater probability of living, than it had at any previous period. From the observations made in London, it appears that out of a certain number of children, born about the same time, nearly one half of them died in the first three years. Dupre de S. Maur ascertained that nearly one half of the children born in the same year, die in seven or eight years. One of the causes of this great mortality is the small pox. Inoculation presents a means of meliorating, and perhaps of extinguishing this disease.\*

Infancy is succeeded by puberty: this is the spring time of life and the season of pleasure. In puberty the langors of the first age disappear; the laxity of the solids and the aqueosity of the fluids is diminished. Previously nature had laboured only for the preservation and growth of man: now it multiplies the vital principles. There is now, not only all that is necessary for existence, but also that which gives existence; this superabundance of life is announced by unequivocal signs.

The first symptoms of puberty are a numbness or stiffness in the groin, a species of sensation hitherto unknown; in the sexual parts, small protuberances arise, which are the germs of the hairs that are to cover these parts. The sound of the voice becomes hoarse, unequal for some time, at the end of which it is fuller and bolder, stronger and more grave than hi-

\* Since this work was published, that great blessing, the vaccine or kine pox has been introduced; and if the practice of vaccinating should be properly persisted in, will eventually, I presume, entirely eradicate the small pox.—Tr.

therto. This change is very obvious in boys; it is less so in girls, whose voice is naturally softer.

There are several signs of puberty common to both sexes, but there are some peculiar to each. The enlargement of the breasts and the eruption of the menses in girls; the emission of the semen and the production of the beard in men. However, there are whole nations, says Buffon, where the men are almost beardless, and others where the women are not subject to the menstrual flux;\* but there is no nation where the puberty of women is not marked by the swelling of the breasts. Lastly, the sentiment of love, and the more or less impressive desires, which the individuals of each sex have for sexual commerce, are certain signs of puberty.

In all countries, women arrive at puberty sooner than men. Puberty is more or less forward or tardy, according to the temperature of the climate, and the manners of the inhabitants. It is more forward among the civilized and governed nations, as the philosopher of Geneva remarks, than amongst the ignorant and savage; and it may be accelerated or retarded by education. In the south of Europe, and in towns and cities, the most of the girls arrive at puberty at the age of twelve, and the boys at fourteen years. In the north, and in countries, the abode of innocence and simplicity, girls do not arrive at puberty until about the fifteen, and the boys about the sixteenth year. In the hot climates of Asia, Africa, and America, it is not rare to see girls marriageable at ten, and even at nine years of age.

\* In Brazil.

It is during puberty and the first succeeding years, that the body completes its increase of height. There are young people who obtain their full height by the fourteenth or fifteenth year; but ordinarily they grow until twenty-two or three. The sexual organs are developed at this age; they now come out of a kind of sleep, in which they have been plunged during infancy. Their development, by exciting in the system a violent commotion, accelerates the general growth, and at the same time causes the actions of the lungs and vessels to predominate. A great abundance of blood abounding more in red parts and gluten than hitherto, is produced, and the diathesis, which until then, had been pituitous, is converted into the sanguine.

This revolution frequently cures the pituitous and spasmodic diseases of the first age, as was observed by the father of medicine; nevertheless, it is sometimes fatal, and some young persons are at this age attacked with destructive apoplexies, or contract epilepsies, or some other incurable nervous diseases for life.

At the same time that the sexual organs are developed, and the sensibility creates a new focus in these parts, the brain also acquires a new life, and the mind is improved. These two centres act upon and influence each other reciprocally; they are in such a mutual dependence, that the imagination excites the genital organs into action, and these in their turn awaken the imagination, and produce mental affections analagous to the nature of their functions; consequently, all the passions of this age are related to love, and

the mind is in the most intimate dependence on the physical parts.

The exterior organ no longer possesses that softness, nor that degree of activity, which it did in infancy. However, the motions and actions are still directed to the circumference, and the skin continues to be the most frequent critical organ in the diseases of this age. But when the exterior organ is deprived of its tonic action, or when by any cause whatever it ceases to be the term of the efforts of nature; as these preserve a direction towards the superior parts, the habit of which they had contracted in the first age, the motions are also disposed to concentrate and fix in these parts. Sometimes this concentration takes place in the breast; then this part receives a considerable increase of humors, from which nature attempts to relieve herself, and it soon becomes a centre of irritation, which causes inflammation, spitting of blood, and frequently degenerates into phthisis pulmonalis, or consumption of the lungs. These diseases generally take place between the eighteenth and thirty-fifth years. The body has entirely completed its growth, in height, at the twenty-second or twenty-third year. Most persons of this age, are slender, and of a spare stature; but by degrees the members acquire their shape and become round, and the body of man is, a little before the age of thirty, at its point of perfection, as respects the proportions of the form. That of women attains it sooner. Man, to be well made, should be square, the muscles solid, the contour of the members strongly designated, and the traits of the visage well marked. In women the parts are rounder, the form softer, the traits finer, and

the complexion fairer. Man has strength and majesty allotted him; women winning graces and amiable beauty.

Every thing announces both the proprietors of the earth.\* Every thing marks in man, even in the exterior, his superiority; he is straight, erect, and his attitude is that of command; his head regards the heavens, and presents an august face, which bears the impression of his rank; the image of the soul is painted upon his physiognomy; his majestic carriage, his stately deportment announces his dignity and his station; he touches the earth with his most distant and inferior extremities; he sees it from afar, and seems to disdain it.

In the age of manhood, the body becomes corpulent and augments in size, the action of the brain becomes stronger and stronger, and the centre of the sensibility acquires all the energy, of which it is susceptible, for the exercise of the mental faculties. The exterior organ loses more and more that softness, which characterises the productions of animal nature in their first state, and the sense of their activity. Man is, at this period, less influenced by exterior impressions. This is the period of life, in which he is disposed to reflection; it is also that in which genius shines with all its lustre, in which the character develops itself, and in which the soul is capable of the most sublime flights towards glory. Montesquieu composed his *Spirit of Laws*, Cesar wept over the statue of Alexander. At this age, the energies and

\* The body of man would be sufficient to secure him that superiority. What boldness in the outlines of the human machine! What elegance in their form! What beauty in their proportion!

actions have a direction contrary to what they had in the preceding, and concentrate from the exterior within towards the epigastric organs. The predominancy of the concentric force is, moreover, promoted by the passions of this age, the most of which spring from ambition; consequently, the action of the venous system, of which the *vena porta* is the centre, prevails; thence the bilious or atrabilious constitution, which is peculiar to the age of manhood, and which disposes to diseases of the bile, and of the organs destined to its secretion. The body has no sooner attained its point of perfection, it has no sooner arrived at the solstice of life, than it begins to decay; at first the decay is imperceptible. The solids harden by degrees, and contract a rigidity, the fat is consumed, the skin dries and wrinkles, the hair turns white, the teeth fall out, the visage becomes deformed, and the body bent. The first shades of this state make their appearance between the forty-fifth and fiftieth year, and they augment by degrees until the sixtieth; from this period old age makes rapid strides until seventy, when decrepitude generally commences, and at eighty, ninety, or an hundred years, death closes the scene of human life.

As the solids have naturally a greater degree of softness in women, they harden more slowly in them than in men, in consequence of which they have a longer old age. It has been observed, that those who pass the critical period of life, live very long, and even more so than men. Their youth is shorter and more brilliant, but their old age is longer and more troublesome.\* The age of decay is the epoch of the com-

\* The critical period is that in which the courses cease to flow.—*Tr.*

mencement of death; the enfeebled organs have lost their spring and activity; all is, in some degree, ossified, every part contracts, and the humors become decomposed; the action of the veinous system obviously predominates; the veins are constantly fuller of blood, than in the other periods of life; the exterior organs having acquired a certain rigidity, opposes itself to the excretion of the perspirable humor, which is retained in the interior of the system; this humor, naturally acrid in old people, acquires a much greater acrimony by retention, and communicates to the mucous glands of the lungs and nose, affections of a catarrhal nature, which are with difficulty cured. As the atrabilious easily combines with the pituitous, it frequently gives birth to a mixed constitution, *atrabilioso pituitous*, which is very common amongst old people.

The sensibility has scarcely any activity in the last stage of life; it exercises itself with difficulty in the brain, for the labour of thought, as well as in the epigastrium and exterior organs of sense for the sensations, which is the more difficultly exercised in proportion as the fibres are the more hardened, and the mucous which covers them, the more desiccated. The sensitive principle appears to be almost entirely withdrawn from the organs of circulation, of digestion, and of the secretions; and these functions are also performed with difficulty, as those organs have no longer the sensibility and the pliancy necessary to motion. It is this rigidity which renders the senses obtuse, the functions slow and laborious, the diseases embarrassing, and the crisis difficult in old age. At

this period of life, the passions no longer possess the empire, the soul is without pleasure, and this slow degradation, which conducts man to the tomb, is a necessary effect of life, which, like the sun, after having had its aurora, its southing, and its setting, finally disappears, but in appearance to rise in another hemisphere.

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## CHAPTER V.

### *The Female Sex.*

SOME authors, born enemies of the graces and of beauty, austere and savage in their temperament, have asserted, that the female sex is only the production of an imperfect development of the human germ. In thus accusing the weakness of nature, they have calumniated the most beautiful part of her works. This opinion, absurd as ridiculous, to be refuted, only requires the simple consideration of the qualities proper to man and woman. In fact, we find nothing absolute, all is relative, every thing is arranged in the most advantageous manner for their union; they are two halves of the same whole, whose particular organization, affectionate sympathies, and a kind of moral attraction, incessantly incline them towards each other for the propagation of the species, and for their mutual felicity. The one has strength and roughness for his portion, the other weakness and mildness.

The woman is the smallest, she is not so strong and is less capable of long labour of the body and mind than man. Her bones are less and not so hard; the most remarkable differences that they present, are found in those that compose the interior part of the trunk, and in the clavicles, which terminate its superior part. Amongst the first, those called *innominata*, and which form the basin conjointly with the *sacrum* and the coccyx, are, in women, more convex externally and contribute, by a greater curve, to give more capacity to the basin. The ossa pubis, which forms the anterior part of the basin, touch each other by a small number of points, and proceed obliquely outwardly, in order to enlarge the space between them and the coccyx.

The convexity of the ossa innominata, occasions the bones of the thighs to be more remote from one another; which increases the size of the haunches. In consequence of which, the muscles that are situated upon these bones, are less compressed by their reciprocal contact, and can extend more freely; consequently, other circumstances similar, the thighs of men are smaller than those of women.

The clavicles are straighter and less curved in women, and the sternum is shorter, so that the breast is not so large.

The soft parts have also a greater degree of softness and flaccidity in women than in men. The flesh is less firm and the blood more serous; the parts are generally smaller and more pliant; the members are rounder, the form more elegant, the traits milder, the motions lighter, and the sensations more acute. It is obvious that the organization of men differs materially

from that of women, and that the organs of the latter are absolutely those of pleasure. Such are, in general, the physical qualities which characterize the amiable sex, whom nature has destined to be the depository of the human species, and of whom Thomas has said, that "without them, the two extremities of life would be without support, and the middle without pleasure."

The acute sensibility with which women are endowed, is the principle of their moral qualities. The effeminacy, the mobility and the inconstancy of this sex, of whom La Bruyere has said, that "caprice was the near neighbor of beauty, to be its counter poison," is owing to this acute sensibility; and this is itself, due to the softness of the cellular tissue. This softness renders the nervous fibres more sensible to the action of physical and moral stimuli, and permits the more free and numerous oscillations. We also observe that the tissue of the viscera and muscles in women, is lax and more expandible: this is the reason why its motions are more active and quicker, but less durable. In man, on the contrary, the cellular substance is firmer and less spongy—its beds more dense and compact; the nervous and muscular fibres are less pliant and flexible; hence it requires stronger irritations to disturb them, but their motion is consequently, stronger and of longer duration. We thence see, that men are less subject to spasmodic affections than women, unless the order of nature is reversed; and they acquire a similarity of manners, and contract the constitution of the female sex. Experience shows how much a deficiency of exercise, idleness and effeminacy, preserve the cellular tissue in its pri-

mitive laxity, and the nervous fibres in the sensibility of infancy. Studious men, and others of a sedentary life, who are subject to a multitude of nervous diseases, are a striking example of it.

This state of softness of the cellular organ, the acute sensibility of the nervous fibre, and its extreme mobility, approximates the constitution of women to that of infancy; moreover, as in the first age, the energies are but very slightly susceptible of concentration in the female sex, and circulate with the greatest rapidity from the exterior within, and from the interior without; the physical and moral impressions forcibly strike the epigastrium, which contracts and confines the play of this centre; it does not, however, long retain this action, but soon reflects it to the other parts of the system. This antagonizing of the epigastrium and the other organs, but particularly of the skin, more active and better marked in women than men, is absolutely necessary to the former; who are to experience stronger revolutions, and those marked by greater dangers.

At the age of puberty, a new order of functions is established in the female system; which has the greatest influence, and which entirely changes their physical and moral state. The womb, which had till now been dormant, becomes a new focus of sensibility, a new centre of action, that radiates towards the brain, and there produces passions analogous to its functions: the oscillations and the fluids are directed towards it; it is imbibed with a superfluous blood, distends, permits it to escape, and establishes a periodical flux; which continues until the progeny suppresses it, or age causes it to cease.

In pregnancy, the action is divided between the womb and the breasts: towards the latter, the milky humor flows. As the courses are re-established when suckling is finished, to be suppressed during the following gestation, and to be again re-established; we see it is by a round of revolutions, that women arrive at the last and most dangerous order, the cessation; which, so soon as it is entirely finished, assures them a long and tranquil life. We see from this slight sketch of the vicissitudes of the life of women, that nothing can facilitate and diminish the dangers of it, but a constitution more sensible and weaker than that of men.\* The extreme sensibility with which the sex is endowed, and which subjects them to a multitude of active impressions, but of short duration, shows why the imagination of women is lively but not strong, and why their writings, more brilliant than profound, are rarely marked with the stamp of genius. The cause is, their brain is lively affected, but not strongly, and because the epigastrium is not susceptible of that degree of tension, which great labors and profound meditations require; a tension which their feeble viscera cannot experience without danger; it would soon degenerate into a spasm, that

\* "A weak being is necessarily timid, because it sees itself exposed to dangers that it cannot avoid by resistance; and its timidity still augments its weakness. The physical effect of fear, being to attract the forces within, it prevents them from remaining long enough without to repulse the cause that excited them: hence women are seized with strong emotions, and faint at the least danger that threatens them. Happily the same constitution of fibres which disposes them to fear, also disposes them to cunning or dissimulation; which is nothing but the art of hiding the fear. This quality excites in them the sense of their wants, in conjunction to that of their feebleness: it supplies the place of the strength of organization, which has not been given them, and enables them to escape by address the action of the offensive causes that they cannot avoid by strength." Desere, pages 223 and 224.

would so much the more easily produce embarrassments, &c. as their tissue is very porous, and would consequently imbibe a great quantity of fluids, that always follow the current of oscillations, and which would attract the flowing of the action.

But if nature, O woman! enchanting sex! has refused you the genius, how amply has she not remunerated you by the agreeableness of body and mind! Have you not the most beautiful and the most legitimate claim to our love and our gratitude, and do you not reign as sovereigns over our hearts? The charms that you spread over our lives, the sweet illusions that you cause to spring up in our souls, all the delicious sensations and the perfection of the faculty of feeling them, this is your work, and this is the least of your claims to our homage; we are also indebted to you for the moral virtues. Without you we should only have asperity without energy, humanity would be trodden under foot, pity would find our hearts covered with triple brass. It is you who place upon our breast the egis of courage, who enoble our actions, and who form us for happiness and glory.

The softness of the cellular tissue, and the lively sensibility which results from it, diminishes with age; the organs insensibly lose their pliancy and acquire a greater degree of hardness, and the energies are directed towards the epigastrium. So soon as the courses cease, a part of the forces that were directed towards the womb, concentrate in the interior, at the expense of this organ, which no longer possesses a specific life; consequently, the great mobility of the fibre diminishes, the motions are less frequent but

stronger, and they are not reflected with so much facility from the interior outwardly, as they were formerly. But as the hardening of the solids is performed more slowly in women than in men, the progress of the gradual degradation which brings on the fatal term, is also much slower; and they arrive to a very great age.

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## CHAPTER VI.

### *On the Constitutions.*

EACH individual has an order of existence which is proper to him; and which, as Bordeu has said, when it turns to his advantage, establishes his health. It is this order of being which is called *constitution*; and of which, there exists as many species as there are individuals.

The constitutions, considered in general, as respects the solids, are reduced to the number of four: strength or vigor, united to sensibility, as in men well constituted; strength united with a small degree of sensibility, as in the greater part of the country people, laborers, &c.; debility united to a small degree of sensibility, as in persons of a very pituitous temperament; and lastly, debility united to an acute sensibility, as in hysteric women. These give the four elementary and primordial constitutions, which experience a great many modifications, and are incessantly increased or diminished by a multitude of inevitable causes, such as climate, regimen, education, the pas-

sions, seasons, &c. We can conceive that the degrees of strength and sensibility, varying in divers subjects, must cause each of these constitutions to present a great number of shades, and that many men, possessing the same, should differ more or less among one another. Now, if we pay attention to the energies affecting a particular direction in the different shades of life, and seasons of the year, and that each individual has his *idiosyncrasy*, that is to say, a particular disposition of such or such an organ to predominate over the others. We shall easily comprehend the doctrine of the humoral *diathesis*, known to the ancients under the name of *temperaments*, and which are of the number of four, the pituitous, sanguine, bilious, and atrabilious. This distinction is founded upon nature. In fact, since the diathesis is the production of the strength of the fibre, of the sensibility, the direction of the energies, and the predominancy of the action of one or several of the organs, diversely combined, the constitutions cannot be better characterized, than by the diathesis, which is proper to each of them. Hippocrates has already said, "man is composed of blood, yellow bile, black bile, and of pituita or phlegm."\* We may, however, reduce these temperaments to three, for that of the atrabilious is only the extreme of the bilious temperament. Observe we do not always find temperaments in the simple state, we are about to describe, but often in that of a mixt one; in this case, it always has the character of the one that predominates, and which is designated by the predominant humor to which it gives birth.

\* Book on the Nature of Man.

The pituitous or phlegmatic temperament is characterized by the softness, laxity, and little action of the fibre, which is moistened with a superabundant serum. Men of this temperament have a very soft and loose flesh, the cellular tissue full of fat, and frequently surcharged with gelatin and very serous blood. The most of them are of a tolerable height, the skin is white and cold to the touch, especially that of the extremities, particularly in winter; the hair and beard light or chestnut coloured, and of a slow growth; they never become bald; the visage is pale, and sometimes bloated; the eyes have not much expression, and the look is languishing. Women of this temperament generally have full breasts, but this fullness soon declines. In the pituitous, the functions are generally slow and embarrassed. Persons of this temperament have a pulse slow, small, and soft, and their veins are small; respiration is slow, and they are subject to oppression; they have but little appetite, support hunger well, and digest laboriously; they rarely experience the sense of thirst; their senses are very dull, the motions difficult, but durable; they are but little inclined to the pleasures of love, and arrive at puberty later than those of other temperaments; they evacuate, by the nose and mouth, much viscous and insipid matter; their excrements are white and mucous; their urine is coloured with a thick sediment. The courses and lochia in pituitous women are pale.

The functions of the mind of the pituitous, are exercised in a feeble and languishing manner; they have a cold imagination, and a bad memory; they are very much given to sleep, and are provoked with difficulty, but easily appeased; they are but little better calcu-

lated for the labours of the body, than those of the mind, at least they must be habituated to them by degrees; habit is their law; they possess a good and correct judgment, a mild character, are civil and peaceable, and the state of apathy seems to be the only one, in which they find happiness.

The sanguine temperament, which may be considered as making the shade between the pituitous and bilious, is the production of the predominancy of a viscous blood, abounding in red parts and gluten; it is the *temperamentum calidum et humidum* (warm and moist) of the ancients; it is characterized by an animated physiognomy, a red or vermilion complexion, the hair is ordinarily of a light or chestnut colour, and regenerates easily; the members are pliant and agile; the veins blue and of a middling size; the pulse full, quick, and regular; the habit of the body warm and soft to the touch, and the flesh firm and compact. Persons of this temperament have but a tolerable appetite, and not much thirst; they are subject to hemorrhages, transpire much, and pass an abundance of urine, which is consistent and of a good colour; the excrements are redish and of a tolerable consistence. The sanguine sleep profoundly, less, however, than the pituitous, and have, ordinarily, agreeable dreams. Men of this temperament generally perform, pretty well, all the functions; they are good, frank, courageous, animated, mild, and cheerful; their memory is happy, their imagination lively and brilliant; they are much inclined to pleasures; they love the table, women, and luxury; but they have rather tastes than passions; they are very sensible, easily carried away, and as easily calmed; they

are heedless, light, inconstant, and witty; but rarely acquire erudition; their conception is quick; they are, nevertheless, incapable of applying themselves to profound meditations; hence, abstract sciences, and, generally, every thing that requires an assiduity or great labor, is displeasing to them, nor will they permit them to claim their attention; but they cultivate with success, poetry, painting, music, and all the agreeable arts, that require a lively imagination.

The bilious temperament, *temperamentum calidum et siccum*, (warm and dry,) is that in which the bile predominates. Those of this constitution are not generally tall, nor corpulent, but strong, nervous and muscular; their bones are large, flesh firm and compact. The habit of the body is lank and meagre, the skin arid, dry and but slightly perspirable, with an acrid or corrosive heat, especially of the hands; the complexion and the eyes are pale and yellowish. The hair and beard are almost always black, crisped, and the former soon falls off. Among the bilious, all the functions, and particularly that of digestion, is rapidly performed. They generally have a voracious appetite, and frequently experience the sense of thirst. Their pulse is quick, elastic, and hard, and the veins very large. The bilious soon attain the term of their growth, and soon become old; they are subject to vomiting of bilious matter; their excrements are very yellow, the wax of the ears abundant, and the urine yellow or red, acrid, and copious. Among women of this temperament, the uterine evacuations are yellowish or citron coloured. The bilious are much inclined to the pleasures of love; they love passionately and with fury; they are strong, and preserve their vigor a

long time, are passionate to excess, which is the effect of their great sensibility; they are very jealous, constant, firm, inexorable, very choleric, and seek revenge when insulted; they have a fine imagination, a solid and deliberate judgment; they have more genius than wit, and are well calculated for abstract sciences. But among so many precious qualities, they almost always mix with them cruelty; they are conceited, obstinate, and frequently misanthropes; they sleep but little, and what they have is not sound; they are awake the greater part of their lives. This temperament is frequently converted into that of the atrabilious, toward the fortieth or fiftieth year of life.

The atrabilious or melancholic temperament, *temperamentum siccum et frigidum*; (dry and cold) of the ancients, is that in which a brownish or blackish yellow bile predominates, and which depraves the colour of the skin, and especially of the face. It may be considered as the *maximum* of the bilious temperament. The atrabilious appears to me to be nothing but the bile oxidated in a higher degree than ordinary. The melancholic have, generally, a considerable quantity of black or brown hair,\* hollow cheeks, body small and meagre, skin dry, cold, hard, rough, and brown or blackish; their pulse is frequent, elastic, small, deep seated, and often irregular, and their veins small; they are voracious, and but seldom thirsty; they grow slowly, and soon become old; they sleep but little, and that little is agitated by terrifying

\* The English are, in general, melancholic, and have, nevertheless, blue eyes, light hair, and a good colour. It is because climate modifies at its pleasure the exterior habit; consequently, that of England, which is cold and moist, combined with other local causes, promotes the pituitosa atrabilious.

dreams; the functions of the belly are irregular; the urine abundant, clear, and not much coloured; they are subject to a vomiting of black matter, to the hemorrhoids or piles, to evacuating much saliva; the belly is frequently constipated and hard, and their excrements are blackish. The sweat manifested on them, is rather the appearance of, than a useful one.

The melancholic possess great sensibility, hence they have a lively and exalted imagination. The smallest reverse of fortune, the slightest pain, throws them into dejection and despair; their mind feeds upon chimeries, which afflict and render them unhappy for fear of the future. This constitution is that of great men, of heroes, of the ambitious and great miscreants. Enterprizes, which appear superior to human forces, conquests, atrocious crimes, sects, factions, revolutions of empires, have frequently been the work of the *melancholic*.

The character of the melancholic is gloomy, thoughtful, difficult, restless, distrustful, and morose. A melancholy person is implacable in his hatred and vengeance. There are of this temperament, those whose unruly passions overcome every thing that opposes them; others possess a good disposition; some have a fear of the consequences of death, others seek, or give themselves up to it. The melancholic are very fond of attention, and their sensibility is frequently turned into fury, when they are neglected; they are almost all good friends, but jealous lovers, and subject to despair. Every age has its peculiar constitution, which depends, among other causes, upon the predominant action of one or more organs. The pituitous constitution belongs especially to infancy; it is due to

the excess of the relative action of the cellular, glandular, and lymphatic systems.

In infancy, all the parts are of an extreme softness. The cellular tissue is in a state of greater expansion than in the succeeding ages; it is penetrated with a considerable quantity of mucous humor, slightly colored red. It is this expansion of the cellular organ, which gives place to the plethory and congestions so common among children. The lymphatic vessels belong to this tissue; they are generally more developed, especially the lacteal vessels of the first order, in this than in the subsequent periods of life. In old age their diameter considerably diminishes. The glands are also endowed with a greater action in early age; they secrete a much greater quantity of mucous, and are constantly engorged with it; this is the reason why they are very voluminous. But the glands, greatly developed in infancy, diminish in proportion as life progresses; there are even those that are soon entirely effaced, as the thymus; others are obliterated by degrees, and are not completely exhausted until old age, such are the mesenteric glands. This predominancy in the cellular, lymphatic, and glandular systems, only exists during the first years of life; it decreases insensibly as life advances. Hence the diseases of infancy are commonly mucous, and have their seat in these organs. A circumstance which is important to remark, is, that the head of children is very large, and that in every age of life, those who have very large heads, have a very loose spongy tissue, and generally become corpulent. Among persons of this description, the blood vessels are not much developed, and they are subject to pituitous and spasmodic dis-

eases; they have a voracious appetite, and support abstinence with difficulty; in a word, they unite the most of the qualities which characterize infancy: those on the contrary, who have a small head, are generally meagre; their blood vessels are well developed; they easily resist hunger; and support, without inconvenience, the loss of blood; and are much disposed to inflammatory diseases.

Another circumstance not less essential, as relates to the distribution of the organic energies in infancy, is, that they are directed not only from the centre to the circumference, but also towards the head. This tendency is necessary, in consequence of the cutting of the teeth, to the exercise and development of the organs of sense; the most of which have their seat in the head. This same habitual tendency of the organic motions towards the head, is also useful to prevent the too great pituesency, to give the necessary quantity of action to the pituitary membrane, in order that it may secrete a sufficient portion of mucuous and pituitous juices.\*

These juices are also abundantly secreted by the stomach and intestines; whose tissue is, at this period, softer, more spongy, and more expansible than in the subsequent periods of life. This identity of functions of the pituitous membrane and intestines, establishes between the head and abdomen, a well marked sympathy, especially in children; and explains the reason

\* This direction of the motions towards the head in infancy, prevents a great number of diseases to which this age is exposed. Nature purges children by different serous excretions from the head, such as the discharges by the nose, eyes, ears, eruptions, &c. Hippocrates feared, not without reason, convulsive affections among those who had not experienced these salutary evacuations.

why the affections of the head frequently interests, in them, the viscera of the abdomen, and *vice versa*.

The causes which promote the pituitous constitution, are the abuse of cold and humid aliments, of farinaceous articles, and especially of those that have not been fermented; that of substances fat, flatulent and difficult to digest; the too frequent use of fish and of milk; excess in regimen, the abuse of watery drinks, and an indolent life; that of being exempt from cares, anxiety, inertia of mind, a continuance of melancholy passions, the habitual use of heavy and gross wines; the habit of bathing after eating; as Alexander de Tralles has already well remarked; too long sleep; winter; a residence in cold and damp countries; places situated in the neighborhood of lakes, marshes, ponds, rivers, streams;\* of those exposed to snow, rains, and to the north:† in a word, all the enervating causes which, by enfeebling the system, cause the action of the cellular organ to predominate. The same causes, supported to a certain degree, for some time produce scrophula, or the rickets; these two diseases depend upon extreme pituency, and should be regarded as the production of the constitution of infancy, carried to excess.

The pituitous constitution appears, at first view, to be that of old people; but they are not in reality pituitous; to use the expressions of Galen, "they are only so in appearance, in consequence of the excretions that take place in them from the nose and

\* The inhabitants of the Phaseis, according to the relation of Hippocrates, who live in a thick and humid atmosphere, have a pale, livid and bloated figure, a voice hoarse and thick, the articulations scarcely apparent, and they are unable to exercise or to work.

† This is the reason why Germans are almost all pituitous.

breast; for their constitution is cold and dry. It is necessary to observe besides, that the serous excretions of old people, are the production of the desiccation of the exterior organ, and of the flowing of the energies interiorly, which the progress of life has brought on by degrees; these two causes occasion the pituitous and perspirable humors to flow, and the mucous glands of the nose and lungs, serve them for outlets: on the contrary, in infancy, the pituitous is the effect of the predominant action of the cellular, lymphatic and glandular systems; which, to speak correctly, make but one; and that of the expansion of the energies. It is among children, consistent, mild, mucilaginous and acescent; in advanced age, it is thin, and bears, as well as the other humors, the impression of an acrimony with which the excretory system is struck. What I have just said results from observations already made by the ancients; "there are several species of pituitous," says Galen; "one mild and white, another acid, and another salt:" the first is that of children in a natural state; the second is also that of children, but degenerated; and finally, the last is that of the age of decay: for what the ancients called salt, is precisely what we now understand by the word acrid. This acrimony of the excreted *pitueta*, is frequently increased by atrabillious matter, and many old people possess a mixed constitution; which is the result of this combination.

The pituitous constitution continued within just bounds, and supported to a certain degree in the other ages, is the most favorable to the duration of life. The pituitous live longer than other persons; the hardening of the organs, and the flowing of the

energies towards the interior, which the succession of ages necessarily produces, operates much more slowly on these, and makes a much less rapid progress, than in the other constitutions. For this reason Galen said, "that those who are naturally humid, live very long, and possess the best health, when the body has acquired strength; they possess these advantages to a greater degree than those of other temperaments of the same age."\* To the pituitous age of infancy, succeeds the sanguine of youth: puberty, which this second period of life commences, diminishes by degrees the softness and laxity of the solids, and by consequence, the *pituesency*; the energies then exercise themselves with more activity upon the pulmonary and arterial systems, and the constitution becomes sanguine. This change is the production of the development of the action of the sensual organs; so soon as these organs awake, there is established in them a centre of sensibility that did not previously exist, and which irradiates the whole system, and determines a new state in the physical and moral parts of man. The influence of the testicles in men, is so general and so powerful, that in addition to the production of the beard and hairs, and the alteration of the voice, to which it gives rise, every part acquires a new vigor; the solids more hardness, the fluids more density; lastly, an exuberance of life, marked by the impatience of pleasure, which induces man to seek the commerce of the other sex.

Puberty does not produce such obvious changes in women; excepting, however, the venereal desires;

\* De sanitate tuenda.

which they, perhaps, experience more powerfully; but which, their modesty makes them conceal. Their constitution almost always retains something of the feebleness and softness of the first age, and the energies longer support the direction from the centre to the circumference.

But it is especially upon the arterial system that the influence of the organs of generation is directed at the age of puberty; the arteries then acquire a state of plethora and an orgasm, which they previously have not; whereas, in advanced age, this state is more remarkable in the veins. Glisson Wintringham, on comparing the arteries and veins in the different ages, ascertained that the relative density of the veins is greater in youth, and that it insensibly diminishes as life progresses; so that in youth the density of the *vena-cava*, compared to that of the *aorta*, is, as 26 to 25, and in old age as 139 to 140: a difference which depends upon the veins being more engorged with blood in the decline of life; owing to which, they must necessarily become thinner. This observation is perfectly consonant with the experiments of Haller; whence, it results, that the density of the coats of the vessels, diminish in proportion to their filling with blood. A multitude of facts prove besides, that the sanguine constitution is closely united to the increase of the forces which are exercised upon the arterial system, and powerfully tend to develop it. It is at this period also, that the blood abounds more in red parts and gluten.

We should regard the lungs, not only as the centre of the arterial system, but also as the principal organ in which nature performs sanguification; it is there

that the blood, disoxygenated by the veins, is converted into arterial blood; but at the epoch of puberty, the pulmonary organ completes its development and augmentation of action. It is not astonishing then, that from that period a greater quantity of blood is formed, than previously. Respiration is performed in a more extensive and more energetic manner, than formerly; the hydrogen and the carbon being disengaged from the pulmonary blood in greater quantities, causes the azote to predominate relatively, which, consequently, augments the proportion of gluten, of which it is the essential principle: the atmospheric oxygen, absorbed also in a greater quantity by the blood, oxydates the iron which is contained in it, and thus augments the red parts. We easily conceive from this theory, why young people are more subject to inflammatory diseases, and spitting of blood, than those of more advanced age. The sanguine temperament is produced, or increased by very nourishing aliments, and especially of animal flesh, by moderate exercise, the suppression of periodical evacuations of blood, and by pregnancy in women; by joy, gaiety, living in temperate regions, and by seasons analogous to spring. This constitution is that, in which one enjoys the best health, and which contributes the most to the pleasantness and happiness of life; but it exposes to inflammations, hemorrhages, and other diseases of the blood, especially in cold and dry weather, when the mercury stands very high for some time in the barometer, and when the wind blows from the north and east.\*

\* The reader will frequently find it necessary, in passing through this work, to locate himself. In a country so vast in extent as that of the United States of Ame-

Virility, or the middle age, and the one in which the bile predominates, immediately succeeds youth. At this period, the solids have not that ductility and that pliancy, which characterises the spring time of life. They have already acquired a certain degree of consistency and density; the exterior organ has no longer the same activity, and the energies begin to retire towards the epigastrium; the system of the vena porta thence receives an increase of action, and forms a greater quantity of bile: however, the *bilification* to which the system naturally tends, and which particularly takes place at this age, is not alone owing to this cause; it is also the production of the degeneration of the blood, which generally occurs at this period. The venous system, of which the vena porta is the centre, predominates in the bilious temperament. We will remark on this occasion, that this system has the greatest influence on the nutritive system. "Those who have small veins and but little blood, cannot support abstinence long; those, on the contrary, who have large veins, full of blood, support it better."† We see this relation well established between old people and children: children have small veins and but little blood, they cannot abstain long; but old people, whose venous system is very full, can resist a long privation of aliments.

rica, different local situations are variously affected by different winds; hence an east wind is, in some situations or districts, considered a wet, and in others a dry one; these remarks hold good as to a west wind, &c. In some districts, the south is considered warm, and the north cold; in others, the reverse is their effect, and they are all considered healthy or sickly, according to the country over which they pass: consequently, no general history of their influence could be given. As this is a subject of much interest, I propose to enlarge on it in an Essay in the Appendix.—*Tr.*

† Galen, Lib. ii. de temperamentis.

The bilious constitution is, ordinarily, a production of the age of virility; it may, however, be produced in the other ages, by the action of certain causes;—such as a residence in a warm and dry country, analogous seasons, labours of the body and mind, carried to excess, strong passions, the abuse of wine and other strong liquors, heating and animal nourishment, the practice of eating sweet substances—sugar, and especially honey, strong seasonings, an excess of sobriety and abstinence, continuing awake a great deal, the suppression of habitual evacuations by the bowels, vomiting, urine, sweats, &c.; the continued use of absorbent earths, alkaline salts, mercury and antimony, the bite of certain venomous animals, such as the rattle snake, viper, and the asp.

The bilious juices are formed, and naturally develop themselves in the humoral system, especially when the sanguine diathesis has made some progress; for the iron contained in the blood being then more oxydated, assumes a yellow colour, and the azote becomes more and more predominant. They are also, in part, the result of the progress of animal fermentation, which is habitually supported in the humors, and of the augmentation of the action of the vena porta; whose irradiation is propagated, in the age of virility, over all the veinous system. In a natural state, the bilious juices are excreted in proportion to their fermentation; in consequence of which, the bile is distributed, and bilious diseases prevented.

The atrabilious temperament is that of the bilious, increased, or carried to the extreme; it belongs to the meridian of life, and to old age. In general old people are dry and cold, and consequently, atrabilious;

for, as Galen remarks, "old people are only humid in relation to the excretions which take place by the superior parts." Their constitution is also, as I have already observed, a mixture of the pituitous and atrabilious; we may, in general, distinguish two kinds of atrabilious; the one natural, and the other morbid. "The one," says Galen, after Hippocrates, "is the sediment—the lees of the blood; which is very thick, and similar to the lees of wine; the other is thin, and appears acid to those who vomit it, or who smell it: it effervesces with earth. The first does not possess any of these qualities; this is the reason why it is, in my opinion, better called melancholic blood, or juice, than atrabilious." He says, in another place: "the true atrabilious is that which is acid; it is the most dangerous, and its effects are terrible." We thence see, that the second species, or rather the atrabilious, properly called, differs from the first, or from the melancholic juice, only by a greater oxygenation; which converts into an acid state, all the qualities that it possesses. The same causes that produce the bilious constitution, also give birth to that of the atrabilious, or melancholic, when they are more intense, or when their action is longer continued; but of all these causes, there are none more powerful than long and corroding grief, cares, inquietude, and an excess in the pleasures of love, and of the table. The diseases dependent on this constitution, only differ from those of the bilious, by a greater and more rapid tendency to putridity and gangrene. "Effeminate, fair, and fat persons," says Galen, "are not subject to melancholy; but those are subject to it who are ruddy, yellow, black, meagre, or hairy; who have large veins,

especially if they are a great deal awake; if they give themselves up to hard and laborious work, experience inquietude, observe a thin regimen, have hemorrhoids, or other evacuations of blood, which are suppressed; and if they use aliments that form melancholic juices, such as the flesh of goats, oxen, and more especially of the he-goat, bull, ass, camel, fox, and dog. The flesh of the hare, and in a peculiar manner, that of the wild boar and snail, engenders melancholic juices, when they are frequently used. In addition; the flesh of all terrestrial animals, those that are fatted, and those of aquatic animals, as the tunny, dolphin, &c. produce these juices; cabbage, lentils, and bread made thereof, as well as that made of injured grain; gross and black wines, and old cheese, produce melancholy juices. There are some, in whom it is the result of fever; but nothing contributes more to its generation than the season, constitution, age, and the country one inhabits.”\*

We should conclude from all that we have just said in relation to the constitution of the ages, that the body of man presents three systems, each of which has a predominant action in the different periods of life. The cellular system, which comprehends the lymphatic vessels and the glands, acts, especially in infancy, and establishes the pituitous constitution. The arterial system, of which the lungs are the centre, acts in the second age; the development of the energies that take place, especially in this system, causes the blood to predominate, and produces the sympathetic irradiation of the generative organs, the specific

\* Galen, Lib. iii. de locis affectis.

life of which commences at the period of puberty. Lastly, the veinous system, whose centre is in the abdomen, and whose action is augmented in the subsequent ages, brings on the bilious and melancholic constitutions. This succession of ages and constitutions, is a necessary effect of the different determinations of the organic forces, which accompany the various periods of life.\*

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## CHAPTER VII.

### *On the Duration of Life.*

EVERY organized being, after having passed through the three periods of growth, consistency and decay, suffers an exhalation from its enfeebled body of the fire which animates it. Death is then a true function of life, which consumes the aliment necessary to its support. Every living being has a term designed it by nature, beyond which it cannot exist. It is in the knowledge of the means, which may prolong this term, by preventing the quick consumption of the vital flame, that the art of preserving health consists. Let us at first take a cursory view of the duration of the different classes of the organized world, by com-

\* Many authors have written very ingeniously on the constitutions; but constitutions are like faces, although there may be leading features, which exhibit a striking likeness, yet no two exactly resemble: so it is with those; every person seems to have a constitution of his own. Our author is certainly ingenious in his divisions, those of the humoral may serve as interesting land marks, and those of the solids are plain and simple.—*Tr.*

mencing with plants, before we proceed to the last period in which the human soul is disengaged from the matter which confines it, and goes to unite with its author. What I shall say on this subject, will prepare the reader to appreciate, finally, the most important circumstances, which have an influence upon the prolongation or diminution of the term of life.

The different species of plants, which botanists, according to the latest discoveries, extend to the number of four thousand, may in general be divided into three principal classes, to wit: the annual or of one year, and even of six months, for they generally originate in spring and die in autumn; the biannual, that die at the end of two years; lastly, the evergreens, which live from four to a thousand years.

Succulent and aqueous plants, whose organs are delicate, live but one or at most two years; those that are stronger, and whose juices are more consistent, live longer; but these cannot live very long without wood. We remark very obvious differences in plants that live but one or two years; those that are not odorous but insipid, generally live a shorter time than the aromatic and pungent plants.

Shrubs and trees of a small kind, may exist sixty and even an hundred years; of this number are, among others, the vine and the rosemary. Trees that live the longest, are the largest and strongest, such as the oak, tillau or linden tree, beech, &c.; the baobab, whose trunk acquires a thickness of twenty-five feet, is one of the *nestors* of the vegetable kingdom. Adenson found, towards the middle of the seventeenth century, the names of navigators of the fifteenth and sixteenth centuries, upon some baobabs, which were then only

six feet thick, and the incisions had not much extended. There are cedars of Lebanon and oaks, that have lived more than a thousand years.

All trees of rapid growth, such as the pine, birch, &c. have a wood not near so strong, and of a shorter duration. The oak, which grows slower, has also a harder wood and lives very long.

Vegetables of the small kind have, in general, a shorter life, than those that are very high and of a certain thickness. Those that have the hardest wood, are not those that live the longest. The dwarf-tree, cypress, juniper, trees that bear stone fruit, and the apple tree, do not live so long as the linden tree, although the wood of this is more tender than that of those. In general, those that give soft, succulent fruit, and are improved by art, are of a shorter duration than others, and of those that bear bad fruit. Among the latter, those that bear nuts or acorns, have a longer life, than those that bear fruit with stones, kernels, or seed. We observe generally, that those whose foliage and fruit come and pass slowly, live longer than others. Domestic trees live a shorter time than wild ones, and those that have sour and unpleasant fruit, than those of a sweet or pleasant fruit. Culture, frequent irrigations and manuring causes trees to grow and fructify more; but they shorten their duration. One thing remarkable is, that by frequently cutting the branches, the vegetable life is often prolonged, and by stirring the earth around the roots of old trees, which have not been touched for a long time, a sort of regeneration is produced, a more abundant and greener foliage is the consequence.

Finally, from experiments made upon vegetables, it results, that to live long, it is necessary, 1. that their growth be slow; 2. that they propagate slowly and not very soon; 3. that they have a certain degree of solidity, but not excessive, sufficient of wood, and that their juice be consistent; 4. that they be not too large, but that they have, nevertheless, a certain size; 5. that they be in the open air; 6. that the earth around them be not frequently stirred, that the irrigations be not too frequent, nor that they be too much manured. Every contrary condition is unfavourable to vegetables, and abridges their life, by rapidly consuming the vital principle, with which they are animated.

Let us now pass to the animal kingdom, which includes an infinite number of species, from the ephemeral insect, which lives at most but a day, and which at the twentieth hour of its age finds itself, as a centenary, in the midst of a numerous posterity, unto the elephant, that lives two hundred years. What innumerable multitudes of animals of a different form, size, organization, and duration! I shall not attempt to embrace so vast a subject, which would lead me from my proposed plan, but shall only collect some particulars, which may serve to explain upon what the duration of life depends.

The most imperfect class of animals, and that which is proximate to the family of vegetables, is that of worms. As worms are of a very weak constitution, it is very easy to destroy them; but as plants, they have a very extraordinary reproductive faculty, which is such that they live and reproduce the parts that they want, and this makes it very difficult to say any thing certain respecting their life. There are in this

same class, some species that seem indestructible; such are, among others, the fili-form worm, and the vibrations. Fontana dried in the hottest sun, and afterwards in the oven, several of these animals, and succeeded in reanimating them six months afterwards, by putting them in tepid water.

Insects, whose organization is less perfect, and which occupy a more elevated rank in the animal scale, do not possess so great a reproductive faculty, but their existence is prolonged in a prodigious manner, by the divers metamorphoses which they undergo. The insect lives several years under the form of larva, of worms, then passes into a state of chrysalis; it exists for some time in this state of apparent death, from whence it comes out in the form of a butterfly. It is then only that it can propagate its species; but this time is short, and it soon afterwards dies.

The amphibia arrive at a very advanced age; they are, no doubt, indebted for their longevity, as well as all other animals who enjoy it, to the intimate union of the vital principle with the nervous medullary substance. There are some almost incredible examples of the tenacity of life in these animals. Turtles have been seen to live for some time without a head; and frogs leap after the heart is torn from them. Toads have been found living enclosed in stones, and even in blocks of marble. According to observation, the turtle and crocodile are, of all the amphibia, those that live the longest. The tortoise, lazy and phlegmatic, grows so slow, as to enable us to see a difference of but a few inches in the first twenty years; it lives more than one hundred years. The crocodile also lives a great many years, and grows until death.

There are some fishes that arrive at a great age. The lamprey lives sixty years, the pike and the carp an hundred and fifty; the salmon grows fast, and does not live long; perch, the growth of which is slow, have a much longer life. Let us remark, by the way, that a natural death is more rare among fishes, than in the other classes of animals, because they devour one another, and the weakest become a prey to the strongest. This continual destruction, by means of which life is supported in the empire of the waters, is absolutely necessary, to prevent the putrefaction, and the consequent pernicious exhalations.

There are also some species of birds which live very long. The great eagle, the bone breaker, which are very large and strong, and the fibres of which are very solid, attain a very advanced age. Some have been seen in menageries, that have lived more than an hundred years. The same thing is noted of the sparrow-hawk, falcon, raven, and swan. The paroquet lives in a domestic state beyond sixty years, and the peacock twenty. The cock, the most lascivious of birds, does not live so long. The small species are still shorter lived, except, however, the blackbird and the goldfinch, which may attain the twentieth year.

Among the mammalia quadrupeds, the elephant lives the longest; it grows until the age of thirty, and lives for the space of two centuries. We cannot determine the duration of the life of the lion; it is, however, presumable, that it is long, for they have been found without teeth. Bears do not live long. It is not the same with the camel, which lives to sixty and even an hundred years. The horse and the ass scarcely pass thirty years; but the mule lives longer. What

has been said of the great age of the stag, is only a fable; they seldom live beyond thirty-five or forty years. The bull, notwithstanding his size and strength, only attains the fifteenth or, at most, the twentieth year. The most of the small quadrupeds, such as sheep, goats, foxes, and hares, do not live more than eight or ten years, except the dog and hog, which live to fifteen and even twenty years.

Observations conduct us to the following results: 1. The duration of life is in a direct proportion to the length of time that the animal remains in utero or in the egg. The elephant, which the female carries near three years, is an animal of the longest life. The stag, bull, dog, &c. which remain but a few months in the body of the mother, do not live so long. 2. The duration of life is in proportion to the slowness of their growth, and in an inverse proportion to the quickness, with which they propagate. The horse, ass, and bull, are calculated to reproduce at the third or fourth year; the two first only attain the twenty-fifth or thirtieth year, and the other the fifteenth or twentieth. Sheep may be mothers at two years, and do not live more than two lustrums or ten years. 3. Horned beasts are generally shorter lived than others. 4. Animals that have black flesh live longer than those that have white. 5. Those that are peaceable and timid, have not so long a life as the courageous and irascible. 6. Animals that are thickly covered, such as birds, live longer than those that are not. It is the same with the elephant, rhinoceros, and crocodile, which have a very hard skin, and also fish with scales. 7. The kind of motion which animals take, appears also to have some influence upon their

lives. Running does not seem favorable to longevity, but flying and swimming, on the contrary, are very advantageous to its duration.

8. The tenacity of life is in proportion to the simplicity of the organization. The zoophytes, which are all stomach, are in some measure indestructible.

9. Cold blooded animals have a greater vital tenacity than the warm blooded. In general, aquatic animals live longer than those that respire.

10. Animals that have the faculty of reproducing new organs, live longer than those that have not; the zoophytes, worms, amphibia, in a word, all cold blooded animals destitute of cartilage, furnish a vast number of examples of it. The changing of scales of fish, the skin of serpents, frogs, crocodiles, &c.; of the plumage and bills of birds, procures them the same advantage. The more perfect, the proportionably longer is life. The two first of the results above mentioned, are subject to but few exceptions, and are in general applicable to every species of animals, even to man.

Man remains nine months in the womb, and his growth continues twenty-one years; hence he does not live more than half so long as the elephant, that remains three years in the maternal womb, and which grows thirty years after its birth.

The ordinary term of human life is ninety or an hundred years; however, without refering to those times in which our forefathers lived several centuries, we have some recent examples which induce us to think, that there is in man a longer source of life, than he ordinarily lives. In this century, (eighteenth) old men of an hundred and twenty, and an hundred and

fifty, and even of an hundred and eighty-five years, have been seen; and if this rarely happens, we have much less reason to accuse nature of the decrepitude than our depraved manners.

Man may attain to a very advanced age in every climate under the torrid zone, as well as in the frozen regions; the only difference is, that there are a greater number of old men in certain countries than in others, and that the term of life in them is greater or less. In these even, in which mortality is in general more considerable, we meet with individuals, who live longer than in others, where it is less so. It is not great, for example, in the warmest climates of the east; hence their population is excessive. Nevertheless we find, other circumstances similar, fewer old men there, than in countries situated more north, where the mortality is prodigious. It is in the high situations, that we meet with the greatest number of old people. However, it will not do to admit it as a principle, that the more elevated a place is, the more it favors longevity; for observation manifestly refutes this position. The mountains of Switzerland furnish a much smaller number of old men, than those of Scotland.

The human species live longer in cold than hot countries; but there is a mean term for cold as well as for heat. The inhabitants of Greenland, Nova Zembla, &c. do not live long. What contributes most to longevity is, the equality and the mildness of the temperature: countries subject to great and sudden variations, are not favorable to the duration of life; in such situations, persons do not reach an extreme old age. An excess of dryness and moisture, is

injurious to life; and the most favorable air, is that which holds a small quantity of water in solution. Islands and peninsulas have, in all ages, been the abode of old age: soil has also an influence on the duration of life; the calcareous is the least salutary.

Observations prove that Norway, Denmark, Sweden, England, France, and Switzerland, are, of Europe, the countries in which man lives the longest; because they unite all the qualities above enumerated; on the contrary, Abyssinia, Surinam, and some parts of America, are those countries, in which, human life is the shortest.

Let us observe, that the greater part of men who have lived to a very great age, were married; and that we can cite a very small number of those who have remained single, that have lived long. Let us observe also, that although there are more women than men who live to be old, that it is nevertheless, of the latter, who attain the most advanced age. A residence in the country, or small towns, is more favorable to longevity, than that of large towns; which is, on the contrary, very prejudicial.

Finally, man lives longer or shorter, in every latitude, accordingly as he is more or less faithful and submissive to the views of nature. The inhabitants of the same country have been seen to live more than a century, whilst they led the frugal and sober life of shepherds and agriculturists; and the succeeding generation sooner terminated their career, so soon as they were advanced in civilization, and began to give themselves up to idleness, luxury, and debauchery.

I will conclude this chapter by a short sketch of political arithmetic, established from the most recent and most faithful observations.

If we suppose, what is very probable, that the earth is peopled with about one thousand millions of souls, and if we prove that it requires thirty-three years for a generation, there die in this space of time the same number; and, consequently, that there is of

deaths each year           30,00,000,  
                                   Day .   82,008,  
                                   Hour .   3,400,  
                                   Minute .   60,  
                                   Second . . . 1.

On the other hand, seeing that the number of deaths are to that of births as 10 are to 12, there is born every year

                                  35,000,000,  
                                   Hour . . . 98,000,  
                                   Day . . . 4,080,  
                                   Minute . . . 72,  
                                   Second . . .  $1\frac{12}{72}$ .

Of all the inhabitants of a country, ordinarily one fourth live in towns, and the other three-fourths in the country. In the latter, there dies 1 out of 40; in small towns, 1 out of 32; in middle sized towns, 1 of 28; in the largest towns or cities, 1 of 24 or 25; in a whole country, 1 of 36: so that out of 1000 living persons, there dies 28 per year.

The number of inhabitants of a country or town, is nearly renewed every thirty years; consequently, in a century, the human species is renewed three and a third times.

Out of 100,000 slaves, there formerly died at Martinique, 20,000 per year.

Of 1000 new born children, there remains at the end of one year, 740; of 2, 620; 3, 600; 4, 596; 5, 584; 6, 574; 7, 564; 8, 554; 9, 546; 10, 540; 15,

518; 20, 496; 25, 471; 30, 446; 35, 420; 40, 385; 45, 350; 50, 313; 55, 271; 60, 226; 65, 180; 70, 130; 75, 85; 80, 49; 85, 24; 90, 11; 95, 3; 97, 1.

Among 100 deceased children in the space of 1 year, there are, in general, 3 dead born. This proportion, however, varies in different places.

At Dresden, of 15 children born in a year, 1 is dead at birth; at Berlin, 1 out of 30; and in Sweden, 1 out of fifty.

Of 200 children born, a small fraction less than 1 perishes in parturition. Of 100 born, we cannot calculate on 1 dying during the mother's confinement.

Of 1000 children suckled by the maternal breast, 300 at most die; but of the same number confided to nurses, 500 die.

Of 115 women brought to bed, we may calculate 1 death during confinement; and among 400, only 1 at delivery.

The small pox in the natural way, generally carries off 8 out of 10, and more girls than boys.

According to a calculation made in England, there was found among 1000 persons, 7 at the age of 100 years, 5 from 101 to 102, 4 at 103, 2 at 104, 4 at 105, 2 at 106, 1 of 107, 7 of 108, 3 at 109, 4 at 110, 3 at 111, 3 at 112, 3 at 116, 2 at 118; hence there is only found one person of 100 years, among 3125 deceased.

It is proved by observation, that of 100 persons who live in large cities or towns, there are not, in the course of the year, more than 12 patients of a month, or 24 of 15 days. The age of 7 years is that in which life becomes more certain. There is also a period, in which the probabilities of living remain the

same for some years. Buffon has observed, that at 80 one may hope to live 3 years; that at 90, there is still a probability of living 3 years, and beyond that age, always 3 years.

By taking the whole number of deaths of a country, we find that the number of males deceased in a year, is to that of females as 27 are to 25.

From observations made during the space of 50 years, it has been found, that the greatest mortality constantly takes place from the end of April to that of May; and next in the months of September and October; and the greatest health, in December and January.

The month, especially the first day of birth, is marked by the greatest number of deaths. Of 2735 children who perished in early age, 1292 died on the first day, 164 in the first month. The number of deaths are to births, as 10 are to 12 or 13; so there is born in a given time two or three-tenths more than die. To divide the whole human race, one-half is at the age of 27 years or more, and the other, or rather more, is below this age.

The married women are to the entire female population of a country, as 1 is to 3, and the married men to the single ones, 3 to 5.

The boys above 13 years, to the inhabitants of a country, are as 4 to 33, and the girls above 13 are as to 25.

The girls as well as the boys above 13 years, are to the whole number of inhabitants, as 1 to 8.

The greatest number of births happen in April, and the number of boys born is to that of girls, as 21 to 20 or 105 to 100; but as there dies in infancy two-twen-

ty-fifths of boys more than girls, the number of men and women are nearly equal towards the marriageable age.

The number of twins is to that of children born, as 1 is to 65 or 70, so that among 65 or 70 births, we do not more than once meet with twin children.

The number of children is to that of the families of a country, as 10 are to 66, so that there are 66 families for 10 children born in a year.

The number of living is, ordinarily, to that of the children born in a year, as 26, 27, or 28 are to 1.

The number of marriages is to that of the inhabitants of a country, as 175 are to 1000. Actually the number of marriages ought to be considerably diminished, in consequence of war and the fatal effects of luxury and libertinage.

In a whole country, each marriage, collectively, does not average more than 4 children; in towns there are only 35 children for 10 marriages.

Men in a state of bearing arms, constitute the one-fourth of the inhabitants of a country.\*

The number of widows is, ordinarily, to that of widowers, as 3 are to 1; that of widows who marry again to that of widowers who re-marry, as 4 are to 5.

The number of widowers in a country is to that of the whole of its inhabitants, as 1 to 51, that of the widows is to the inhabitants, as 1 to 15.

The widowers and widows are to the married people of a country, as 3 to 7; the number of widowers is to that of the marriages, as 1 to 10, and that of the widows, as 3 to 7.

\* May this never be thy situation, United States of America.—*T*7.

## CHAPTER VIII.

*Natural History of Man in the different Climates.*

MAN is a cosmopolite; he is the inhabitant of every country and every climate; he can live and perpetuate his species under latitudes the most opposite. It is not the same with animals, which for the most part, soon degenerate, or do not at all perpetuate their species, but become by degrees extinct in those places or countries which are not peculiar to them. It appears that it is to the great sensibility with which the human species are endowed, that man is indebted for the resisting force, which he opposes to the exterior agents, that deprave the animal organization, the fixed tone of which is alone sufficient to secure him against the action of the offensive causes, that the different climates present. However, man, by changing his residence, is not sheltered from disease; he frequently contracts those peculiar to the natives of the place, to which he removes, or he becomes subject to others, produced by nature herself, who makes useful efforts to reduce into equilibrium the organic system of the new inhabitant, with the new order of things. Experience also teaches us, that the inhabitants of warm countries become accustomed to climates more easily, than those of cold ones removed into warm countries.

The climate by its temperature and its productions, exercises the greatest influence, not only upon the physical part of man, but also upon his mental faculties.

Government and religion also powerful modify his existence: so that his character, his manners, opinions, prejudices, physiognomy, colour, size, are in close connexion with these causes, and especially the place which he inhabits. In fact, we frequently meet with very obvious differences in neighboring people. A woods, river, or mountain frequently establishes a line of demarkation, that renders two hamlets almost entirely different.

Every thing is subject to the laws of physics, and the animals, as well as man, experience the influence of the heavens and of the earth.

It is principally by nourishment, that man receives the influence of the earth; that of the air and of the heavens act more superficially, and whilst they alter their exterior organ, the aliments act on the interior by properties which are constantly relative to those of the earth which produce them. It thence results, as has been well observed by Buffon, that the same causes which modify man in our climates, have also an influence upon all the animal species. The wolf, which in our temperate zone is, perhaps, the most ferocious animal, is not near as much so as the tiger, panther, and lion, of the torrid zone, or the white bear, lynx, and the hyæna, of the frozen zone. Moreover, we remark not only that climates are made for the species, or the species for the climates, but we also find in each species in particular, the climate made for the manners, and the manners relative to the climate. The ferocious animals of Africa are much less formidable in America; they have degenerated in the new continent, from having there experienced the

influence of a milder climate, and have become conformable to its nature.

Vegetables do not participate less than animals in the nature of the climate; each country, every degree of temperature, has its particular plants. It is the excessive climates that give birth to those whose qualities are in the extreme; on the contrary, temperate climates only produce mild substances; the mildest herbs, the most healthy legumes, and the most pleasant fruits. It is only in these, that we meet with peaceable animals, and people whose manners are mild and innocent. In every country, organized beings have direct relations with the climate. To take a bird's eye view of the principal countries of the globe, beginning at the north, will be sufficient to convince us of this fact. Spitzbergen is the most northern country of which we have any knowledge; it is also the coldest, and has a very piercing air. During summer the sun remains more than forty days upon the horizon; but its rays have so little force, that the severity of the cold is very little diminished. This country is only inhabited by white bears, with palmed feet, of considerable size and strength, by grey foxes, and rein-deers, surcharged with fat, which has the fatal property of giving the dysentery to those who eat them, and by a variety of ducks.

The soil produces neither trees nor shrubs. This country is uninhabited by man.

Nova Zembla, a large island to the north of Asia, in the Frozen sea, is the most miserable country in the universe; it is full of mountains, and almost entirely covered with snow. This island is not inhabited, but frequented by the Samoides, who pass there

about the middle of May, and who are occupied all the summer in fishing and hunting. The Hollanders who landed on the eastern coast of this island, in 1596, did not see the sun from the fourth of November, till the twenty-sixth of January, 1597. They should not have perceived it until fourteen days later, according to the rules of astronomy. What these navigators took for the sun during these fourteen days, was, doubtless, but a parhelion or mock sun, as has been proved by Casini the elder.

Greenland, a large peninsula to the north-east of North America, does not produce any tree, except towards the south, and the only ones that grow even there, are willows, birch, alder, some juniper berry bushes, gooseberries and roots, which bear a bad fruit. But the mosses produce there in considerable quantities; they are very nourishing, especially the lichen icelandicus; they soon fatten the animals that live upon them. In this country we meet with some quadrupeds and many fishes; the whale, herring, and codfish, abound in it. In Greenland there are not any serpents nor venomous reptiles, no more than at Spitzbergen and Iceland, in a word, in countries where the cold is extreme.

The cold is excessive in this country; the strongest liquors freeze even in the warmest apartments; it increases from year to year, and this island, where wheat was formerly sowed, and which was covered with forests, does not produce any wheat at present; it only produces some hardy shrubs. From the beginning of June until August, the sun is warm, very brilliant, and never leaves the horizon, so that the Greenlanders have no night. From the month of Oc-

tober until January, it does not appear at all, or at most but two or three hours. A twilight of several hours spreads a lightness, which makes up for the absence of the sun, and the aurora borealis succeeds this twilight every day. The aurora borealis shines all winter, and gives a light which surpasses the most beautiful light of the moon.

The Greenlanders do not differ in any respect from the Esquimaux, who are at the north of North America; they constitute together the same people and the same race of men, whose idiom, manners, visage, and figure, are perfectly similar. They are small, thick set or squat, and are scarcely four feet high; they have a large head, large and flat face, high cheek bones, flat nose, big lips, and the skin of a deep olive color. The women are as homely as the men, and resemble them so much that they can scarcely be distinguished; they are still smaller, have very short feet and hands, breasts long and soft; they rarely bear more than three or four children, and arrive at an advanced age. But few of the men attain the age of fifty years. This people are neat, adroit, and indefatigable at hunting and fishing. The women also dispute with the men in strength and address. They are but little provident, and have no care for the morrow. They live only upon meats and fishes, and support hunger with an incredible firmness. Pure water and the oil of fish constitute all their drink.

The Greenlanders, as well as the Esquimaux, are not subject to any power, and live among themselves in perfect equality. They have no worship, nor any idea of God, and live from their infancy, free and independent, without education, without magistrates,

and free from restraint. The father alone enjoys some authority over his family. There prevails among them much union and harmony. Polygamy is tolerated, and the examples of repudiation are pretty frequent. These people are subject to but a very few diseases; the scurvy is, as it were, the only disease of the country; but here, as in every other place, bountiful nature has placed the remedy at the side of the disease; the scurvy grass and other antiscorbutic plants grow very abundantly in this country.

The environs of Hudson bay, the most considerable bay of North America, presents the most frightful prospects. Upon whatsoever side we extend our view, we perceive only uncultivated and sterile grounds, steep rocks which ascend to the clouds, and profound ravines and vallies, always covered with snow and ice.

In this country the sun never rises or sets without a great cone of light. The aurora borealis succeeds this phenomenon, and diffuses a light which is not even effaced by the full moon, however the sky is rarely clear.

Although the heat of summer is pretty great during forty or sixty days, thunder and lightning is rarely manifested in this country. The aurora borealis sometimes kindles the inflammable exhalations, which burns the bark of trees, without attacking the body of them.

The inhabitants of this unhappy country do not differ from the Greenlanders. Every thing remains in the sterility of nature. We there see on every side only the effects of a feeble organization, and of a cold which constrains the development of the organs.

Although in the neighborhood of the poles, the cold seems to arrest the progress of animal and vegetable life, nature is, however, only inanimate in appearance, and the sea has received in compensation, what has been withheld from the earth. Nature dispenses there as many energies to animate the whales, the phoques,\* the innumerable shoals of herrings and codfish, and the clouds of aquatic birds, which darken the surface of the frozen ocean, as she employs elsewhere to organize plants, and a prodigious variety of living beings. We every where meet with the same tendency to organization. There circulates all round the globe an equal proportion of vital spirit; and the extreme temperatures of countries cannot arrest its vivifying power and activity. The quantity of life is the same in every place.

Iceland island is situated in the North sea, near the pole, consequently experiences excessive cold and frequent earthquakes. The volcanoes which produce these, prevent this island from being thickly inhabited. Add to this, that it produces neither corn nor fruit. The inhabitants live upon bread, fish, and putrid meats, and only drink water and milk whey. Iceland furnishes neither game nor ferocious beasts, because it is very remote from the continent. Sometimes, however, bears arrive there upon large cakes of ice, brought by the winds upon the coasts of the island. In this country there is a prodigious quantity of sheep, which always remain in the open country.

\* Genus of quadrupeds of the order of amphibia, under which head are included the sea-lion, sea-bear, sea-calf, sea-wolf, &c.—*Tr.*

At the north of Iceland, the sun is continually seen from the end of April until the end of July; but the inhabitants are deprived of its light from the end of November until the end of January. During this long night, the Icelanders possess the light of the *aurora borealis*, which appears as soon as the days begin to shorten, the brightness of which augments in proportion, as they become shorter.

The climate of Iceland is very healthy, and the inhabitants lead a hard and laborious life from their youth. The children only suck eight days; they are afterwards laid upon the ground, and a small vessel filled with milk is placed at their side, when they wish to drink, they are turned towards the vessel, and they suck the milk through a tube confined to the vessel. By the time the children are nine months old, they eat every thing as their elder brethren. They do not know what it is to be swaddled, cradled, and nursed; they are scarcely fifteen days old, when they are put in small clothes and a vest; they are suffered to roll upon the earth, until they can get up without help, when they learn to walk. The Icelanders are very slovenly, and so cowardly that they cannot be accustomed to fire a gun. There are no defects to which they are not subject, but drunkenness is their predominant vice, and they will sell all that they possess to obtain brandy, which is the life of all their assemblies, and all their feasts.

In Lapland, which is to the north of Europe, and upon the northern coast of Tartary, we find men very like the Greenlanders, both as regards their manners and physically. As soon as their children are born, they plunge them into cold water. In general all the

northern nations resemble one another in the exterior, and have nearly the same inclinations and the same usages. They appear to be the Tartars, more or less degenerated. These nations rarely leave the place of their nativity. They are cowardly, and very unskillful in the use of arms; nevertheless, they are indefatigable at hunting and fishing.

When we wish to find the Laplanders, or the other northern people, of whom I have just spoken, we must search under the earth, or in almost entirely subterraneous cabins, the roofs of which are covered with the bark of trees or fish bones. It is in these gloomy places, that they pass a night of several months, during which they keep a continual fire. In summer even, they are obliged to keep a thick smoke, to prevent being incommoded by the insects, with which that country abounds. They are but little subject to diseases, but become blind from being always dazzled by the shining of the snow, and being affected by the smoke. They do not live long, and the women of this country are not very fruitful. It is not the same in Sweden, and the countries situated in nearly the same degree of latitude; in these countries it is not rare to see women who have had thirty children. All the northern nations have the whimsical custom of offering their women to foreigners, and of being much flattered when one condescends to accept them; they doubtless find those less homely whom strangers have not disdained. We also find this custom among the Tartars of Cremia, the Kalmucks and several other nations of Siberia and of Tartary, whose women are nearly as homely as those of the north; whereas in all the neighboring nations,

as China and Persia, where the women are handsome, the men are excessively jealous.

The nations who inhabit the temperate zone beyond the polar circle, have generally light hair, the iris of the eye blue, white complexion; are tall, strong, courageous, warlike, and restless. They have a natural inclination to expatriate; they have been seen scattered as far as Africa, and there are no nations amongst us that have not derived their origin from the north, and who are not mixed with some of the northern races. These people are entirely different from those situated under the polar circle, or in its neighborhood; this difference is very obvious, whether as relates to their exterior qualities, or to their manners and inclinations.

The Tartar nation, taken collectively, occupies the most immense countries of Asia. The men of this race are very homely, have a swarthy and olive complexion, little beard, and in small patches like the Chinese, big thighs and short legs; they are of a middle stature, but very strong and very robust. The most hideous and the most deformed people are the Kalmucks. These robust men, thieves, and at the same time, very hospitable, are neighbors to the Caspian sea, and situated between the Muscovites and the Grand Tartars. Their visage is so large, that there is at least five or six inches width between their eyes, which are very small; their nose is so short and so flat, that in the place of the nostrils, we only perceive two holes; their knees are turned outward, and their feet inward.

Although the Tartar blood is mixed with that of the Chinese and the eastern Russians, the traits of

that race are still preserved. Many of the Muscovites have the physiognomy of the Tartars, and as these, the body well set, big thighs, and short legs.

In advancing towards the east of Independent Tartary, we find a little mildness in the traits.

The Chinese have a more striking resemblance to the Tartars in their physiognomy, than even the Muscovites; it is even probable, that they are of the same race, and in fact their figure and their traits, when compared, leave no doubt on this score. The Chinese, the most ancient known people, and the oldest civilized, who inhabit the eastern extremity of the continent of Asia, are almost without beard, have a brown complexion, and differ but a little from the Japanese, who are browner, owing to their climate being more southern, so that we may regard these two nations, as making but one and the same race of men. The Chinese and the Japanese, although robust, are less so than the Europeans; they have oblong, deep seated eyes, which are subject to twinkling, and the color of which are brown or black; their eye-brows are placed very high, their look is very piercing; they have a large head and short neck, black, thick, and shining hair; their nose is flattened, large, and spreading; their character is a mixture of curiosity, submission, patience, justice, bravery, credulity, and pride. Moreover, these two nations have the same natural disposition, the same manners, and the same customs. A whimsical custom prevails amongst them, which is that a woman cannot be amiable if her feet are not sufficiently small to go into the slipper of a child of six years old. This is the reason why they are in the habit of strongly compressing the feet of

girls from early age, to prevent them from acquiring their full growth. Another usage in China, not less absurd, is also found established in Tartary, and even among the Hottentots; it is that of flattening the nose of children while in the cradle; the education of a daughter would be incomplete, if at the approach of marriage, she had not a flat nose. A prominent nose is a deformity in these countries. We find a contrary custom on the coast of Malabar, among the islanders of the Persian gulf, and in California. So different are the ideas that each nation has of beauty. In these places they pierce the partitions of the nose of girls, to pass rings, golden pins, and gewgaws of crystal. The savages of Brazil add to these usages, that of making an opening in the lower lip, to adopt a green stone, or a small cylinder of ivory.

The Corsicans are, originally, of China; they have preserved the language, manners, and form of government of that country. They inhabit a peninsula of Asia, called Corea; which is situated between China and Japan. We remark among the Cochin Chinese, the Tonquinese, Siamese, Peguans, the inhabitants of Aracan, of Laos, and the other neighboring countries, nearly the same traits as amongst the Chinese; the only difference is, the colour is more or less deep accordingly as they inhabit mountainous countries or vallies, situated to the south or north. Long ears are much admired amongst these people; some succeed in lengthening them by stretching; others pierce them, and make an opening so considerable, that the fist might be introduced, and the ears fall down almost to the shoulders; especially of the inhabitants of Laos. The Siamese, make the beauty of

the teeth consist in blackening them; and they dye them with a kind of varnish which gives them this colour, and which they renew every year.

The inhabitants of Java have also a great resemblance to the Tartars and Chinese; whereas the Malays, and those of Sumatra, and the small neighboring islands, differ from them in their traits, form of body and color, as well as in the proportion of their members; which has given rise to the belief, that these islands, as well as all those of the Indian Archipelago, have been peopled by different nations from the neighboring continents, and even by the Europeans; hence, a great variety of men are found in this place.

In ascending towards the north, we find in the Manilla and in the Philippine islands, nations which are, of all the inhabitants of the globe, the most mixed, in consequence of the alliances which they have long since contracted, and which they continue to make with the Spaniards, Indians, Chinese, Malabars, and blacks. It is necessary to observe, relative to the latter, that those who inhabit the rocks and woods of these isles, have no resemblance to those who do not. There are some among them who, like the negroes of Angola, have crisped hair; there are others who have it long. Voyagers relate many circumstances respecting them, which are so extraordinary, as to be destitute of belief.

The Papous, and the other inhabitants of New Guinea, are black, and resemble those of Africa, although they are separated from them by an interval of more than two thousand and two hundred leagues. They deform themselves with a kind of peg or pin, of

the size of one's finger, and about four inches long, that they pass in their nostrils; they also make great openings in their ears, to pass long pins through; however, amongst almost all these nations, the women pierce them to suspend mere ornaments of fancy. In New Guinea, the women have very long breasts, hanging upon the navel, very large bellies, and the arms and legs quite small.

The inhabitants of New Holland resemble the Hottentots; they are tall, straight, slender, and have eye lashes, half closed, to guard the eye from the gnats, with which they are incessantly incommoded. These people are very miserable, and approach the condition of brutes, in their manners; they live *pele melè*, men and women in hordes of from fifteen to thirty; they have neither houses nor beds; the bark of a tree, with which they cover half of their body, is their only vestment; and their only nourishment is that of little fishes, which they take by making use of a species of reservoirs of stone in the small arms of the sea.

The Moguls, the Guzerats, Mahrattas, and the different nations who inhabit the peninsula of the Indies, have a stature and traits pretty similar to those of the Europeans. Both sexes are of an olive color. The Mogul women have the inferior extremities very long, and short bodies. If Tavernier is to be credited, as soon as we pass Lahor, and the kingdom of Cashmere, the women are entirely destitute of hair, and the men have very little beard. In the kingdom of Deccan, and on the coast of Malabar, they marry their boys at ten, and their girls at eight years; and they frequently have children at this age: but these

premature women cease to conceive before thirty. Many of the Mogul women cut their skin into flowers, and paint it divers colors with the juice of roots; which renders them like flowered stuff.

The Bengalese have a more yellow complexion than the Moguls, and their women are the most lascivious of India. The great commerce of this country is, in that of male and female slaves, and of eunuchs. These people are handsome and well made, and have mild manners. The Coromandalese and the Malabars, have a very black color; they are less civilized than the Bengalese: the common people are almost naked. The Banians eat nothing that has had life; they have such an horror of murder, that they fear to kill even the least insect.

The Calicutiens are of an olive colour, and are prohibited from having more than one wife; but their women of nobility are permitted to have several husbands. It is not rare, in this country, to see mothers prostitute their daughters very young. Among the Calicutiens, we meet with whole families, whose legs are as large as the body of a man, and whose skin is hard, rough, and as if covered with warts; which prevents them from being active. The large legs is especially, very common among the *Naires*; that is to say, the nobility. We also find this deformity, but less frequent, among the inhabitants of Ceylon.

The isle of Ceylon, thickly peopled, contains two nations, different in their manners, government, and religion. The Bedas, (a kind of savages,) are established in the northern parts of the island, and in the less fertile country; they are of a pale white color, and have red hair; they are discovered with difficulty,

inasmuch as they take care to hide themselves in the thickest woods; they are divided into tribes, which obey a chief; they are in small numbers, almost naked, and have nearly the same manners and same government, as the Scotch Mountaineers; they never cook the flesh of animals which they kill with the arrow, but preserve it in honey. Honey, they have in abundance. It is very probable that the Bedas, as well as the Chacretas of Java, are of an European race. The Cingalese form a more numerous and a more powerful nation; they inhabit the southern part of Ceylon; they are black, ill formed, wear clothing, and are subject to despots; they are more civilized than the former, but are cheats, sordid, and adulators, as are all servile nations.

The Maldivese, have a considerable resemblance to the Europeans; they are well made and well proportioned, and only differ from those in their olive color. However, as the blood of the Maldivese is mixed with that of all nations, we meet with a great number of very white women among them, who are excessive libertines; they are indiscreet, unfaithful, and so lascivious, as not to find any men sufficiently vigorous: they make frequent use of the birch, and eat nothing that is not strongly seasoned. The Maldivese are polished, witty, industrious, and apply themselves to the culture of the arts, and even of sciences; which they esteem much, particularly astronomy: they are courageous, adroit at arms, and friends of order and policy.

The education of children, is one of the principal objects of legislation, in all the Maldivian islands; the mothers, of all classes, even the queens, are obliged

to nurse their children; they do not envelope them with swaddling clothes, and deformed persons are not seen amongst them. At the age of nine months, they begin to walk. They receive the Mahometan circumcision at seven years, at nine they are put to the studies and exercises of the country. Goa is the principal establishment of the Portuguese in the Indies. A great commerce of slavery was formerly carried on there; they bought women who knew how to play on instruments, sew and embroider, from all the Indian countries; amongst whom were found whites, olive colored, brown, in a word, of all colors. The Indians are very much given to the pleasures of love; they prefer the Cape and Mosambique girls; who are black. The sweat of these people has not a bad smell; in this respect, they differ from the negroes of Africa; the smell of whom, especially when warm, is similar to that of green leeks. The Indians prefer Europeans to natives.

The principal religion is that of Brahma. It is probable that it is this country, (where the double empire of good and evil are, in some degree, only separated by a rampart of mountains, from whence the islanders of Ceylon, in looking towards the equator in the two equinoxial seasons, see alternately, the sea agitated by tempests on the right, and a perfect calm on the left,) which has given rise to the dogma of the two principles of good and evil of *Oramasus* and *Arismanus*—such is the connexion of the physical with the moral laws, that climate has diffused every where the foundation of the systems whose objects are important to happiness.

Polygamy is permitted by all the religions of Asia,

and the plurality of husbands is tolerated in some places. In the kingdoms of Bootan and Thibet, a single woman is frequently common to a whole family, without jealousy or domestic troubles resulting from it. Here the religion and the laws are in relation to the climate, for more girls than boys are born; the contrary is the case in the cold countries of Asia.

India, is the most favored climate of nature; but we only find in it people, who are slothful and abased by bondage, who, without greatness of soul, vegetate under the most delightful heavens, and whose strength is not sufficient to contend with a handful of Europeans. The Indians have no strength of character, they only have the spirit of commerce; they love money, but have not the courage to defend it; borne down under the yoke of bondage, and brutalized by the most humiliating despotism, they are the most vile, and most contemptible of nations.

The most neighboring nation to the Moguls, are the Persians; consequently, we do not remark a very great difference between them, especially on the south side; nevertheless, their blood is mixed with that of the Georgians and Circassians. It is principally in the two latter nations, that nature has been pleased to form the most beautiful persons. Almost all the men of quality in Persia, are born of Georgian or Circassian mothers; were it not for that, originals of Tartary, they would be the most homely men. The merchants bring a multitude of handsome women, of all colors, into Persia; the white they get from Poland, Muscovy, Circassia, Georgia, and the frontiers of Grand Tartary; the brown, from the Mogul lands,

the kingdom of Galconda and Visiapour; and the blacks from the coast of Melinda, and from the Red Sea.

The Persians are of a fine stature, and are generally corpulent: their complexion of a white olive; however, the Schirassiens, the inhabitants of Candahar, and all those who are adjacent to India, incline toward the blackish; they have black hair and eye brows, forehead high and prominent, eyes black or blue, aquiline nose, full cheeks, a large chin, and long visage; the ears are pendant, owing to the weight of their turbans, which they always wear; their legs are more or less crooked, owing to their manner of sitting; their usage is to squat, and to rest all the weight of their body on their legs, which they contract, so as to make their heels touch their bottoms.

To the friend of humanity, the Persians present the most sad spectacle—he there sees inhabitants dispersed in the vast regions, infested with robbers, and some tyrants who, sword in hand, contend for towns in ashes, and the fields that they have ravaged.

The Persians are, nevertheless, civil, but vain, flatterers and hypocrites; they are naturally strong, vigorous and warlike; they enjoy good health, and notwithstanding their turbulent and dissolute life, they arrive to a very advanced age. The inhabitants of Ghilan and Mazandran, who live in a very low and flat country, are subject to intermittent fevers, deafness, vertigo, and to swellings. Nearly all the Persians have to combat, during the most of their lives, diseases of the eyes, and even the cataract; they are also very subject to the hemorrhoids, bilious fevers, and jaundice; the latter may be regarded as an epi-

demic disease in Persia: no other extraordinary disease ever prevails in Persia. The nations of this country, Turkey, Arabia, Egypt and Barbary, may be considered as one and the same, since Mahomet and his successors have invaded their territory. These mixed people, subjected to the same government, and performing the same worship, resemble one another in their traits and manners. The princesses and Arabian ladies, who are almost always in their apartments, are white, very handsome, and well made; but the common women, who are tanned by the heat of the sun, are black or brown, and paint their skin of divers colors.

The greater part of these nations present the greatest example of degradation, to which the human species can be susceptible, and commit outrages against nature, in the organs which serve for reproduction; their gloomy and restless jealousy, deprives them of all confidence in the virtue of their women; these are put under the guard and oversight of those sexless beings, whose name alone excites horror.

Luxury has caused the same crime to be committed in modern Italy; and many a musician here has acquired an unnatural voice, but at the expense of the population.

Infibulation is a custom at Pegu, and in some Asiatic countries, as well as in Ethiopia; they there secure the continence of the sex by means of a ring; that of the girls, can be removed only by a cruel operation; that of the women has a lock, whose key is carried by the husbands. The Italians also, practice infibulation; in a less barbarous manner in fact, but not less injurious to the sex. In some parts of Asia

we meet with *Santons*, *Faquirs*, and *Bonzes*, who infibulate themselves, to exhibit to the people a presumptuous and useless continence; they load the viril member with a large and heavy circle of iron, and thus deprive themselves of the faculty of giving life, in order to acquire the right of tyrannizing and persecuting their fellow-citizens. Some Indians also, infibulate themselves with a strip of bark; doubtless to please their priests, and to participate in their false glory.

Amongst the most of these nations, as well as amongst the Jews, circumcision is an act of religion. It has indubitably taken its origin between the equator and the thirtieth degree of the northern latitude; consequently this vast portion of the globe contains at present more circumcised people, than all the rest of the inhabited earth. There are scarcely any amongst the Siamese, Tonquinese, Pugeans, and the Chinese, spread in these latitudes, who are not circumcised. In Ethiopia, in some countries of India, but especially in Egypt, about the age of thirty, the women undergo a kind of circumcision, the excission of the nymphia, a barbarous operation invented by superstition, which frequently occasions death. A not less atrocious custom is that established in the island of Formosa. In this place the women are not permitted to bear children at their full term, before the age of thirty-five years. When they become pregnant before this period, which is fixed by the ministers of worship, a priestess conducts them to the temple, where they trample them under foot, and make them miscarry; and it is not until after repeated similar murders, that they are permitted to become mothers.

In general, a great difference is not remarkable between the citizens, who inhabit the country from the twentieth to the thirtieth degree of latitude, north of the ancient continent. They are more or less brown or swarthy, pretty handsome, and well made. The varieties that are met with, depend upon the temperature of the climate, and the people intermixing with others towards the north. Those who inhabit a temperate country, such as those of the northern provinces of Mogul and Persia, as the Armenians, Turks, Georgians, Mingrelians, Circassians, Greeks, and different nations of Europe, are the most handsome, whitest, and best proportioned men of the earth. The Georgians owe much of their beauty to the inhabitants of Cashmere, here the women combine the graces with beauty. The men are not so handsome; they are witty, but great drunkards and libertines. The king and the great men choose their concubines from among the Georgians, and they are prohibited trafficking in them, except it be in Persia, for the Ottoman seraglio. In Georgia the noblemen perform the infamous function of executioners; and the wantonness of the daughters is the most flattering and honorable circumstances to families of this country.

The Circassians are very handsome and very white; they have very small eye-brows. During summer the common women only wear a single colored chemise, open half way down their body; they have a very handsome bosom, and are very free with strangers.

The people of Mingrelia, formerly Calchida, are not less beautiful than the Georgians and Circassians; these three nations appear to be but one. The Min-

grelians believe in dreams, they hold this superstition from the Egyptians, from whom they descended, according to the relation of Diodorus Siculus; they have a barbarous charity towards their sick parents; when these are extremely ill, they withdraw every thing from under their head, and, let it remain hanging without any support, and they very soon expire. Another atrocity which widows, pregnant by their first husbands, commit, is to bury alive the child that is not provided for. The indigent exercise this cruelty, when it is impossible that they can give bread to their children.

The Mingrelians are very well made; they have a majestic air, charming traits, an admirable stature, and very engaging looks; they caress all those who cast their eyes upon them, and endeavor to inspire them with desires, in order to satisfy them. The husbands are neither troublesome nor jealous. When a husband surprises his wife in a flagrant crime, he exacts no other vengeance, than to make her gallant pay a hog, which they eat together with the spouse. They have many women and concubines, and may sell and exchange the children which they have by them.

The Turks are a mixed people, and are generally very robust; both sexes are handsome and well proportioned. But the Greek women excel those of Turkey for beauty and vivacity; they also enjoy a greater liberty.

The Greeks, Neapolitans, Sicilians, Corsicans, Sardinians, and the Spaniards, differ but little from one another; they are placed very nearly under the same parallel; they are browner than the French,

English, and other less southern nations. In travelling from France to Spain, we scarcely arrive at Bayonne, before we perceive a great difference in the color; here the complexion is browner and the women have more brilliant eyes.

Africa is inhabited by numerous nations of different origin, whose exterior qualities are quite dissimilar. In these nations and those of Asia, there are amongst others, two, the Egyptians and Syrians, which have become better known from the learned Savary and Volney, and the expedition of Bonaparte, than they were formerly; and the information thus acquired, merits the attention of philosophers, because it is from these countries, that are derived the most of the opinions, which the greater part of Europe has embraced, as well as the religious ideas, which have so powerfully influenced our morals, our laws, and our social state.

The climate of Egypt is very warm; the thermometer of Reaumer, from the end of July to the commencement of September, stood at twenty-four and twenty-five degrees above zero, in the most temperate apartments; this excessive heat is not entirely owing to the powerful action of the sun, since other countries in the same latitude, are less so, but to the ground being but little elevated above the sea. Thus the Egyptians are, in summer, in an almost continual state of sweat. With such a heat, and a marshy state of the soil, which lasts three months, we would suppose Egypt to be an unhealthy country; but experience proves the contrary, and the inhabitants live to be old. "The emanations of stagnant water," says

Volney,\* “so destructive in Cyprus and at Alexandria, have not this effect in Egypt. To me the reason appears to be owing to the habitual dryness of the air, established by the proximity of both Africa and Arabia, which incessantly aspires the moisture; and also to the habitual currents of winds, which circulate without obstruction; this dryness is such, that meats exposed even in summer to the north wind, does not putrify, but dry and harden equal to wood. The deserts furnish carcasses thus dried, which have become so light, that a man can easily raise with one hand the entire carcase of a camel.

However, the air upon the coast is infinitely less dry, than that of the interior of the country. At Alexandria and Rosetto, one cannot expose iron twenty-eight hours in the air, without its being entirely rusted. Natron is very abundant in Egypt; the stones are red with it, and long crystallized needles are found in most places. Vegetation is incredibly active, and the development of plants performed with a prodigious rapidity; but exotic plants very soon degenerate in this country. Animals are very fruitful, and the women, who are excessively given to the pleasures of love, frequently have two children at a birth.

The Nile runs through Egypt from south to north, and fertilizes this country by the mud or slime, that its regular and annual overflowing deposits.

Egypt is, in common with all countries, watered by large rivers, such as the Ganges, Indus, &c. subject to overflowings; that of the Nile takes place about

\* Voyage in Syria and Egypt, tom. i. p. 63, 64.

the end of June, and continues until the end of September. The year is well commenced, when it rises twenty-four feet; then the inhabitants rejoice. When it exceeds this height, the year is bad, because the water remains too long upon the ground, and requires too much time to flow off; not leaving sufficient time for the sowing and gathering of the grain. If it does not rise to six feet, there is also a scarcity, because it does not cover a sufficient extent of country, and leaves a part of the ground without enriching it; when this is the case, the Egyptians are exempt from duties. The periodical overflowing of the Nile, is owing to the regular and constant winds which, blowing from north to south, accumulate the vapors of the Mediterranean; these are converted into clouds upon the lunar mountains at the environs of the line, and in Abyssinia, where they dissolve into abundant rains.

The population of Egypt may be distinguished into four principal races of inhabitants; the first and most considerable is that of the Arabs, which may be divided into two classes, the settled and wandering; both of these came from divers parts of Arabia, and have preserved their original physiognomy; they have a tall stature, muscular and robust bodies, their skin, burnt by the sun, is almost black, but their visage is by no means disagreeable.

The second race is that of the Copts; these descend from the ancient Egyptians; they have a yellow and smoky skin, bloated visage, swollen eyes, flat nose, thick lips, in a word, the true figure of a mulatto; but the ancient Egyptians, according to the report of Herodotus, had a black skin and crisped

hair; that is to say, they were really negroes, of the species of all the natives of Africa. This explains how these people, allied for several centuries to the Romans and Greeks, have lost the intensity of their primitive color, preserving the impression of the original mould. It is thus that the space of nine centuries has not been able to efface the shade which distinguishes the inhabitants of Gaul from those men of the north, who, under Charles the fat, came to occupy the province formerly called Normandy. One is astonished at the paternal resemblance of the inhabitants of this country with the Danes; preserved, notwithstanding the length of time and distance of places.

A third race of the inhabitants of Egypt, is that of the Turks, formerly known among the Greeks under the name of Parthians, Massagates, and even Scythians, whose spirit in modern times is, according to Volney, to destroy the labors of the past with the hope of the future, because, in the barbarity of an ignorant despotism, there is no futurity.

Finally, the fourth race is that of the Mamalukes, originals of Asia; with whom the Tartars composed a militia about the year 1230, which they introduced into Egypt, and who from slaves, became despots for several centuries, arbitrarily governing the whole country. The Mamalukes, as well as the Ottomans, did not perpetuate their species, a family of them did not exist in the second generation; all their children perished in the first or second age: the Ottomans were only able to perpetuate their species by marrying indigenous women; which the Mamalukes have always

disdained—their women, like themselves, are slaves transported from Georgia, Mingrelia, &c.

The Egyptians are frequently affected with diseased eyes; and blindness is so common, that of an hundred persons we meet, twenty of them are blind, ten one-eyed, and twenty others whose eyes are red, purulent, or blemished: almost all of them wear bandages, indicative of the commencement or termination of inflamed eyes.

The ophthalmia, or inflammation of the eye, which is epidemic, attacks particularly the common people. It is not so general in Syria; here, the inhabitants of the sea coasts alone, are subject to it. It appears, that it is principally owing to the irritating quality of the air of these countries; which, especially, communicates its action to the organs of sight.

Many of the cases of blindness in Egypt, are also in consequence of the small pox; which is very fatal and badly treated; inoculation is nevertheless known, but not much used.

A very common disease at Cairo, is the syphilis; which is with difficulty cured. The treatment by mercury is, ordinarily, unsuccessful; the vegetable sudorifics are more successful, without being infallible; but the virus is less active in consequence of the transpirations, which is excessive; and we see here, as in Spain, old people with it until their eightieth year; however, it is fatal to children who are born infected, and to those who carry it into cold countries. In Syria, at Damascus, and in the mountains, it is more dangerous, because the winter is more rigorous in these places.

A particular inconvenience at Egypt, is an eruption of red, burning pustles, with which the body is covered in July and August, and which is thought to be owing to the bad quality of the water of the Nile; which becomes corrupted by the end of May, and which is drank by the inhabitants; this eruption is always a salutary depuration.

A still more extensive affection at Cairo, is a swelling of the testicles, which frequently degenerates into an enormous hydrocele; the Greeks and Copts are the most subject to this disease; and it appears to depend upon the immediate use of oils and the warm bath. During spring, which is in Egypt, the summer of our climates, remittent bilious fevers prevail, and sometimes become epidemic. The best method of treating them is to give kino in doses of from two to three ounces, in the remission; abstinence from meat, fish, and especially eggs, which is a species of poison in this country, is essential, and the use of acids and vegetable aliments is salutary. Bleeding is almost always pernicious here, as well as in warm countries where the temperament, as well as the diseases, are generally bilious.

The plague is not an original of Egypt, as has been asserted, its true source is Constantinople; where it is perpetuated by the blind negligence of the Turks, and thence is propagated into Egypt, where it makes frightful ravages every fourth or fifth year. It prevails at Constantinople in summer, in consequence of the heat and moisture, and ceases in winter, owing to the cold, which is rigorous; the contrary is the case in Egypt; here, winter foment the plague, because it is hot and dry. It is not so prevalent in

**Syria.** The fanaticism and barbarism of the government, have hitherto prevented the Turks from taking precautions against this destructive evil, the germ of which, it would be impossible entirely to stifle.

Syria, situated in Asia, borders on Egypt; from which it is separated by the isthmus of Suez. This country is, in some measure, only a chain of mountains, the highest of which is Libanus; the south of Syria, that is to say, the basin of Jordan, is a country of volcanoes, the eruptions of which have ceased, but which still, sometimes, give place to earthquakes. The bituminous and sulphureous sources of the Asphaltic lake, the lava, the pumice-stone thrown upon its borders, and the warm bath of Tabaria, prove that this valley has been the focus of a fire, which is not yet extinct; clouds of smoke frequently issue from the lake, and new crevices are made upon its banks every day.

Syria partakes with Egypt, Persia, and almost all the south of Asia, of a formidable plague—clouds of locusts; which darken the heavens, and which, when they alight, cover the earth for the space of several leagues. Happily this plague does not occur very often, for it brings on pestilential diseases, which devastate the country. It is remarked that the locusts only appear at the end of very mild winters, and that they always come from the deserts of Arabia. The inhabitants endeavour to preserve themselves by opposing them with torrents of smoke; but there are two more efficacious agents against these insects, which are the south and south-east winds that drive them up the Mediterranean, and the birds called *Sa-marmar*, which make a continual war with them.

In Syria there are two general climates, the one very warm, which is that of the coast of the interior plains; the other temperate and similar to ours, which is in the mountains. The Syrians, as well as the Egyptians, are subject to revolutions that have mixed the races. They may be divided into three principal classes: 1. The posterity of the people conquered by the Greeks of the lower empire; 2. That of the conquering Arabs; 3. The present predominant people, the Ottoman Turks. All the races naturalize themselves equally well in Syria, and preserve themselves there without any other alterations than those that result from the nature of the climate; consequently, the inhabitants of the plains of the south, are browner than those of the north, and these much more so than the mountaineers. In Libanus and the country of the Druses, the complexion is the same as that of the inhabitants of the southern departments of France: the women of Damascus and Tripoli, are boasted of for the whiteness and regularity of their features.

The Syrians are, in general, of a middle stature; we meet with, in either sex, but few crooked or deformed. They have no particular disease but the eruptions of Aleppo; the other diseases are dysenteries, continued bilious, remittent and intermittent fevers: the small pox is sometimes very fatal in this country. Bleeding is rarely useful in these diseases; but mild vomits, purges, and acids, as tamarinds, cream of tartar, &c. are frequently used to advantage.

Now if we take a cursory view of Barbary, we shall see that the mountaineers are white, whilst those who inhabit the maritime coasts and the plains, are

swarthy or brown; this is owing to the high situation producing the same effect that several degrees of latitude does. If we observe the inhabitants of Africa beyond the tropics, we shall find from the Red sea to the ocean, species of Moors so black, that they would be taken for negroes; the first occupy the north of the Senegal river, and the negroes the south. Scarcely any but mulattoes, are seen in Cape Verd; and these are probably the offspring of the Portuguese that were first established there, and who have mixed with the negroes. They have been called the copper colored negroes, because they are yellowish, and have preserved the traits of the negroes. The negroes of Senegal, who live near the river Gambia, are very black, handsome, and well made; their women are also very handsome, and very fond of the whites, and their sweat is slightly foetid. The negroes of the island of Goree, and of the coast of Cape Verd, are of a very deep black; they are well proportioned and have as great a contempt for other negroes who are not so black as they are, as we have for the tawny. They are passionately fond of brandy, with which they frequently get drunk; to obtain it they will sell their children, parents, and even themselves. These negroes are in the custom of engraving upon their bodies with a sharp stone, the figures of the flowers and animals of their country. This fashion is in vogue in many countries; we find it established in Hindostan, Sierra Leone, in the island of Formosa, and in the Floridas. A great number of the Arabs, also, work flowers in and paint their skin, into which they introduce colors by means of a needle.

The women of Tunis engrave initials in the skin, by means of a lancet and vitriol.

The negroes of Guinea, notwithstanding they have good health, rarely arrive to a great age; they are decrepid at the age of forty years. The premature use of women shorten their lives: in this country it is rare to find girls who can remember when they lost their virginity.

The negroes have features peculiar to themselves, and which represents that state of contraction that the visage assumes when it is struck by a vivid light, and a strong reverberation of heat; the features of the whites are, on the contrary, lengthened, the eyes more prominent, and the whole countenance more open. The negroes have round eyes, a flat nose, big features, thick lips, and wool instead of hair; the skull is twice as thick as that of the whites, their bones are more solid and their flesh more dense, they have very large navels, and their increase is prodigious. Their intelligence is very limited, and it does not appear that their minds are capable of great improvement.\*

The negroes are a race of men but little extended, they are only met with in excessively warm countries; there are none of them beyond the bounds of the torrid zone, and they do not constitute the twentieth part of the human species; their number is to that of the whites and browns, as 1 to 23.

The little negroes, just born, are almost white; except at the extremity of the nails a blackish fillet is

\* Many facts might be adduced to prove that the minds of the blacks are as capable of improvement as those of any other nation. In our country they acquire learning with a prodigious facility. We indulge the pleasing hope, that the day is fast approaching, when degraded Africa, &c. will shine forth in the splendor of the blessed fruits of civilization, science and religion.—*Tr.*

perceived, and at the scrotum, or end of the glands penis, a black spot. They remain white the first eight days; it is not until this period that the skin begins to turn brown.

Nature observes the following order in the four mixed generations: 1. From a negro with a white woman, a half black, with long hair; 2. From a mulatto and a white results the tawny quarteroon, with long hair; 3. From the quarteroon and a white, a kind of octovan, less tawny than the father; 4. From the octovan and white, an infant perfectly white.

There are four filiations in an inverse sense, from the white to the black: 1. From a white man and a negress, a kind of mulatto, with long hair; 2. From the mulatto and negress, the quarteroon, who is three-fourths black; 3. From the quarteroon and the negress, the octovan, who is seven eighths black; 4. Lastly, from this octovan and the negress is born a real negroe, with crisped hair.

There also exists individual issues of black or olive negroes, to which the name of *Albinos*, *Blafards*, and the improper one of *white negroes*, have been given; they are neither a race nor species of men; the milk-white color of their skin, is owing to such accidental causes as have, in an especial manner, derogated from the primitive, plain, and common law of nature. The *Albinos* are regarded, in their country, as rare and sacred beings. The sovereigns of Africa and the Indies, always support a certain number of them with the greatest magnificence, in the enclosure of their palaces.

We cannot better compare these unfortunate beings, the refuse of nature, as to their mental faculties and

degradation, than to the numerous *Cretins of Valais*. These are deaf, dumb, idiots, almost insensible to blows, and have goitres (swelled necks) of considerable size, which descend as far as their middle; they are neither furious nor mischievous, but absolutely foolish and incapable of thinking; they only experience the sense of physical wants, and are passionately fond of all the pleasures of the senses. The inhabitants of the *Valais* regard these *Cretins* as saints and tutelary angels; those who have not them in their families, think themselves seriously at variance with heaven. The *Cretins* have a very livid skin; they are born stupid and imbecile, and remain so until death, unless a remedy can be administered to their physical and moral state. Such is also the case of the *Blafards*, whose stupidity is equal to that of the *Cretins*, and if they are not entirely deprived of the gift of speech, they are so much the more maltreated, as regards the senses of sight and hearing. These persons are condemned by the structure of their eyes, to shun the light like owls. They are very weak; their height rarely exceeds four feet five inches; their complexion is of a pale white, the color of linen or white wax, without any shade of carnation or red; small grey lenticular spots are sometimes distinguished on them; they have no beard; in Africa their hair is woolly and frizzled, in Asia long and straight; their eye brows and lashes are silken, and their eyes are formed like those of partridges. These unhappy beings terminate their sad career at the age of thirty years, having merely existed, not lived; they are principally met with about the centre of Africa, at the

extremity of southern Asia, in the isles of the south, and at Darien, in the new world.

Let us observe that the deafness or weakness of hearing, is only the effect of the dazzling whiteness, which distinguishes the Albinos. It has been remarked, that very white dogs and the shining white cats of Angola, scarcely hear any sound. It is very probable, that the naturalists of the north will one day perceive that the hearing diminishes in animals of their climates, during excessive cold weather, a period when they are the whitest.

We should not confound the Blafards or Albinos with the negroes, who become white by accidental causes. The negroes are subject to a disease, which deprives them, in part, of their natural blackness, and which is accompanied with hideous symptoms. It is a species of white jaundice, in which there still remains some traces of a yellowish black at the root of the nails; the body swells, and some livid spots are distinguished upon the skin; the iris is diseased and becomes overcast. When the disease is not inveterate, they are easily cured by eating of serpents and adders; then their body resumes its natural color, if not, they die about the age of thirty years.

We know but little of the people who inhabit the interior coast of Africa, from Cape Negro to Cape Volta. All we know of the Caffres, who inhabit a part of southern Africa, is, that they are not near so black as the negroes, and that they form different nations. Nearly all of them are cruel and barbarous. Hitherto we have not been able to make satisfactory observations, relative to the inhabitants of *Terra*

*de Natal*, and the Hottentots of the Cape of Good Hope.

The different people who inhabit *Terra de Natal*, which constitutes part of Caffraria, live together in small villages, and are governed by the most aged among them; they are affable and hospitable; their principal occupation is agriculture, and the rearing of cows and goats, of which they take great care; they live upon bread and meat, and make use of milk a little sour, for their ordinary drink; they are swarthy, and have crisped or frizzled hair.

The Hottentots are well made and well proportioned; they, like the negroes, have large eyes, a flat nose, thick lips, and short wooly hair, but they are of an olive color. These people are robust, industrious, active, and of a surprising swiftness. They have an inconceivable address in the management of arms. With their zagies (kind of half lance) they fend off darts and stones. They have been accused, without foundation, of laziness and drunkenness, but they have pure and mild manners. The Hottentots who are adjacent to the Caffres, are wanderers, slovenly, and lead a savage life. Like the Madagascars,\* they have no worship, no idea of the divinity; notwithstanding, they are hospitable, humane, and have much good faith.

The women are much smaller than the men. That they have naturally a long apron of skin descending down their thighs, as has been asserted, is not the fact.

\* It has been remarked that the old people are highly esteemed among the different nations who people the island of Madagasear. It is these who administer justice and who are charged with the support of the laws and customs.

The Hottentots are mostly shepherds or huntsmen; they are frequently at war, and like the Swiss, treat with their neighbors to go to their defence. Formerly they were in the custom of cutting off a joint of the finger, when they lost one of their relations, so that one might know by the inspection of their fingers, the number of deaths in a family; this custom was also established in Paraguay, and in California; it still exists among the Guaranese.

The Hottentots regard the acts of thinking and reflecting as the plague of life. *So do the Hottentots amongst us!* These people are very lazy; their women do almost every thing; the men pass the greater part of their time in sleeping or resting upon their hammocks. If one would buy their bed, they would sell it in the morning, without thinking they would want it the following night.

If we extend our views to the different countries of America, we shall there find, in the most northern parts, as has been already remarked, people similar to those of the countries north of Europe and Asia. The savages who inhabit the straits of Davis, are of an olive color, very homely, low, but very robust, and have short and big legs; they live long, and many of them attain the hundredth year; they have the color, figure, and manners of the Laplanders. As we find near the Laplanders, the Finese, who are white, handsome, pretty large and well made, so do we find near the straits of Davis, a species of white men, resembling the Finese. We afterwards meet with, in Hudson's bay, hairy men, similar to the savages of Jago; and lastly those of Canada and the whole of Terra Firma, who resemble the Tartars in

so many places, that we could scarcely doubt their having descended from them, if we were not very much embarrassed respecting the possibility of the migration.

If we stop to take a view of the Iroquois and the Hurons, savage nations of North America, in the interior of Canada, we shall there find a barbarous custom, which makes nature shudder; it is that of killing their parents, who are too weak to follow them a hunting or in their military expeditions, for fear that they will die with hunger, or by the arms of their enemies; they think they do an act of filial piety, by obeying the wishes of the authors of their days, who demand death of them as a favor; and they do not think they can give them a more honorable sepulchre than their entrails. These people are of a high stature, olive color, polygamists, cruel, and live in society.

The savages of Florida, Mississippi, and the southern parts of the continent of North America, are pretty well made, and more swarthy than those of Canada; they are of an olive color, inclining to red, which is, in a great degree, owing to the rocou with which they rub themselves; they are almost naked, and very valiant, but ferocious; they immolate the men which they take in war to the sun, after which they devour them.

The Natchese and the savages of Louisiana are large and corpulent; they have a very long nose, and an arched chin. When a noble woman, whom they think is of the race of the sun, dies, they slaughter twelve small children and fourteen

adults, whom they inter with her;\* and they put in their common graves the kitchen utensils, war arms, and the entire equipage of a toilette.

Louisiana is very damp and marshy; the inhabitants are much exposed to malignant remittent, and intermittent fevers, which do not cease until the north winds begins to blow in November. The tetanus or locked-jaw is very prevalent there, especially amongst young children; the diseases occasioned by worms of every species, and even the tape-worm is very common, and persons of every age are very subject to them. The small-pox appears in this country at certain periods, and makes great ravages, as well among the whites as the Indians and negroes. Affections of the breast, such as spitting of blood, and the phthisis pulmonalis or consumption are also very frequent.

California, a very large peninsula of North America, presents in general a climate warm and dry to excess. Its ground is naked, stoney, mountainous, sandy, and is very sterile. Among the small number of trees that grow there, the most useful is the *pitahaya*, whose fruit is the principal nourishment of the inhabitants.

The Californians are well made, and very robust, but in general inconstant, pusillanimous, lazy, stupid, and even insensible; they are children in whom reason has not yet developed itself; they are more swarthy than the Mexicans, who are notwithstanding, under the torrid zone; this deeper color is no doubt

\* For the sake of humanity, I hope this is merely a fabrication by travellers, who delight in degrading the natural state of man. From the contiguity of those nations to us, and from the knowledge we have of their history, we doubt the correctness of the imputation.—*Tr.*

owing to the fat and other substances, with which they anoint their bodies.

The Caribbees are of the peninsulas of the windward Antilles, which are concentrated into Dominique and Saint Vincent. These people, like the Omaguas, have the head flattened in a very deformed manner. It is pretended that the parents are in the habit of compressing the head of the new born child between two planks, in order to make it resemble the full moon. This same usage is found among the Omaguas. The Caribbees paint the body with the oil of rocou, which gives them the color of cooked crabs.

It is thought that this custom, established among almost all savage nations, of painting the skin, is intended to guard them against the sting of insects, with which their country abounds. The Caribbees have black hair, but not crisped nor frizzled, and they wear it short; they have no beard, and are not hairy; they have black, large, and prominent eyes, and a wild look. They go naked, and are not less ashamed of a vestment, than an European would be to be naked. Let us observe that if the most of the savages cover the sexual parts, it is less the effect of bashfulness, than a fear of wounding and tearing the delicate and sensible organs in traversing the woods. The Caribbees have a very offensive smell; their intellect is very contracted. The men disdain to eat with the women, and only use them to gratify their wants. When a woman is brought to bed, so soon as she is delivered, she gets up to attend to the cares of the family; the husband takes her place, and remains in bed a whole month, without drinking or eat-

ing the ten first days; at the end of the month, the relations and friends come to visit the pretended sick; they make incisions in his skin, and bleed him in every part, without his daring to complain. A custom a little similar has been and still is in vogue in the province formerly called Bearn; it is what the inhabitants of the country call *making a lying-in*. But there is this difference, that instead of tormenting the husband, they treat him very mildly, and make him take restorative aliments. It appears that this whimsical custom has become extinct in Spain, where it prevailed in the time of Strabo.

The Caribbees live very long, they worship the moon, are frequently at war, and make use of arrows poisoned with the juice of the *mancelinier*.

The interior of South America is inhabited by a multitude of savage nations, who are cruel, vindictive, always at war amongst themselves, and almost all cannibals. The Brazilians are correctly considered the most barbarous; in height they resemble the Europeans, but are more robust, and less subject to diseases; they have but few lame or deformed; their complexion is that of the Spaniards and Portuguese; they paint their skin divers colors—have a flat nose; the first care of the father, at the birth of his child, is to render it this service. Both sexes are almost always naked, with the exception of days of feasts, and when they are at war.

The Brazilians, although they have the most decided taste for human flesh, only eat those of their enemies who fall alive into their hands; they do not touch the dead, nor the dying extended upon the field of battle: they are very hospitable. Although poly-

gamists, they have an horror for adultery; they enjoy the liberty of divorce. They live by fishing and hunting, and cultivate the *alpy*, potatoe and the *maniac*; whose roots also serve them, as well as most of the South Americans, for nourishment.

The Brazilians, like most savages, do not manifest any attachment for the place of their birth; they live a wandering and vagabond life, and see no country where they cannot subsist. The love of country, which exalts the mind in good governments, and passes into a habit in bad ones; which preserves to each nation its character, its usages, and its tastes, is a fictitious sentiment which originates in society, but is unknown in a state of nature. The course of the moral life of savages, is entirely opposed to that of civilized men; the latter enjoy the kindness of nature only in the first age, the former enjoy it in every period of life; they find a sufficiency every where to satisfy their physical wants, which are the only ones they know, and their country is every where.

The Peruvians are, like the inhabitants of the isthmus of Darien, copper colored; especially those who inhabit the borders of the sea and the low ground. Those, on the contrary, who remain in high countries, as between the two chains of the Cordilleras, are almost as white as the Europeans, while the natives of Terra Firma, situated near the river Amazon, and in the continent of Guiana, are swarthy and of a reddish color, differently shaded. These divers shades, as has been said by Condamine, are principally owing to the different temperature of the several countries which they inhabit, varying from the great heat of the torrid zone, to the cold which is experienced in the vicinity of snow.

It is the diversity of temperature that renders the inhabitants of the high parts of Peru and those of the low country, so dissimilar. Persons of the most elevated countries are subject to asthma, inflammations of the breast and rheumatism. These diseases are dangerous and even mortal, to those who are already affected with the venereal disease, or who make use of strong liquors. Others, who inhabit the inferior mountains, are exposed to remittent and intermittent bilious fevers, which are very contagious. The small pox, also, is in all these countries, the cause of inexpressible ravages.

Peru is very subject to earthquakes, which are almost habitual; this terrible evil is the effect of the volcanoes, which are very numerous. The high parts of that country offer variations of temperature which are experienced the same day, sometimes the same hour, and always in a very short time, as great as those of the most opposite zones. Those who go there from the vallies, feel, on their arrival, so piercing a cold, as to prevent its effects either by fire or clothing; but it ceases to be disagreeable after a residence of twenty or thirty days. Those who go there for the first time, are more or less tormented with seasickness, similar to what they would suffer upon the ocean.

In the vallies, although near the equator, there prevails the most delightful temperature, and the four seasons of the year are sensibly marked, without being inconvenient; that of winter is the most distinct and the most constant, although under the torrid zone; it only rains there every two or three years.

The inhabitants of Paraguay, thus called from the

name of a great river that waters the country, are pretty tall; they have a long visage, and are of an olive color. They are subject to a kind of leprosy, which covers the whole body, and forms crusts on it similar to the scales of fish; but this inconvenience does not cause them any pain or disarrangement in health.

The climate of Chili is the most agreeable temperature of the two hemispheres; this country is situated under a sky which is always pure and serene. Its soil is extremely productive and fertile; its inhabitants are of a swarthy color, inclining to that of a red copper, like that of the Peruvians. In general, in all South America, the people are of a reddish yellow. The inhabitants of Chili are of a fine stature; they have large members, large breasts, tolerably pleasant visage, but without beard; small eyes, long ears, hair black, flat, and as thick as horse hair; the most of them go naked, notwithstanding the country is cold; they only wear the skins of animals upon their shoulders.\*

It is at the extremity of Chili, toward *Terra Magellanica*, that it is pretended a race of men are found called Patagonians, whose gigantic height is from nine to ten feet; but if they really exist, which is very doubtful, their number is small, and they do not constitute a particular nation, for the inhabitants near the

\* Since this work was written, great changes have taken place in Spanish America; the wilderness is becoming a fruitful field, and many of the districts which were only peopled with savages, are now inhabited by civilized man. This is still more the case in respect to several of the districts of North America. At present Spanish America is a scene of much interest; the commissioners sent out by our government, have given us much important information respecting South America, and especially Chili.—*Tr.*

straits of the neighboring islands, are savages of a middle height, who resemble the other Americans in their olive color, and black, flat hair.

Properly speaking, we find in the new world but a single race of men, more or less swarthy, according to the divers climates which they inhabit; if we except North America, whose inhabitants differ but little from the Laplanders, and some others with light hair, who resemble the northern Europeans, we only see men very nearly alike in all the rest of this vast continent, whilst the nations of the old world offer a very great number of varieties. This uniformity is owing to their all living in the same manner, to the seasons being similar, and to the temperature being constantly at very near the same degree. All the indigenous Americans were, at the discovery of the country and are still perhaps, savages, if we except the Mexicans and Peruvians, whose civilization is still, however, very limited. The origin of all the American people is common; they all came from the same stock, and they to this day preserve almost all the characters of their primitive race.

Nature does not appear to have been kind to the aborigines of this climate; they are not very strong, are without courage, and have no beard; they are all degraded in the organs of virility, and but little sensible to the charms of love. The women, weaker than the men, are as ill treated by nature as by their husbands; the latter only see in them the instruments of their wants, and they use them less for to gratify their pleasures, than as a sacrifice to their laziness; however, although they impose upon them the labors of agriculture, they reserve to themselves the perils of

war, hunting, and fishing. That kind of infancy which is marked by the absence of the signs of virility, and by that indifference that they have for women, seems to announce them as just coming from the hands of nature, but their origin is uncertain, and there is no data by which we can establish it.

We are authorised to suppose the Americans a new people, from their limited civilization. That vast continent was very thinly peopled when first discovered; it is still covered with immense marshes, which makes the air unhealthy, although a great deal of the ground has been cleared, and the earth produces a multitude of poisons. What is surprising, we meet with many animals there whose analogies do not exist in our hemisphere, (eastern;) whence we may infer, that there has existed from time immemorial, and perhaps from the beginning of time, an insurmountable barrier between the old and new world, which has prevented the indigenous animals from passing from one continent into the other.

Respecting the colonies of the islands discovered in this century, (eighteenth,) in the South sea and in the northern continent, Byron is said to have seen in the isles of the Pacific ocean, some men armed with long pikes, which they shook with a threatening air; these men are, says he, of a swarthy color, vigorous, well proportioned, and extremely swift in the chase. In many other islands of the same sea, and especially in those called the islands of the prince of Wales, numerous colonies are found; these insulars, according to this voyager, resemble those just spoken of, in their height and the proportion of their members. Their complexion is brazen, but clear, and the traits

of the figure have nothing disagreeable in them; their hair and beard is black.

In many other islands situated beyond the equator, in this same sea, there exists, says Carteret, numerous colonies of men, the greater part of whom have woolly heads like that of the negroes, but less black than those of Guinea, and have not, like them, flat noses and big lips; these powder their hair and even their beards, white. This practice is also prevalent among the *Papous*; however, there are some of these islands inhabited by men whose heads are not woolly, and who, instead of being black, are copper colored, with but little beard, coarse and long black hair, and who are not entirely naked as the preceding; which indicates that their country is not so warm as that of the first.

The insulars of Otaheite are very large, and of a fine stature, superior to that of the Europeans; they are strong, well limbed, well made, nimble, active, and of a fine figure; their color is swarthy, they have generally black hair, but it is sometimes brown and even light; their women are very handsome and freely sell their favors in public; the men, through civility, or for recompense, offer their sisters and their daughters to strangers. The Otaheitans live to extreme old age without inconvenience, and retain the acuteness of the senses. According to the account of Bougainville, fish and vegetables are their principal nourishment; they rarely eat meat, and only drink water, they have a repugnancy for wine, strong liquors, tobacco, spices, and for all strong substances. It seems, says captain Cook, that they are of a brave character, sincere, without suspicion or perfidy, and without an incli-

nation to vengeance and cruelty; but they are addicted to theft. Among them marriage is but a contract between a man and a woman, and they practise circumcision without any motive other than that of cleanliness.

The inhabitants of the isle of Huaheine, according to the same author, resemble in their figure, language, dress and usages, those of Otaheite; from whom they are about thirty leagues distant. The men appear to be still more vigorous, and of a large stature; the women are very handsome; they live upon vegetables and viands, and all speak the same language, which is that of all the islands of the South sea, as far as New Zealand.

We have but very lately become acquainted with the northern regions; Cook has had the best opportunity of seeing them. Ferdinand de Quiros, who landed there before him, relates that the savages of *Belle Isle* differ but little from those of Otaheite in their manners; they are handsome, well made, and white, although in a climate where it seems they should be black. The women are very handsome and half dressed. The author adds, that upon the eastern coast of New Holland, to which he gives the name of *Tierra del Espiritu Santo*, he saw inhabitants of three colors; one black, another very white, with red hair and beard, and the others mulattoes; which induced him to conjecture that this country was very extensive; he was not deceived, for from the discoveries of Cook it results, that New Holland is as extensive as the whole of Europe. Cook says its inhabitants are naked, and live only upon fish. Upon the same coast, at some distance, Quiros saw another

nation of a higher stature, and of a more greyish color; these go in troops armed with arrows, which they shoot at the Spaniards, who are only able to make them withdraw by the firing of muskets.

Abel Tasman found, in the country adjacent to the bay of New Zealand, men whose voice was coarse, and who were of a large stature; they were of a brownish yellow color, and had black hair, almost as long and as thick as those of the Japanese; it was fastened to the top of the head with a feather, which was long and thick in the middle. Some of them had the middle of the body covered with mats, others with cotton linen, and others were naked.

The inhabitants of New Zealand, says Cook, have in general, a stature equal to that of the largest Europeans; they have fleshy members, strong and well proportioned, but they are not so fat as the lazy islanders of the South sea; they are alert, vigorous, and adroit; their complexion is generally brown. The women have no delicacy in their traits, their voice is very mild, and it is by it that they are distinguished from the men—each dressing alike. The Zealanders have black hair and beard, white and regular teeth, they enjoy good health and live to a great age. Their principal nourishment is fish; they are decent and modest, but not very genteel. The insulars of the South sea split the prepuce, in order that it may not cover the glands of the penis; the Zealanders, on the contrary, bring it over the glands, and tie the extremity with a cord which is fastened to their middle; the glands penis is the only part which they exhibit with extreme shame. This usage, although apparently, contrary to cleanliness, has nevertheless

the advantage of supporting the freshness and sensibility of these parts; those, in general, who have a short prepuce, lose, in the part that is uncovered, the sensibility sooner than other men.

There is a great resemblance between the inhabitants of this country, and those of the islands of the South sea, with regard to their customs and languages, which proves that all these insulars have the same origin. Cook thinks that they did not come from America, which is situated at the east of these countries; and as the language of the Otaheitiens, and the inhabitants of the other islands of the Pacific ocean, have a strong resemblance with the languages of those of southern India, it is probable that all these colonies are aborigines of Indian Archipelago.

It is, as we have already observed, upon the climate in a great measure, that the physical and moral properties of a nation depend. We remark, in general, that in all warm countries, the men are smaller, leaner, more lively, gayer, and more witty, but less vigorous and less laborious; that they arrive at manhood sooner, and that they also sooner become old, than they do in cold climates. The women are less fruitful, handsomer, but not so well shaped. A light color is as rare in these countries, as a brown one is in the north.

Beauty depends, in a great degree, upon the temperature of the climate. Cold, by contracting the exterior tissue in the female sex of the north, deprives the skin of that softness and pliancy, which are the indications of sensibility; a burning atmosphere, by causing copious sweats, dries and wrinkles the skin, enervates the constitution, and blasts beauty in its

germ. It is in the temperate zones that the most handsome men, and the most charming women are found. The nearer we approach the equator and the poles, the less lavish is nature of her favors; we there meet with a multitude of deformed and hideous beings. In certain countries these are pigmies, Albinos, in a word, colonies of men entirely degraded, and this fatal degradation extends even to vegetables; there the trees are for the most part degenerated, and the flowers perish before they are blown.

The character of a people is also closely interested by the country that they inhabit. The Caribbees, born and living in the woods, should not have the urbanity and atticism of the French; the African, enervated by the excessive warmth which he habitually endures, cannot have the strength and vigor of those nations which have been justly regarded as the nursery of the human species.

Let us admit, nevertheless, that the heat of a climate is not the only cause of the inertia and indolence of its inhabitants; the fertility of the soil does not contribute less to the production of this disposition or effect. In fact, if the savage of the north is more active than the African and the Caribbee, it is because these, for whom nature does every thing, have no need of such great industry. Ignorance and stupidity flow from the same source. In Africa and America, which are the nations whose faculties of mind are the least developed? They are the inhabitants of these forests, the trees of which administer without culture to their wants. Have we not seen that prosperity blunts the spirit of a nation, the same

as affliction renders it more acute and enlightens it, but brutalizes it when it becomes excessive?

The passions, as well as the genius, are closely dependent on climates. Love, for example, is in warm countries, as has been well observed by De Seze, a delirium, a burning fever, a cry of nature; in temperate climates, it is a mild passion, a sentimental affection, and frequently the creature of education; lastly, in cold countries, it is not a passion, but the tranquil sentiment of a not very urgent want.

It is in temperate climates, that genius seems to have fixed her empire; climates of this description have been the cradle of the sciences and arts, necessary to the civilization and prosperity of nations. It is not the same in the torrid and frozen zones, which, to judge from the negroes and Laplanders, are the scourge of human intellect, and the tomb of nature. "As far as the present time," says Fontenelle, "the sciences have not passed Egypt and *Mauritania* on the one side, and on the other, Sweden. Perhaps it is only by chance, that they were extended between Mount Atlas and the Baltic sea. We do not know if this is not the bounds that nature has set to them, and whether we may hope ever to see great authors among the negroes and Laplanders."

The influence of climate is such, that it may entirely change the manners of a nation. A colony insensibly contracts the physical constitution, regimen, and character of a new country, where it has been transplanted. The Tartars who conquered China, differ scarcely any from the nation whom they have subjugated; the Hollanders, active and laborious in Europe, are effeminate and voluptuous at Batavia.

A river or a mountain is sufficient to establish a very distinct difference between two neighboring nations. The inhabitants of Turin are not like those of the Alps; the Athenians differ from the Thebans, although they are only separated by the river Asoph. The climate is subject to vary either by some great revolution of the globe, or other secondary causes. In the time of Hippocrates, the Scythians were an impotent generation; nevertheless, it was those, who under the name of *Alans*, *Vandals*, and *Heruliens*, inundated Europe, and overturned the Roman empire.

Italy itself has experienced physical and moral vicissitudes. At present its atmosphere is infected by the deadly exhalations of the Pontin marshes, and by volcanic eruptions. It no longer experiences those rigorous winters, of which Titus Livy speaks. Its inhabitants have lost the energy of their character, and Rome, after having given birth to the heroes of liberty, has terminated by becoming the enslaved city of sacerdotal superstition.

Government and religion have not less influence on the character and manners of a nation. When the one is despotic, and the other is mysterious, they destroy all energy, clip the wings of genius, and stifle thought in the mind, and virtue in the soul. The country of Themistocles, Socrates, and that of so many other great men, is an unequivocal proof of it; for at this day it only presents the monuments of a servitude the most outrageous to humanity.

The property of despotic governments is to enervate the operations of the passions, and to enfeeble their energy. Hence a moral consumption is the dis-

ease which causes the destruction of these states. A people subject to an arbitrary power, have not the firmness, nor the boldness and elevation of soul, as those have, who are only obedient to the law. Under despotism, man is a stranger to honor, to posterity, and by consequence, to those heroic efforts which virtue produces. Worth is not esteemed for its own sake, but for the advantages which are annexed to power. Merit and probity are useless appendages. It is not the same in a free nation, where the love of glory continually stimulates; for here it is the price of great actions and patriotic virtues. Arbitrary power is a germ of the calamities, the development of which leads to misery and devastation.

A slave deprived of activity and energy, is essentially vicious and ignorant; his soul is tainted by a moral gangrene, which corrupts its faculties. Servile hands cannot fertilize the fields, nor brutalized minds acquire talents. A people in bondage are cowardly, perfidious, informers, and cruel; selfish to excess, they never consult general interest. A free people are courageous, frank, and humane; they honor agriculture, nurse and improve the arts; they are incessantly occupied in the happiness of their country; their genius and their arms multiply; they extend the fruitful branches of industry, and open the sources of public prosperity.

It is pretty generally observed, that when the social laws are not contrary to nature, and not in opposition to the climate, those who live under a mild and serene sky, have mild institutions, and their annals are not sullied with those great crimes, which are a disgrace to human nature. Besides, their manners

become purified by the regimen of Pythagoras, for which nature has given them a taste. Men under the line and near the poles, are depraved. The inhabitants of the burning plains of the torrid zone, and of the frozen poles, tormented by the heat of the sun, or discouraged by its absence, and having nature dead or inanimate before their eyes, are of a gloomy and misanthropic character; they have almost always sanguinary laws and corrupt morals. Their God is wicked and cruel, and to honor him, they endeavor to resemble him. It is the same with nations whose countries are subject to inundations, storms, and earthquakes. If we consult the history of Egypt, from Mexico to Japan, we will find the people ferocious and cruel, possessing a violent and despotic government, and a barbarous and destructive worship.

It is observed throughout the world, that religion has the greatest influence upon the minds of nations, and that the most of the denominations bear the impressions of climate. It is a great misfortune to humanity, when religion is established by force. The Mahometan religion, which only speaks of the sword, always acts upon the Musselman with the destructive spirit, which characterized it in its establishment. It is still worse when the preists preach the dogmas of intolerance. It is then that the torches of discord are lighted, that the plains are strewed with the dead, that the fields are drenched with blood, and that the towns are burnt. Apostles of falsehood, does your religion consist in destruction? Is the God, who animates nature, a God of ruin and of tombs? Does he demand devastation and death for homages? Does he require the cries and tears of despair for hymns,

homicides for adorations, and a world deserted and covered with ashes for a temple? These are, nevertheless, sacred impostures, the bitter fruits of your odious falsehoods. We every where meet with the melancholy traces of the destruction which you have ordered in the name of a God, good and clement by his essence, but whom you have made like unto yourselves; add to which, you have perverted and corrupted the morals of nature, brutalized man, and broken the springs of the soul. What then is to be expected from nations borne down under the yoke of sacerdotal superstition? Doubtless so long as they submit patiently to wear the chains, with which the priests of a false God have bound them, they will not acquire an elevation and dignity of soul; for the stupifying poison of the mind destroys the moral sense, and holds, as enchained, the intellectual faculties.

The physical degradations and the horrible customs, which we meet with among the greater part of nations, originate from the necessity they are under of disfiguring themselves to know one another, and from the false ideas they have received of beauty. It may also be the effect of the worship they have adopted.

One of the inconveniences of a black color, the image of night, says Raynal, is to confound all objects. This is also one of the causes which induces the blacks to engrave the visage and the breast, and to trace figures upon the skin with different juices, in order that they may not be mistaken for those of their wandering tribes, and to prevent a mixture and confusion with the other tribes equally vagabonds and dispersed. The custom that the inhabitants of warm countries have of varnishing the body, is also intended

to diminish the transpiration, which would be too abundant in these climates for men who wear no clothes; it is also designed to defend them from the sting of insects and reptiles, which are in very great numbers in these countries. The Americans give the preference to red substances, and they mix this color in their varnishes, either because they have a particular taste for it, or that this color is the most proper to repulse the insects.

As to the mutilations which diverse nations perform upon certain parts, it appears to me very probable, that they are principally to be ascribed to the almost general opinion, that nature, in organizing man, has only essayed him, and that he is imperfect. It is according to this absurd principle, that new Prometheuses have a place in their work shops, and have new-fashioned him according to their caprices; but they have only employed a destructive chisel, and have substituted deformity for the simple beauty of nature. Probably, also, as the author of the *Philosophy of Nature* thinks, the priests, by exhibiting divinities of hideous and whimsical figures, to the veneration of the ignorant and credulous, would insensibly determine them to adopt their figures, in order to render themselves propitious. It is certain that in many parts of the world, they have had recourse to barbarous operations, to conduct their slaves to their purpose. The priests have succeeded in giving chains to nations, but by mutilating first their souls, then their bodies, and by transforming them afterwards into beasts of burden. Religious fanaticism can alone, in my opinion, account for these wounds on the human species; it is only that which can make virtue consist in shedding the blood

of brothers, and can sanctify the crime; it is only that which after paralyzing reason, throws the heart of man into errors and ferocity. O philosophy, divinity of thinking beings! descend from the heavens, come and inhabit this unfortunate earth, and cause thy torch to shine upon all men; dissipate for ever the thick darkness of ignorance and of falsehood!\*

\* True religion is that which inspires love and gratitude, that which never costs nature a sigh, nor reason a murmur, that, finally, which is founded on the belief in God and in a future state.

## SECTION II.

ON MAN, IN HIS RELATION WITH WHAT SURROUNDS HIM, AND WHAT IS APPLIED TO THE SURFACE OF HIS BODY.

### CHAPTER I.

#### *On the Sideral influence.*

**T**HE influence of the sun, moon and other planets upon our globe, has for some time been questionable. The gross and absurd fables with which this subject has been overcharged, have justly caused the opinions of the ancient philosophers, who admitted this influence, to be ridiculed; but since it has been minutely and correctly observed, it has been discovered that vegetables and animals really experience modifications and alterations, more or less obvious, according to the divers degrees of action which the sun and the planets (especially the moon) exercise upon our atmosphere; and that the return of several diseases coincide with the divers phases of these planets.

In addition to the sun and the planets acting upon the atmosphere, and consequently, upon the bodies or substances that are therein contained, by their caloric and their light, they also magnetise and electrify it, in a certain sense, by reciprocally electrifying one ano-

ther. One of the most grand and sublime ideas of Kepler is, in my opinion, that which makes the sun the magnetic focus, whose force retains and directs the planetary spheres. The terraqueous globe, from the great number of magnetic phenomena that it presents, may perhaps, be considered a loadstone of great extent, which continually magnetises the sun, and is in turn, magnetised and electrified by it. This idea, as respects the earth, is not destitute of probability, from the diurnal oscillations of the magnetic needle, and its menstrual variations; but more especially, as it has been observed, that during winter, in consequence of the perihelium of the earth, the magnetic force is singularly augmented; an important remark, which was made by Dr. Knight, inventor of artificial loadstones. A similar impression should be made on the other planets, in consequence of their distance, their mass, the swiftness of their motion, and of their light. The ebbing and flowing of the ocean, are obvious indications of the electrization performed by the sun, but more especially by the moon; since the elevation of the waters under this, represents an incipient water spout. As the water in a vessel placed, at a certain distance, under a wire suspended to the principal conductor of an electric machine, swells and rises, so do the waters of the ocean extend and rise towards the moon, with all the appearance of an electrical attraction; and the universal attraction is, perhaps, nothing else than the effect of natural electricity. Hence, we may consider the moon, with regard to the earth, as an armour of the solar loadstone. But if these two planets magnetise and electrify our planet, there must be a very great difference

in the effect which they produce when they act together, and in the same direction, in the syzygies; and that of their separate action, or their action divided in different directions, as in the quadratures.

The sun has, upon every physical substance, an action which we cannot ascertain; we will only observe, that at the period of its passage by the meridian and horizon, the state of the heavens change—that winds, rains, and serenity are then established, cease, or increase. At midnight, or at mid-day, the sky being even, serene, and the air tranquil, there almost always rises a light wind, or rather that which prevails, changes its direction. In winter an east wind blows in the morning, and in the evening in summer, a west; in a word, if we assiduously observe the state of the sky, we shall always perceive variations in the four cardinal points. They may also be very obviously remarked in the annual points of motion; which are the two solstices, and the two equinoxes.

Another not less interesting observation is, that the paroxysms of diseases correspond, as respects the intensity of the symptoms or their remission, with the four cardinal points; most fevers increase near sunset, and remissions occur about the rising of this planet. This change, analogous to the tides, appears to depend upon the diurnal motions.

The moon has, by its light, the greatest influence upon animals and vegetables; if it acts upon them by its heat, it is but very feebly, for its rays received upon a burning mirror, do not produce any obvious change upon a thermometer placed at its focus. We know that the light of the moon tans and alters the complexion; and it is certain that the greatest growth

of plants, is during the night; as St. Pierre observes. There are many vegetables which only flourish in the rays of this planet, and numerous classes of insects, birds, quadrupeds, and fish, regulate their amours, their hunts and their voyages, by the different phases of this planet.

The moon has also an influence upon the terrestrial globe, by its gravitation.

The universal attraction of all the particles of matter, is a general law, and the principle of the greater part of the phenomena of nature. This attraction is mutual; it follows the direct course of the masses, and the inverse square of the distances. It is from this mutual attraction which prevails between the planets and the sun, between the satellites and their planets, combined with the tangential force, that results the elliptic motion of the planets round the sun, and of the satellites around their planets. It is the sun and moon's attraction of the waters of the ocean which occasions the ebbing and flowing, and the different phenomena that are there observed.

The attraction of the moon forces the waters from the sea, and raises them at the same time in both hemispheres. The sea then represents an elongated spheroid; because, in the hemisphere which is immediately under this planet, the waters are more forcibly attracted than the centre of the earth, which is more remote, whereas, in the opposite hemisphere, this centre is more attracted than the waters; thence it follows, that these gravitate less towards it, and it is in this manner that it makes a convexity in the parts of the ocean which are situated under the moon on both sides, and a flattening in those which are in quadrature

with it, in consequence of the obliquity of the attractive force.

The action of the sun upon the tides, is much less than that of the moon; this is the reason why the periods in which they are the most considerable, are those of the new and full moon, and particularly of the equinoxes. It has been discovered that the moon raises the water five feet, and the sun two; that is to say, that the latter raises them 22 inches 0.7, and the former 2.5 times more.

The causes which produce the tides of the ocean, also necessarily produce similar effects in the atmosphere; for the air is a fluid which, surrounding the earth, is subject, as well as the waters of the sea and other bodies, to the general laws of gravitation. The air being a very elastic fluid, the action of the sun and moon ought to produce aerial tides much more considerable than those of the ocean, and they are greater or less in proportion to the proximity or remoteness of the moon to or from the earth; hence, the air becomes more or less heavy according as it is in perigee or apogee; which is proved by barometrical observations. From the examination of a journal of forty-eight years, the medium height of a barometer is constantly greater when the moon is in apogee, than when it is in perigee.

It follows from this, that the aerial tides may well be the cause of regular winds; what seems still more to prove it is, that according to the calculations of D'Alembert, the combined attraction of the sun and moon produces, under the equator, a perpetual east wind, which in the temperate zones, is changed into a west wind; at some distance from the tropics, the

same wind afterwards changes its direction, in consequence of local circumstances.

Here observation accords with calculations; it proves that it is in the equinoxes that the winds most constantly prevail, that tempests commonly happen in the syzygies, that at all times a little wind rises at high tide, and that a little after mid-day and midnight the atmosphere is always agitated.

We should not be surprised that the atmospheric tides, which, as those of the ocean, depend upon the united attraction of the sun and moon, be nevertheless more considerable than these, because the air being eight hundred and fifty times lighter than water, and its elasticity incomparably greater; the attractive force of the two planets ought to produce in the air an excessive dilation, which is in proportion to the diminution of its gravitation towards the earth. The mobility of the air being greater than that of the water, also concurs to augment the atmospheric tides. In like manner the terrestrial atmosphere being nearer the moon by the nineteenth part of a radius of the earth than the waters of the ocean, must be more powerfully attracted in the parts corresponding perpendicularly with the moon, which also contributes to the augmentation of the aerial tides; it is then demonstrated, that the attractive and combined forces of the sun and moon upon the atmosphere, raises and dilates it in an inverse proportion to the squares of the distances, and cause it to take, as the ocean, the form of an elongated spheroid.\* But these divers changes in

\* This important question was learnedly discussed in 1776, in a manuscript memoir of citizen Cl. Ignace Dormoy, of Besancon, formerly member of several academies; we hope the author will soon publish it, with other researches upon physical subjects and those of natural history, which can only improve under the influence of the arts and sciences.

the weight of the air, cannot take place without the sublunary bodies, and, principally, the organized bodies experiencing them; hence, the sun and moon have a real physical influence on them, by their attraction; and here observation accords with theory, as we shall soon see.

In each lunation there are ten important situations to remark; the four lunar phases, the perigee and apogee, the two passages of the moon by the equator, which may be called the ascending and descending equinox, and, lastly, the two lunistics; of which the one is boreal, when the moon approaches our zenith, and the other is austral, when it is more remote from it.

The sum of the changes of the times effected in these lunar points, predominate considerably over those which do not change.

TABLE

*Of the changes and non-changes in the lunar points; by Toaldo.*

Lunar points.	Changes.	Non-changes.	Proportion reduced to the smallest terms.
New moons, . . . .	950	156	:: 6 : 1.
Full moons, . . . .	928	174	:: 5 : 1.
First quarters, . . . .	796	316	:: 2½ : 1.
Last quarters, . . . .	795	319	:: 2½ : 1.
Perigees, . . . .	1009	169	:: 7 : 1.
Apogees, . . . .	961	226	:: 4 : 1.
Ascending equinoxes,	541	167	:: 3¼ : 1.
Descending equinoxes,	519	184	:: 2¾ : 1.
Southern lunistics, .	521	177	:: 3 : 1.
Northern lunistics, .	526	180	:: 2¾ : 1.

From this table we see, that out of 1106 new moons, there were 950 changes of weather, and only 156 times in which the weather did not change. The comparison then is 950 against 156, or, which amounts



It has also been remarked, that the number of deaths should increase from year to year, no doubt, as Toaldo conjectures, in proportion to the augmentation of the cold and moisture, and the heaviness of the air, &c. The number of deaths augment or diminish with the tide, that is to say, according to the order which the lunar points follow. Deaths frequently take place in these critical positions of the moon, and especially at full moon, particularly when the weather is bad or cloudy. Old people also die more frequently at these periods.

The moon has a decided influence on the periodical returns of diseases, as well as on their crisis, as has already been observed by the father of medicine. Galen has also remarked, that the epileptic fits have a great relation with the different lunar phases. Many celebrated physicians, and amongst others, Mead, cites divers examples which confirm the observation of Galen. In the works of Bertholon on the *electricity of the human body*, we find tables calculated from the case of a maniac, during a whole year, which evidently prove how much nervous diseases are influenced by the power of the planet of the night. In this journal, we find that the new and full moon are, of all points, those that have the greatest influence. In a word, daily experience demonstrates, that all the periodical diseases are much influenced by the phases of the moon, and that they are in some degree regulated by its course.

The crisis of diseases have also a relation with the lunar phases. We observe that if there is presented signs of concoction in the new or full moon, the crisis takes place in the following lunar point, if nature is

not disconcerted in her operations, and if nothing is opposed to its curative powers. It is not only, says Mead, the new or full moon which occasions changes in the body, this planet also acts upon us when at the highest meridian point, or at the most opposite position.

Observation equally proves, that the other planets produce, according to their different aspects, different meteors, as winds, tempests, in a word, all sorts of alterations in the atmosphere, and also in diseases.

When Saturn is in conjunction with, or in opposition to another planet, the sun excepted, and when its aspect is sextile, trine, or quadrate, there is a very cold wind, which ordinarily comes from the north. When this aspect occurs in winter, the season is very cold, and the most of the nights are clear and serene. In spring, and especially about the commencement of June, it occasions cold, which taking place suddenly, causes the greatest damages to the productions of the earth. When Saturn is in conjunction with Venus, we should expect cold rains, accompanied with north winds.

When Jupiter has, with another planet, one of the aspects of which I have just spoken, and especially in spring or autumn, it produces violent and tempestuous winds. Venus determines rain, especially when it is in conjunction with Mercury, Saturn, or Jupiter. The planets which make nature glad, and produce serenity, are the Sun and Mars, especially in summer, and when in conjunction. The same effect also takes place, but in a less degree, with Jupiter and Mercury; the latter renders the weather so unsettled, that rain and clear weather succeed each other very

often in the same day. It excites winds when in conjunction with Jupiter, and rain when it is with Venus. It is necessary to remark, that the influence of these planets also varies considerably, according to the divers positions of the sun and the seasons, for Saturn causes a much greater degree of cold in winter than in summer. The sun and Mars occasion a much less degree of heat in the first of these seasons than in the second. Jupiter and Mercury occasion more impetuous winds in the spring and autumn than in the summer.

Acute diseases manifest themselves at the equinoxes, and become epidemic, or acquire a greater degree of violence, and they diminish or disappear towards the solstice. The first are also prejudicial to persons effected with phthisics, hectics, and diseases of languor.

The aspects of Saturn and Jupiter, and of Saturn and Mars, are harbingers of the most terrible contagious and epidemic diseases. The destructive fevers that have so often ravaged Europe, are sufficient to establish this fact; that of 1127 took place about the conjunction of Saturn and Jupiter. Boccace and Guy of Chauleiu, relate, that the aspect of Jupiter, Saturn, and Mars, preceded the pestilential fever of 1348. Marsilius Ficinus, one of the greatest philosophers of his age, regarded the conjunction of Saturn and Mars as the principal cause of the disease, which desolated the world in 1478. Gaspard Bartholin, professor at Copenhagen, predicted in a public discourse, delivered 1628, after the conjunction of Saturn and Mars, which succeeded a hot summer and a mild winter, the frightful epidemic, that manifested itself some time after-

wards. It was the conjunction of the same planets, which produced the prediction of Paul de Sorbait, physician to the emperor; he predicted with the greatest exactness, the disease which ravaged Vienna and other places. Daniel Sennertus predicted the dysentery, which prevailed in 1624 and 1637, from the position of these same planets.

There are stationary fevers and epidemic diseases, which are in opposition to the sensible qualities of the air; they depend, perhaps, as many others, upon the planetary influence, (the attraction appears to me insufficient to account for them.) It is possible that it may be, as some of the ancients have supposed, which modern philosophy has unjustly ridiculed, that the sidereal exhalations in our atmosphere, might communicate to the air qualities pernicious to vegetables and animals, and that they thus produce these popular diseases, the cause of which we do not know, and which the ignorant vulgar consider as the wrath of God against his creatures.



## CHAPTER II.

### *On Atmospheric Air.*

OF those things called by the ancients *non-naturals*, the air has a just title to the first rank. Air is absolutely necessary to life, and it supports health or causes disease, according as it receives useful or pernicious qualities.

There are but two kinds of air that can serve for

respiration and combustion; these are vital air or oxygen gas, and atmospheric air; the latter is also indebted to the oxygen gas, which enters into its composition for these properties. It is to the just proportion between the oxygen gas and the azote, which are the constituent principles of the atmosphere, that its respirability depends. All the other airs, such as azotic gas, hydrogen, carbonic, &c. are noxious; animals that respire them soon become in a state of asphyxia, and burning substances that are plunged into them are almost immediately extinguished.

Atmospheric air is an elastic, diaphanous, non-odorous, insipid, heavy, electric fluid, capable of rarefaction and condensation, which surrounds the terrestrial globe, with which it moves, and which is necessary to the support of the life of animals provided with lungs; it is also essential to combustion.

We will consider air under three points of view, to wit: under its physical and chemical relations, and in respect to its electricity.

#### 1. Air considered physically.

Air is an elastic fluid. Its elasticity, as well as that of the other gasses, is owing to the presence of caloric, the repulsive force of which is greater than the attraction, which its particles mutually exercise upon one another. Although air be very fluid, it does not, however, penetrate every substance or body. Vitri-fied substances, through which light easily passes, are impenetrable to air. Many bodies into which water, alcohol, oils, and some saline solutions easily insinuate themselves, are not penetrated by air. Air is insipid; it, however, possesses some degree of causticity. The muscles and especially the heart of animals, which

have been dead for a short time, contract by a simple contact of air. Wounds exposed to its action, experience painful sensations. We know its influence upon the fœtus at the moment of its birth. Lastly, it is owing to its stimulating effect, that the difficulty with which solutions of continuity (wounds) in vegetables and animals cicatrize.

Air is not odorous, yet it is the vehicle of the odours and miasms, which are discharged from all bodies. We may consider the atmosphere as an immense laboratory, in which nature performs an infinite number of decompositions and combinations; it is a vast reservoir where the attenuated and volatilized productions of substances are received, mixed, agitated, dissolved, decomposed, and where they form new compounds. It is a chaos—a mixture of mineral exhalations, and of animal and vegetable miasms, which are constantly subject to the action of the electric gas, caloric and light.

The gravity of the air is demonstrated by the effects that the pumps produce, in which water rises to the height of thirty-two feet; by the variation of the barometer, in which the mercury ascends in an inverse ratio of the heights; by the hemispheres of Magdeburg, and by the balance, from which it results, that a cubit foot of air weighs seven hundred and eighty-five grains. Lastly, it is demonstrated, that its pressure upon a man of a common stature is equivalent to that of a weight of twenty-two thousand and four hundred pounds; that of a column of air is equal to a column of Mercury of the same base and twenty-eight inches high, and to that of a column of water of the same base, and of thirty-two feet of elevation. Phi-

losophers do not agree respecting the gravity of air, compared with that of water; some pretend that it is as one to one thousand, and others in the proportion of one to eight hundred and fifty.

The height of the atmosphere is not yet determined. The barometer supports itself at twenty-eight inches above the surface of the sea,\* and it diminishes one line by sixty-three feet in the first moments of elevation, but it is scarcely possible afterwards to ascertain with precision the dilation of the mercury, in proportion as we ascend from the earth; consequently, we have no data from which we can calculate its height with certainty. Astronomical refractions give from eighteen to twenty leagues, but this estimate is not certain, for there is no refraction perceptible near the moon, and this planet has an atmosphere, since volcanoes have been perceived in it.

An important observation as relates to the variations which the air experiences, and to the effects which must result from it upon the animal economy is, that the barometer constantly presents regular diurnal variations; the mercury begins to rise at the commencement of night, and continues to do so until towards midnight, from that time it descends until the approach of day, then it ascends until mid-day, to descend afterwards until evening; having intervals of repose between these variations. A daily vacillation is also remarked in the needles of the compass, which is such, that the needle turns towards the west from two hours after midnight until eight o'clock in the morning, and retrogrades after mid-day towards the east. The pendulum vacillates every six hours, from

\* In France the mean height of a barometer is twenty-seven and an half inches.

north to south. The greatest variations of the thermometer are noticed to occur at the same time that those of the barometer do, and they coincide with those of the pulse. Bryan Robinson, of Dublin, has observed that the pulse is very slow in the morning, until mid-day, and that it then becomes more frequent; that two hours after it again becomes slower, until eight o'clock in the evening, and then increases in frequency; that sleep produces a remission, and, finally, that it again increases until two hours after midnight—a time in which it is at its greatest height and frequency, to lower again until seven or eight o'clock in the morning.

It is from September until March that the barometer experiences the greatest variations; under the equator the variations are very small, but they increase in proportion as one advances towards the poles. The most considerable indicate tempests, or are the effects of earthquakes, and they take place at the same time in a very considerable extent of country. The different positions of the moon, as well as electricity, have the greatest share in it; it is, especially, in the torrid zone, where the temperature is uniform, that the heights of the mercury in the barometer corresponds with the different lunar phases. The sum of these heights is constantly greater in the syzygies than in the quadratures; which proves that this satellite of the earth augments when it is in conjunction with, or in opposition to, the sun.

The air, by its gravity, exercises a great influence in nature, and its pressure prevents the dilation and evaporation of fluids.

Many liquids would cease to be such, and soon

pass into the state of gas, were it not for the pressure of the atmosphere; such are, among others, ether. If we place a covered phial filled with ether under the receiver of an air-pump, and after having produced a vacuum, remove the covering or stopper, the ether will be suddenly volatized into vapor that will fill the receiver. This liquor also assumes the gaseous form at the height of eighty-four hundred feet above the level of the sea, whereas at the ordinary degree of pressure, it requires a heat equal to that of the human body—that is to say, from thirty-one to thirty-three degrees to evaporate it; to evaporate alcohol, a heat of from sixty-two to sixty-three degrees of Reaumer is necessary, and to evaporate water, eighty. These fluids would be in a permanent state of gas, if they did not experience the pressure of the atmosphere; hence, the reason why they support an ebullition in a vacuum.

It is the pressure of the air that retains the fluids in the vessels of animals, and prevents them from evaporating; when this pressure is considerably diminished, which is the case upon high mountains, hemorrhages, and especially of the lungs, is the consequence. The same effect is observed to happen to animals that are confined in an exhausted receiver; they finally perish, but not all with the same promptitude. Those whose hearts have two ventricles, die in a few minutes; reptiles, fish, in a word, animals whose hearts are *mono-ventriculair*, may survive several hours, because it does not require so great a degree of caloric to support life in them as in the former.

However, man can live in a very rarified air. The

air at the height of thirty-six hundred feet will support vegetation, and life is supported at a greater elevation; Cuença and Quito, which are six hundred fathoms high, are inhabited and very fertile. It is observed that trees are smaller upon high mountains, and that they do not grow at the height of two thousand fathoms; at this elevation the earth only bears a very clear turf, which is not higher than moss; at two thousand three hundred fathom above the level of the sea, no plants are seen.

From the calculations of Cassini, it appears that no animal can live at the height of two thousand four hundred and forty-six fathoms above the level of the sea. He supposes that at this height the atmosphere is twice as much dilated as at the level of the sea; and air dilated in this ratio in a reservoir, commonly destroys all animals subjected to the experiment. However, the Spaniards in Peru, ascended to the summit of a mountain elevated two thousand nine hundred and thirty-five fathoms, and they were not destroyed by the rarity of the air, although they were four hundred and eighty-nine fathoms higher than the point indicated by Cassini. Moreover, the persons sent to measure the ground under the equator, lived a long time upon the summit of mount Pechincha, which is two thousand four hundred and seventy-one fathoms higher than the level of the sea; they were consequently twenty-five fathoms higher than the point indicated by Cassini. The same persons when encamped upon the mountain, frequently saw vultures flying, which supported themselves at two hundred fathoms above its summit; that is to say, where the mercury of the barometer would only stand at fourteen inches.

We must admit, however, that the most of persons who ascend high mountains, not only experience vertigo, nausea, discharges of blood, weakness, and universal debility, but also, that asthma, spitting of blood, consumption, and other affections of the breast, are more common and more frequent there, than elsewhere; and that hence, the air respired in such places is not congenial to longevity. The different affections that are experienced at the tops of mountains, not only depend upon the excessive diminution of the weight of the atmosphere, but also upon the deficiency of vegetation and the presence of hydrogen gas, which abounds in the superior parts of the atmosphere.

The most salubrious air is that which is neither too heavy nor too light; its excess of weight and its too great rarity, are equally pernicious. When it is too heavy, that is, when the elevation of the mercury in the barometer is above twenty-eight inches, it strongly surcharges the lungs, and it is not less injurious to the head; for the strong compression of the lungs, which is the immediate effect of it, is an obstacle to the return of the blood from the brain to the heart. Nervous persons suffer, also, from the excess of gravity of the air. In 1768 and 1770, the mercury stood, for a long time, at a great height, and dreadful epidemic affections of the lungs prevailed, the crisis of which were performed with difficulty, and rather by stools and sweats than by expectoration. Phthisics and asthmas, especially, are much influenced by an excess of the weight of the atmosphere; dropsies have also been seen to increase or diminish in size, in proportion as the mercury rises or falls in the baro-

meter. Inhalation and exhalation by the cutaneous and pulmonary vessels, account for this phenomenon; these two functions are, in a great degree, dependent upon the faculty which the air has of assimilating and dissolving the vapors; and this property is in proportion to its weight.

Air, too rare, is injurious; it does not sufficiently resist the blood of the lungs; thence they are engorged, and oppose the blood which abounds in the brain and other parts, and prevents its free ingress into the right ventricle; the vessels of the pericardia, (heart purse,) those of the brain, and sometimes even the right auricle, being surcharged with blood, rupture, and suddenly produce death. These accidents are peculiarly liable to occur when the weight of the air is suddenly diminished. Duhomel remarked, that in the month of December, 1747, sudden deaths were very frequent; the barometer lowered in this month in less than ten days, one inch and four lines; which would necessarily produce very great changes in the body, since the variation of an inch in the barometer makes a difference of more than a thousand pounds in the weight of the atmosphere.

The air is compressible and elastic; it may be reduced by compression to the twenty-eighth part of its ordinary volume. From the observations of Pringle, it appears that meat may be preserved a long time in a compressed air; its density appears to contribute to the savor of aliments and drinks; pepper, ginger, salt, and spirits of wine, are almost insipid upon high mountains, as upon the peake of Teneriffe; where the air is greatly rarified, owing to the particles not being so forcibly applied to the nervous papillæ of the

tongue; nevertheless, Canary wine sensibly affects the organ of taste; doubtless owing to its unctious qualities, which by making it adhere to the tongue, enables it to perceive its savor.

Caloric is the principle of heat, and of the antagonizing repulsive force of attraction; accordingly as it is more or less diffused and reflected in the atmosphere, this is more or less rarified, and its temperature is higher or lower. The principal causes of these variations, are the following:

1. *The presence of the sun for a longer or shorter time upon the horizon:* such is the reason why the winters of climates situated near the antarctic polar circle, are much more rigorous than ours; in fact, the duration of the sun is eight hours less in the tropic of Capricorn, than in that of Cancer; hence, navigators report to have met with floating ice, and to have experienced a great degree of cold in the southern seas, at a much less latitude than in the northern seas.

2. *The perpendicular or oblique action of the sun.* In summer this planet remains not only a longer time on the horizon than in other seasons, but its action is also perpendicular; in winter it is nearer the earth, but it enlightens and warms it a shorter time, and its rays are oblique; hence, the rays of the sun fall in a much greater quantity upon our planet during summer, and thus the heat ought to be augmented, although the sun be then in apogee; for the heat is composed of both what exists and what has preceded.

3. *The nature of the soil.* Sandy ground easily becomes warm and soon melts the snow; argillaceous earth contracts heat with difficulty; also caves, whose bottoms are sand or gravel, and which are not much

higher than the water, are bad; they may be improved by dressing them, that is to say, by putting a thick bed of potter's clay, well mixed with water on them, and then paving them.

In general water never acquires the same temperature as the earth; the waters of the seas, lakes, rivers, &c. are colder than the earth; consequently, the more a country is covered with water, the colder it is. A region covered with forests, thickets, &c. is also, for the same reason, colder than that which is cleared, because the first is more humid. A country with much meadow ground has a similar effect; it is always colder than that whose soil is naked, sandy or stony. The color of the earth also contributes to warm the atmosphere; that which is strongly colored, absorbs the rays of light, and acquires much heat; the snow, on black ground, melts much sooner than it does on that of other colors. In some countries of Savoy, the husbandmen, in spring, spread black earth upon the fields which they wish to cultivate early, and the snow melts there fifteen or twenty days sooner than on other grounds.

4. *Local position.* A place situated to the south, at the foot of a hill or mountain which reflects the rays of the sun, will be extremely warm, whilst on the other hand, one which looks towards the north will be cold, although on a level with the first.

5. *Greater or less elevation of the earth.* It is the more considerable in proportion to the greater extent of the continent; thus Siberia, and a part of Tartary, are very much elevated above the level of the sea, for in going there by Russia, we almost continually ascend; and we may observe that the currents and

rivers which empty into the sea, have a very great fall. These countries are very cold, owing to their being very high and to the air being very subtile; it is an invariable law of nature, that snow and ice is constantly found at twelve thousand feet above the surface of the sea.

6. *Figure of mountains.* Those that present a concave side to the sun, have the effect of a burning mirror upon the plains; clouds that are convex or concave, also augment the heat, either by reflection or the refraction of light: this figure of the clouds is even sufficient to light the inflammable exhalations that float in the atmosphere.

The heat augments in proportion to the number of mountains and clouds which are formed in the manner that I have just mentioned; the experiments of Mairan, prove that solar light, reflected upon a thermometer by concave mirrors, causes the mercury to rise in proportion to the number of reflecting mirrors, so that if one mirror raises it three degrees, two will raise it six, and three nine.

7. *The serenity of the sky, and aqueous vapors disseminated in the air.* The first of these promotes heat, and the second produces cold. We know that by enveloping the bulb of a thermometer in a very volatile liquor, such as ether, the mercury descends to several degrees below zero. In the Indies, the inhabitants procure ice by evaporation; they dig holes in the earth, thirty feet square and two deep, the bottom of which they cover with sugar-canes, or the dried stalks of Indian corn, to about the height of eight inches; they then place small unvarnished earthen pots, of an inch and a quarter deep, and a quarter of

an inch thick, which they fill with boiling water; these vessels are so porous, as to be penetrated through and through by the water. They are fixed at the commencement of night, and the next day before sun-rise, they find the water converted into ice. This congelation is evidently owing to evaporation. We know that when a substance quits the solid state, to pass into that of a liquid, or a liquid to assume that of an elastic, it produces cold, owing to its depriving the ambient bodies of a certain quantity of caloric. Such is the reason why the heat of southern countries is temperate, when they are contiguous to seas, rivers, currents, and forests.

8. *Winds.* In our climate (France) those of the south are hot, and those of the east are cool. Winds increase or diminish the temperature of the atmosphere, according to the countries through which they pass, and accordingly as they are charged with caloric, water, particles of snow, ice, &c. The air does not generally assume the temperature of the surface of the earth. The earth preserves its heat during night, whilst at a small height above the surface of it, the heat diminishes much more, than at the elevation of fifty feet, which is no doubt the effect of evaporation.

9. Lastly. *Volcanoes.* These are subterraneous fires, which continually warm the earth that covers them, and that which is contiguous thereto.

It appears from the observations that have been made in all subterraneous places, in the latitude of forty or fifty degrees, that the interior heat of the strata, from one to nine hundred feet deep, is about ten degrees above zero. It also results from experi-

ments made upon the heat of water, that in summer its surface is much warmer than it is at bottom, and that in winter, on the contrary, its surface is colder than its foundation. In our latitude, at a certain depth, water has a temperature of about four degrees. Phipps found it several degrees below zero at the eightieth degree of north latitude. In the sea, between the tropics, the heat is more considerable, for Ellis ascertained that at an hundred and fifty fathoms, the thermometer marked nine degrees above the term of congelation; but at a less depth the temperature was colder.

It is now demonstrated that the *maximum* of heat is the same in every climate, and that the mercury does not rise to a greater height during summer, under the line than under the polar circle. The nearer they approach the equator, the more constant is the heat; it is its continuance which renders it disagreeable, and makes it appear excessive. It is certain, according to the observations made and repeated for a great number of years, that the thermometer of Reaumur rarely rises in these countries, to more than thirty or thirty-four degrees. Peru is very warm, it is situated in the torrid zone, and almost on a level with the sea; nevertheless, the mercury scarcely ever rises there above the thirtieth degree. It is the same in other countries situated between the tropics. At Senegal, which is one of the warmest countries, the thermometer sometimes, but very rarely, rises to the thirty-fourth or thirty-fifth degree. It appears that this excess of heat is in a great measure owing to the sand, with which that country is covered.

We must not suppose that the countries situated

under the equator, are the warmest of the globe; at some distance from the torrid zone, a greater degree of heat is experienced than even under the line. It appears that this effect should, in a great measure, be attributed to the great quantity of vapors, which the air dissolves under the line, as is proved by the rust that metals soon contract; this fact is the more probable, as we obtain in this situation but feeble signs of electricity. For the same reason the greatest degree of heat and cold never manifest themselves at the solstices, but about twenty-seven days afterwards.

So, according to the experiments of De Luc, the greatest degree of heat takes place when the day is about three-fourths spent, and the greatest cold about sun-rise, owing to the fall of the vapors, and a light wind that usually rises with the sun. The same philosopher estimates the mean temperature as taking place at about two-fifths of the day.

The greatest degree of cold that has been observed, is the seventieth degree of Reaumur. According to the report of the academicians sent to the north, mercury congeals under the polar circle. The coldest countries, through which they travelled, were those contiguous to Hudson's bay, Greenland, and Spitzbergen, which extend from the seventy-eighth degree of north latitude to the eightieth, and even beyond. There the sea is constantly frozen, but a singular phenomenon occurs in Lapland, that is, during summer, which is very short, as great a degree of heat is experienced, as is between the tropics; the same phenomenon occurs in Sweden. In Lapland the sun has been seen to burn the moss. The academicians relate, that on the nineteenth of August, 1736, the heat was so

great, that a fire kindled in the forest of Horilakero, and caused a terrible conflagration.

Some observations made in different places, seem to prove, that the heat of the atmosphere and of the globe, has diminished for a certain number of years. Toaldo has remarked, that this diminution was at Padua, four and an half degrees, in the course of fifty-five years. Legentil had nearly the same result at Paris. This confirms the hypothesis of Buffon, respecting the successive increased cold of the planets. Rozier also observed, that the cold augmented from year to year, and his observations are conformable to those of the former academy of Paris; but he also remarked, that in proportion to the increase of cold, so was the augmentation of the heat in certain days in summer.

Caloric has the property of dilating solids, and evaporating fluids. It owes this quality to the repulsive force with which it is endowed in a free state, and by means of which it separates the particles of the body, into which it is interposed, and diminishes their attractive uniting force; it dries the bodies of animals, augments the consistency of the humors, by depriving them of their vehicle, and promotes the natural tendency they have to putrify. It enervates and exhausts the system, not, as is commonly thought, because it deprives the fibres of their *robur physicum*, but by diverting the energies, and attracting them towards the exterior organ or skin, which thence becomes more active.

The porous system exercises a greater action, the phrenic centre resists less; it receives the oscillations, and does not retain them; then atony and spasm succeed each other rapidly in this centre. This is the

reason why one is sensibly affected by heat, which is neither great nor constant. From this augmentation of the action of the porous system, it results that one must transpire much, eat little, and have the greatest tendency to effeminacy and indolence.

Warm seasons are favorable to pituitous persons, and unfavorable to the meagre, and those whose fibres are small and dry. The first warm weather in the spring pretty generally produces diseases. It has constantly been observed, that persons of a weak and delicate constitution, who go out but little in winter, and who continually inspire the air of their apartments, are subject to divers inconveniencies, when they wish to enjoy the first fine weather of spring. The heat of this season suddenly attracts the humors to the head, rarifies them, and the membranous parts thus distended, frequently suffer from lancinating pains, and divers other symptoms of disease. The vapors which the sun at the commencement of this season raises from the earth, until then moistened by fogs, rains, and snows, contribute not a little to the production of the diseases, which occur in the spring, and especially to affections of the breast. It is then prudent for common people, studious persons, and all those who do not lead an active life, not to expose themselves too much to the first rays of the sun, and not to give up entirely to the pleasure and attraction of the first spring days, during which nature labors to renew her productions.

Cold air produces contrary effects, it contracts and condenses; it gives tone and vigor to the solids, and is opposed to evaporation; it acts upon the pulmonary and cutaneous systems, and augments the resistance

of the latter to the efforts of the viscera. The fibres which the cold has condensed, are less sensible to stimuli, and more difficultly perform their functions; in these circumstances, it requires very strong impressions to excite much action. The energies, less disseminated to the exterior, unite in the epigastrium, which serves as a point of support to the muscles of voluntary action. The phrenic centre, freely receiving the action, and returning it in the same manner, is not alternately affected with atony and spasm; it possesses a constant tension. This is the reason that a person is strong without being active, or rather that he has more force of resistance than of impression. However, when by any cause whatever, there is already a concentration of energies in the epigastrium, as in the hypochondriases and melancholy, the cold may become injurious, because then this centre reflecting towards the brain, the spasm with which this organ is struck, interrupts its functions, and perverts the mental faculties. This is the reason that suicide is more common in winter, than in any other season, and especially when the winds blow from the north; in England they are called for this reason the hanging winds. It has also been remarked, that the greater part of crimes are committed in winter, the season in which man unites to cruelty the powerful sense of his strength.

History presents a memorable example of the power of cold air upon the morals. The duke de Guise was so strongly convinced that Henry III. who had him so often in his power, never dared to assassinate him, that he departed for Blois. Chancellor Chiverni, becoming acquainted with his departure,

exclaimed that he was lost, because, said he, when it is cold, a trifle vexes the king, and rouses him into fury. In fact, the event justified his fatal prediction for the duke was assassinated.

Cold air concentrates the action of the interior, and warm air determines it to the exterior. These two motions cross and succeed each other, sometimes very suddenly in the same season—autumn, for example, offers a great number of irregularities. The temperature in this season passes suddenly from cold to hot, and from hot to cold, several times in a day. It is these sudden transitions which renders this season so dangerous to consumptive patients, old people, in a word, to weak and delicate persons, whose bodies, without vigor, cannot resist these frequent vicissitudes. Autumnal diseases are of a long continuance; they have a nervous character which is opposed to a crisis, and their solution is rarely perfect before the return of spring.\* What I have just said, is equally applicable to countries, which possess an autumnal constitution, and the temperature of which varies several times in a day. Diseases similar to those which autumn produces, and of which the crisis is difficult, seem to prevail in them. The fevers of the spring, on the contrary, are less serious and obstinate; they have a humoral character, which indicates that the exterior organ is not impeded in its action, and that the currents of oscillations, and the efforts which nature makes, are developed from the interior outwardly;

\* The autumnal diseases of our country are not so tedious. The intermittent fever frequently leaves the system in a state of languor, that nothing but cold frosty weather will cure.—*Tr.*

consequently this direction is the most advantageous in all diseases.

The air is constantly charged with a greater or less quantity of moisture; it is a sponge always imbued with water. The receiver of an air-pump grows dull, in proportion as a vacuum is produced, owing to the rarified air not being able to sustain the vapor. If we mix a pound of ice and six ounces of muriat of soda in a clean dry vessel, and it is left for some time exposed in a place, where it will not freeze, its exterior parts will be covered by degrees with a thick layer of hoar frost, which is nothing but water previously held in solution by the air contiguous to the vessel, and which is afterwards condensed by the cold produced in the experiment. The deliquescent body exposed to the air, becomes more or less humid and heavy, by being separated from the water contained in the atmosphere. Hygrometers prove the same thing,\* so that we may regard it as a well demonstrated truth, that the dryest air in appearance, contains, notwithstanding, a certain quantity of water in the state of vapor.

The water contained in the air is found in three different states: 1. In that of perfect dissolution; 2. In that of commenced precipitation; and, lastly, in that of complete precipitation. In the first state the air appears to be dry; it is heavy, elastic, transparent, and the sky is serene. According to the experiments of Saussure, a cubic foot of atmospheric air can hold, in solution, twelve grains of water. Precipitation com-

\* Foucher has observed, that the greatest changes marked by the thermometer, take place in summer, between seven and eight o'clock in the morning, and in winter, between eight and nine.

mences when the quantity of this fluid exceeds the point of saturation; the air is in this state, less heavy, not so elastic, obscured by fogs, and the sky is cloudy. Lastly, the precipitation is complete, when the watery vapors considerably exceed the point of saturation; the particles then approximate more closely, and become heavier than air; obedient to the laws of gravity, they fall upon the earth in the form of rain, snow, hail, &c. according to the divers degrees of cold and heat, of division, condensation, and electricity that they experience in the lower or higher regions of the atmosphere.

Observations relative to the humidity of the atmosphere, have given the following results: 1. Mountainous places, and those covered with forests, are more frequently watered by rains than others, because the mountains and woods attract and retain the vapors contained in the atmosphere, and because the electric fire abandons these vapors by discharging upon the elevated places and trees. Such is the reason why it rains for a whole year in the great forests of the Cordilleras; and experience has taught us that, when we wish it to cease raining in a country covered with trees, our object may be accomplished by clearing it; this is what has taken place in Sweden and America, where it rains much less frequently than it formerly did, since the inhabitants have cut down a great part of the forests. As soon as a considerable part of the woods of the Alps were destroyed, the low countries became much more subject to storms and inundations; and the latter ascended to a greater height than previously.

It is commonly supposed that a greater quantity of

rain falls in places adjacent to the sea than elsewhere; but observation proves the contrary, and the proximity of the sea does not appear to contribute to it, at least not much, for it rains very little in the towns of Holland; St. Petersburg, situated almost upon the sea, is not more watered by rains than Paris, which is much more remote from it. Mountains are the most powerful causes of this meteor, they exercise a considerable attractive force upon the clouds and fogs, arrest the winds and change their direction; it is from this circumstance that Great Britain, which is a mountainous country, abounds in rains, whereas open countries, as Holland, the isle of France, and the maritime countries, which do not present any obstacle to the course of the winds, suffers the vapors, clouds, and the fogs to pass off with them.

2. By calculating the quantities of rain that has fallen in the space of nine years, we find that the quantity of each year is nearly equal. Toaldo has remarked that the revolution of the perigee of the moon, which is accomplished in nine years, wanting two months, generally produce in the corresponding years the same phenomena which established a periodical circle of seasons, and that there falls every nine years the same quantity of water, in counting from one perigee of the moon to the following. The mean quantity for nine years, which is one hundred and fifty-two inches and a half for Italy, has never given a greater difference than three inches per year.

3. It rains more commonly in the day than at night, in nearly the relation of three to one, according to the observations of Toaldo. Messier has remarked that, from 1763 to 1772, it rained at Paris 1324 times

during the day, and only 740 during the night; this effect appears to be owing to several causes, to wit: to the electricity, which is stronger in the day than night, and to a greater evaporation occasioned by the heat, which rarifies the air whilst the sun enlightens the horizon.

It also rains more frequently after mid-day than in the morning; the rarefaction of the air being greater after mid-day, permits the aqueous vapors to unite, and these becoming heavier than an equal volume of air, are forced to obey the laws of gravitation, and fall in the form of rain.

4. It has been observed that storms and bad weather most ordinarily take place at the commencement of high or low tides; they are of long duration when the tides are high, and dissipate sooner when it is low: it is said that the clouds and winds follow the motion of the water of the ocean.

5. The greatest droughts in the year do not ordinarily occur in the warmest season, but in March and April;\* and the most rainy months are those of summer: it has also been observed that rains are more general in warm than cold countries.

6. Lastly, it appears from the numerous observations that have been made upon rains, that about nineteen or twenty inches falls upon the whole surface of the earth in each year. Lord Bacon has also remarked, that the running water of currents and rivers evaporate less than the stagnant water of lakes and marshes.

\* This certainly is not the case in this country. From the observations I have made, and I have kept a diary of the weather for many years, I think May and November, ordinarily, the driest months in the year.—*Tr.*

Moist air is super-saturated with water, and it is with the greatest difficulty that it can be charged with more; it follows, that the evaporation from substances, and the transpiration of vegetables and animals, must be obviously diminished during wet weather; the latter, so far from being relieved of the excremental humors that are pernicious when retained, do, on the contrary, absorb a certain quantity of aqueous vapors contained in the atmosphere; this absorption is performed by means of inhaling vessels, which open in an almost infinite number in the cells of the external cellular tissue. The cellular tissue, which is very porous, imbibes it at first itself, and distends, then the fluid with which it is penetrated, is taken up by these vessels, where it is mixed with the lymph of which they are the vehicles, and thence flows into the ocean of blood, which it dilutes and renders aqueous, at the same time that it relaxes the solid parts. This absorption of atmospheric water, is proved by a multitude of facts; in the warm bath the body acquires an increase of weight, and the water which constituted the bath is sensibly diminished.

Contagious diseases, frictions with mercurial ointment, tartarised antimony, &c. &c. equally demonstrate absorption;\* and there are few physicians who do not know the experiments made in South Carolina by Linnings; from which it results, that a man acquires in the space of one hour, one pound, in passing from a dry into a moist air, and that he loses still

\* The mercury contained in the mercurial ointment penetrates the body, and frequently produces salivation: this metal has been sometimes found united into globules in the vessels and cavities of the body, on opening dead bodies of those who had made use of the ointment by friction: the tartarised antimony, dissolved in water, causes vomiting, by rubbing the hand or other parts with it.

sooner, this augmentation of weight, by repassing into a dry air. A humid atmosphere is negatively electrified, for of all the conductors of electric gas, there is none more powerful than water in a state of vapor; consequently, in this constitution the powers of life are much less energetic than in dry constitutions; the solids are almost in a state of inertia, the circulation and the secretions languish, the sensations are less powerful, because the senses are obtunded. In wet weather we feel ourselves dull, heavy, and as little disposed to the labors of the body as to those of the mind.

The air is, in general, more humid in the evening than in the other parts of the day; it is dangerous to be exposed then, and especially in certain places. It is this humidity of the evening that is called dew, and which is nothing but a light vapor, that is condensed and converted into water. The air of the morning is not insalubrious, it is freed from a great part of its moisture, and the earth is covered with dew, which is also the effect of its transpiration;\* the vapor and the dew change according to the time and place, and by consequence, produce different effects. It is very dangerous to be exposed to the evening air in warm countries, because it is charged with moisture in proportion to the heat which has been experienced during the day. In the southern countries of Europe, the vapors are not very perceptible nor dangerous, except from the end of July until the end of September. Foreigners are, in a peculiar manner, the victims of the effects of noxious dews, &c. In the most of the departments

\* See Appendix—Advice to persons who reside in sickly situations.—*Tr.*

of France, in all the high countries where the soil is more dry than humid, and even in many of the plains, such as those of the environs of Paris, the dew only consists of watery vapors by no means charged with pernicious miasms; but it is not free from danger when we are exposed to it without precautions—we then encounter the danger of those diseases which depend on moisture and coolness combined. It is much worse when the moist vapors are united with marsh miasma, as at Rome, and generally, in all countries abounding in wet and marshy soil; dysentery, malignant remitting, and intermitting fevers are commonly the consequence of this imprudence. In order to guard against the fatal effects of the miasms with which the air abounds, especially in the night, in these countries, it is important to prevent the approach of the rivers and currents by dikes, and by digging of canals or ditches to promote the flowing of the waters before the heat is sufficiently powerful to accelerate putrefaction; lastly, nature should be seconded by establishing mills,\* steam engines, &c. when the ground is too low for the waters to run off by canals.

The period of the day in which the air is the most salubrious, is the morning; it is also that which is proper for convalescents, the infirm, and valetudinarians to respire.

The humid constitution of the atmosphere is, generally, insalubrious and pernicious to vegetables and to animals; when it continues long, the former do not

\* Our author cannot mean mill ponds, such as are common in many parts of our country, for it is an obvious fact that these, in sickly situations, are very unwholesome.—*Tr.*

arrive at their real point of maturity, and they furnish as well as the flesh of animals, only gross and unhealthy aliments; finally, all the productions of animated nature bear the impression of this unhealthy constitution, which promotes the *pituitesency*, and disposes to *pituitous* diseases. It is the same with vegetables which acquire noxious qualities. The flowers of the *ægrolethron* or rose laurel, with yellow blossoms, becomes poisonous in wet springs, which renders the honey that the bees gather from them, pernicious. In the famous retreat of the ten thousand, the soldiers of Xenophon's army having eaten much honey in the environs of Tresibond, where the shrub of which we speak was very common, and had become more noxious than customary by the effect of a humid constitution, were violently attacked with puking and purging, and with delirium; some were near dying, and others furious and in a state similar to drunkenness; however, none of them died, the disease ceased next day at nearly the same hour that it had commenced, and these soldiers were in a state like that which succeeds a violent purging.

It has been observed that the hemlock of our country has not a very active juice, except in rainy years. The productions of spring are for the most part acrid, in consequence of the moisture of this season. Plants that vegetate in water, are most ordinarily active and corrosive,\* and it is thought, not without foundation,

\* Culture in suitable ground may deprive them, at least in a great measure, of these qualities. In our gardens celery loses the disagreeable taste which it has in moist ground: the skirrit is rendered mild by culture, so as to become a healthy aliment. Heat may also correct the acridness of certain plants. In Greece, garlic has not the taste and disagreeable odour that it contracts in our country; we know that onions are much milder in the southern departments of France than in those of the north.

that it is the fogs and atmospheric moisture which causes grain to rust, scab, and contract the ergot.\*

These constitutions are, nevertheless, favorable to some individuals; to those whose fibre is small, dry, and hard, to meagre persons, whose blood and humors are desiccated; but it is requisite that it should not continue long, otherwise these will feel its pernicious effects. Of all the temperatures this is the most injurious to the *pituitous*—to those whose fibres are soft, inert, and imbued with a great quantity of serum and crude humors; it is also during this state of the atmosphere that those are worse, and that they experience the pituitous diseases.

The excess of atmospheric moisture not only produces more serious diseases than the other constitutions, but it is also opposed to a crisis, by depriving the system of the energies which are necessary to perform digestion; and it accelerates the fatal term, especially amongst old people. It has been constantly observed that old people, as well as persons extremely sick, succumb, other circumstances alike, much more frequently in wet weather, and especially when thick and damp fogs prevail, than in other periods or changes of the weather.

Of all the states of the atmosphere, serenity is the most salubrious. Then the air is translucid, it contains but a small quantity of water, and possesses a suitable gravity and elasticity; it is positively electrified, and freely penetrated by the solar rays.

The effect of dry weather is to retain the electricity in the body. In this state, the air is electric; it per-

\* Some philosophers think, [however, that the ergot is the effect of insects that abound in wet seasons.

forms the functions of insulating, and prevents the electric gas, which incessantly accumulates the acting forces of life in animals, from being dissipated. In this constitution, the sensations are more acute; all the functions are performed with greater freedom and ease; the excremental humors are evacuated by means of transpiration, sweat, and urine; the appetite is greater, and the imagination is more lively and fruitful. Vegetables are also more sapid, and acquire a more suitable degree of maturity; they then furnish animals with a nourishment both wholesome and agreeable. But, in order that the serenity may enjoy all these advantages, it is necessary that it be sometimes interrupted by mild and moderate rains, otherwise it becomes inconvenient, and even injurious to vegetables and animals; it dries them, alters and destroys the nature of their juices, and renders their alimentary use less salubrious; it augments the action of the venous system in animals, and excites diseases, that have their seat in this system, and which are owing to the bilious diathesis. This constitution also augments the sensibility and vibratory motion of the fibre, and disposes to spasmodic and convulsive affections. But the diseases that are manifested during dry weather, are more regular, of a shorter duration, and are less severe, than those of the moist and rainy constitutions.

## 2. Air considered chemically.

Atmospheric air is a mixture of oxygen gas and azote. In an hundred parts of atmospheric air, there are about sixty-three parts of azote, and twenty-seven of oxygen. The carbonic acid gas, which is met with in it, is not a constituent principle;

it is only contained accidentally, and constitutes about the two-hundredth part of it. Oxygen gas or vital air is the only one that serves for combustion and respiration. Azotic gas appears to have no other function than that of moderating the action of the vital air, without which it would consume the life of animals with too much rapidity.

Respiration is a real combustion. In the same manner as this, it decomposes and alters the atmosphere, and it can only be performed by the influence of oxygen gas. When this gas has completely disappeared by its combinations with different substances, either by the act of respiration or combustion, the residue of the atmospheric air will no longer serve for either of these purposes; animals perish, and ignited bodies are extinguished in it. We thence easily conceive that very injurious effects must result to the animal economy, from a great number of men or animals being in a place not well ventilated, as in public shows, prisons, hospitals, cow-houses, and stables, in which the air, not circulating freely, is incessantly contaminated. Eudeometrical experiments prove, that respiration and the animal emanations have this effect. The action of the air thus vitiated, which is the same as that of the air which has served for combustion, is developed in the most active manner upon delicate persons, and those of great sensibility; and asphyxia, of which it is frequently the cause, is not the only serious accident, which they have to fear, who inspire it. The miasms which are continually escaping from the bodies of animals, conveys into the system a principle of *septicity*, and produces enervation, which tends to the destruction of life, and to the

production of contagious and malignant fevers, known under the name of hospital, prison fevers, &c. and which frequently produce sad ravages.

Respiration and combustion are then active causes, which continually alter the atmosphere and vitiate it; this air would soon lose the power of supporting life, if there was not in nature a power, continually in action, which replaces the oxygen gas thus incessantly lost. This power is the solar light, which disengages this gas from oxydes, from carbonic acid, water and vegetables exposed to its rays.

Eudeometrical observations prove, that the air which we respire at sea, is very pure and highly oxygenated.\* It is probable that the great purity of this air depends principally upon the immense volumes of water absorbing the carbonic acid and the pernicious miasms diffused in the atmosphere; and upon these waters which are salt, not being subject to corruption, especially in very warm climates, where they hold a greater quantity of salt in solution, than they do in cold climates.†

The experiments made by the celebrated Ingenhouz, upon vegetables, have given the following results:

1. All vegetables, not excepting the mosses, nor even the parasite plants, exposed to the contact of the

\* Hence the extreme fallacy of sending consumptive patients to sea. In inflammatory diseases of the lungs, air more highly oxygenated than ordinarily, increases the inflammatory action, and sound philosophy dictates a reduction of this active gas.—*Tr.*

† In the Baltic sea, a pound of water contains about two drachms of salt; double the quantity has been obtained from the sea between England and the United Provinces; that of the Spanish sea furnishes one ounce, and that of the sea between the tropics, from an ounce and an half to two ounces.

solar rays, transpire immense quantities of oxygen gas, which is supposed to be the production of the decomposition of the water that they contain. On the contrary, during the night and in the shade, they exhale the carbonic acid; they exhale this gas even after having been sometime taken from the earth; their leaves and branches recently separated from the trunks, also exhale it; but they furnish it in very small quantities, compared to the oxygen gas; during the whole night, they give scarcely the hundredth part as much carbonic acid gas, as they do oxygen in the space of an hour or two, when exposed to the sun.

2. Diseased plants, or those that have lost the vigor of vegetation, do not give out any oxygen gas, but they retain the property of transpiring carbonic acid gas.

3. When the heat of the summer is considerably diminished, the leaves and the fruit do not vitiate, in so great a degree, the atmospheric air, during the night and in the shade; flowers do not so soon lose this property. The leaves continue to give vital air to the sun late in autumn.

4. The nocturnal emanations of leaves, flowers, and fruits, are diminished during winter, only in quantity and not in quality.

5. Vegetables which preserve all their verdure in hot-houses or in other places, do not cease to exhale air to the sun in winter; but this air does not differ from the atmospheric. During this season, those same vegetables lose, in a great measure, the power of vitiating the atmospheric air.

6. This property which plants have of exhaling vital air in the sun, and carbonic acid in the shade,

augments towards spring in proportion to the vigor of vegetation.

7. There are some flowers that vitiate the air more than others. Violets, roses, mithridate, the flowers of the little laurel, those of the spurge laurel, are peculiarly noxious; it would be dangerous to keep a quantity of them in a close unventilated room.

8. The noxious emanation of flowers and leaves differ entirely from the *aroma* of plants; the former is as much to be feared, as the latter is innocent. Plants of a very offensive smell, do not vitiate the air so much, as those that diffuse a very agreeable odour, or those which do not give out any odour.

9. The mushroom at all times exhales carbonic acid gas.

10. When a leaf is reversed, the inferior surface turned towards the sun, and the smooth to the shade, it continues to give out air, but of a quality inferior to that exhaled in its natural situation; the difference is as 190 to 210.

11. Lastly. The air expired by animals, is less vitiated in winter than in summer, the difference is about as four to five.

The air we expire, is a mixture of carbonic acid, which existed in a small quantity in the inspired air, and of azotic gas, which also constituted a part of that inspired. The greatest portion of the atmospheric oxygen gas, is converted into this acid, by its combination with the carbon of the lungs. Another, but smaller proportion of the gas is united to the hydrogen, and forms with it, the water which is disengaged in the form of vapors. Lastly, another portion is fixed in the blood of the veins of the lungs, and it is

thus that the blood repasses to the state of arterial, by the loss of a certain quantity of hydrogen and carbon, and by a small proportion of the oxygen being fixed in the blood. It is thus that the blood acquires its vermilion color, and the specific stimulating quality, proper to produce the contraction of the two left cavities of the heart. But this new blood loses by degrees these qualities, to resume those of the venous blood, by absorbing the carbon and the hydrogen in the arterial extremities. Thus the venous blood differs particularly from the arterial, the former containing more carbon and hydrogen and less oxygen than the latter.

When the oxygen gas enters into some combinations, it loses entirely or in part, the caloric which it contains in abundance in its natural state; it thence follows, that it permits its caloric to escape continually during respiration. It was then, with reason, that the ancients regarded the lungs as the furnace of the animal heat. The caloric, disengaged from this gas, is fixed in the blood of the pulmonary veins, and in proportion as this blood re-absorbs the hydrogen and carbon in the different parts of the body, the capacity it has of containing the caloric between its particles diminish, and this is disengaged and diffused uniformly in every part of the system, disseminating throughout nearly the same degree of temperature.

From this theory we may easily conceive—1. Why those who reside on the mountains have warmer blood, than those of the vallies. 2. Why the temperature of animals that respire is higher than that of the medium in which they live, whilst those that have but small or no lungs, have a temperature corresponding

with their mediums. Among the warm blooded animals, those that have the largest lungs, relative to the size of their body, have the most heat; such are, among others, birds, which cause Farenheit's thermometer to rise to an hundred and eight degrees. We easily conceive that men who have very large and dilatable breasts, have warmer blood than others, and are more disposed to inflammatory diseases; and that violent exercise, as well as fever, by causing a greater quantity of blood to pass into the lungs in a shorter time, determine a greater number of inspirations, and consequently augment the animal heat. On the contrary, in a state of languor and extreme weakness, as in agony, the air penetrating the lungs with difficulty, the heat of the body is scarcely perceptible, and soon ceases. As the blood, in these circumstances, is surcharged with an exceeding great quantity of hydrogen and carbon, and as its oxygenation diminishes more and more, it soon loses its vital stimulus, the heart contracts no more, and life is extinguished.

Oxygen gas is the only respirable part of the atmospheric acid, and that which in respiration furnishes caloric; it thence follows, that if it was inspired without a mixture of azote, it would produce an excessive heat, and, consequently, pernicious effects. Thus an idea, as true as ingenious, was presented to Macquer, when he said, that as the vital air causes substances to burn rapidly, just so, when respired by animals; it must augment the motions of life, and abridge its duration. Experiments have verified this opinion: if an animal be plunged in vital air, the respiration and motions of the heart acquire an intensity and an increased force; in a short time it experiences

a violent fever, its eyes become red and swollen, sweat flows from all parts, and the heat obviously augments; lastly, the inflammatory fever becomes more and more acute, and is soon followed by a mortal gangrene, of which the lungs are the seat.

These phenomena explain why highly oxygenated air, such as that respired upon the sea and pretty high mountains, is pernicious in consumption with an inflammatory diathesis, as well as in all analogous diseases. This gas inflames the lungs, and produces in them effects that are observed upon animals plunged into it. This truth was not unknown to the ancients; they feared the effects of the oxygenated air of high places on the lungs, and preferred that of the plains and valleys. Their practice accords with experimental knowledge, for the use of this gas, injurious to consumptive patients, in consequence of the excess of heat which it conveys into the lungs, already too much stimulated, is, in fact, much more abundant upon the sea, and tolerably high mountains, than in the plains.

The diminution of the vital air in plains, is principally owing to the great number of animals that inhabit them, to the vegetation, which is not so great there, and to the multiplied combustions, that are incessantly carried on in these places. Upon tolerably high mountains, the pines, fir-trees, and ivy, are always green, and consequently always active, continually exhale large quantities of oxygen gas; they protect the numerous families of plants, which grow near them, against the vicissitudes of the seasons, and furnish with difficulty, nourishment to a small number of wandering herds, during some months of the year.

In the countries of plains, on the contrary, we meet with a multitude of places that have no vegetation; such as towns, villages, hamlets, roads, &c. many places which remain uncultivated from one year to another, vast forests and thick woods which are impenetrable to the air and winds, while millions of men and animals incessantly vitiate the air in these places, by their respiration and their excretions. If we add to these causes the numerous combustions which are in the habitations, in the lime-kilns, glass-houses, forges, and other factories; lastly, the exhalations which proceed from laboratories, work-shops, and filthy streets, sinks, grave-yards, privies, substances in a state of fermentation, &c. &c. we shall see that the proportion of oxygen gas should be much less, and that the miasms which corrupt the air, are infinitely more numerous in level, than in high and mountainous countries.

From what has just been said, we must infer that highly oxygenated air cannot be proper for sanguine, bilious, or atra-bilious persons, nor for those whose fibre is small, very sensible, and irritable. Individuals subject to nervous asthma, are also injured by it; in these it produces contractions of the breast, and fatal suffocations, in consequence of the spasms of the diaphragm, produced sympathetically, by the contact of this air upon the lungs and upon the skin or cutaneous organ.

This gas, not only furnishes too much caloric, but it is also a powerful stimulant, that excites the action and sensibility, already too great, in these subjects. The air of plains and valleys, of cow-houses and stables, is most proper for persons laboring under these

diseases; being charged with moisture and carbonic acid, it is, consequently, less vital, and retards not only the activity of the vital flame, but it also diminishes, by its relaxing quality, the spasms of the breast.

The highly oxygenated atmosphere of the sea, and especially of mountains not too elevated, is salutary to persons of a phlegmatic constitution, whose fibre is soft, inert, and imbued with a superabundant serum; it is useful to all those affected with humid cachexia and cold humors; in a word, it is salutary in cases of marasma—that is to say, in all affections characterised with paleness, feebleness, a habitual sensation of cold, and a slowness of motion. In addition to its reanimating the action, and its disengaging a great quantity of caloric in the lungs, it positively electrises, and produces upon animals the same happy effect that it does on vegetables exposed to its influence. In animals, this effect is owing to the light which is separated from it in respiration, and which probably combines in a quiescent manner with the blood.

It is not only the air vitiated by respiration and combustion which perniciously affects men and animals; the gas which vegetables and animals in a state of fermentation, give out, is not less dangerous. Grapes, barley, &c. when fermented in cellars, disengage, the same as charcoal and coal in a state of ignition, large quantities of carbonic acid gas which, respired, occasions asphyxia and soon death, if the person who respire them is not promptly relieved. This fatal effect has been, sometimes, seen produced by this same gas exhaled from odoriferous flowers and fruits, confined in close and unventilated apartments.

As respiration is a real combustion, it is proper to act, in cases of asphyxia produced by the non-respirable gases, in the same manner as we do when we wish to rekindle coal, almost extinguished for the want of the communication of air; provided their extinction be not complete, they relight, by simply exposing them to the free air, or by blowing them. It is absolutely the same with animals struck with asphyxia; however, when this is great, this means is insufficient, because the motion of the breast having entirely ceased, the air can no longer penetrate the lungs; in this case, it is necessary to renew the heat of the patient, when it is below the twenty-ninth degree of Reaumer's scale; but the heat must be applied gradually, uniformly, and never beyond the thirty-first or thirty-second degree; for strong heat, or that applied suddenly, rapidly destroys the vital principle. When the heat of the patient is renewed, it is advisable, if he does not respire, to inflate the lungs with a large quantity of air, and especially vital air, which is much the most efficacious; it is desirable that there be, at each inflation, more than an hundred cubic inches, and that the air be expelled each time, before new air is introduced. When these means are unsuccessful, it is necessary to excite the play of the organic parts and resuscitate their sensibility; to effect this, stimulants are employed; such as acids, spirits of ammonia, tobacco smoke injected into the intestines, and the throwing of cold water upon the body. Electrifying appears to me a very efficacious cure for asphyxia; Fontana's experiments on animals, tends to support this sentiment; the happy results of this experimenter, from active stimulus, induces me to believe

it might be advantageously employed in this disease. It is only by the continued application of these means for a long time, that we can hope to succeed; patients have been seen laboring under this affection for two or three hours after assiduous endeavors to resuscitate, without giving signs of life, but have finally recovered, and they may always be restored when the sensibility is not completely destroyed.

Goodwin is wrong in rejecting all other means than the application of heat and the inflation of the lungs; for observation proves, that in a number of cases success has been obtained by the application of stimulants or irritants to the skin and intestines. Men who have long labored under an asphyxia, produced by the vapor of charcoal, have been cured by cold water being dashed upon their body, and by being plunged into a cold bath. Dogs which have been suffocated by the vapors of the *Grotto del Canni* near Naples, have been immediately reanimated by plunging them in the neighboring water.

In Russia and Siberia, where it is not rare to see persons suffocated by the air heated and charged with the vapors of the stoves, it is customary to expose those thus affected, to the open air, to wet their bodies with cold water, and to rub them with snow until it is melted.

Dry frictions upon the body are useful, not only from producing heat, but as excitants: benefit is sometimes derived from covering asphyxia patients with warm ashes or salt. Active stimulants, such as ammonia and acetic acid, have also been happily applied to the most sensible parts—such as the nose, mouth, &c.; but patients thus affected, should not be made to

swallow, before deglutition is completely reestablished. Where deglutition is not impaired, small quantities of wine or other spirituous liquors should be administered, and even emetics may be given where there are symptoms indicative of the necessity of their use.

There are a multitude of elastic fluids and miasms of a different nature, as well as the carbonic gas which the atmosphere receives into it, which continually tends to alter it, and render it impure and unhealthy. Minerals are volatilized, vegetables and animals continually transpire—they constantly experience alterations and decompositions; insensible particles are incessantly discharged from them into the air, and float with the current of the winds.

There are no substances in nature subject to friction or attenuated by the decomposing action of caloric, that are not disseminated in the atmospheric ocean; the seeds of a great number of plants, and the eggs of an infinitude of insects, are supported in the air and transported by the winds. The atmosphere is a vast reservoir, which receives all the concrete or fluid substances susceptible of being converted into vapor, at the degree of heat and pressure which we habitually experience; when these vapors are sceptic and are aspired by animals, either by respiration or cutaneous inhalation, their action is dreadful.

It is, in a great measure, to the vegetable and mineral emanations proper to each country, that their local constitutions and endemical diseases depend; a knowledge of which can only be obtained by studying the natural history of the said country; and the concatenation of knowledge is such as to make it desirable to become acquainted with natural history,

meteorology, chemistry and nosology, to attain this end.

There is one thing worthy of remark, relative to the exhalations of the earth, which produce insalubrity, i. e. when we undertake to cultivate ground that has been for a long time untilled, or which has never been cultivated, pestilential exhalations arise from substances brought to the surface of the earth by the labor of husbandry; these exhalations cause epidemics, whose intensity and duration are in proportion to the nature and extent of the ground thus cultivated; it is owing to this circumstance that a great number of persons have been victims to the clearing of grounds both in America and its islands, and in Europe. The culture of the earth is, nevertheless, of the greatest utility; independently of the advantages that it procures to animal life, it contributes not a little to purify the air which we respire. The earth which we inhabit, has only become salubrious by clearing; in its original state it was covered with thick forests and foul marshes, which infected the atmosphere and conveyed destructive miasms in the sources of life; the labor and sweat of our forefathers have changed the face of the globe, and rendered it inhabitable. It has also been observed, that clearing renders certain meteors more frequent, and sometimes produces new ones.

Since the Europeans have cultivated the lands of America, the temperature of this country has changed, and the storms which were so rare here, as scarcely to be one in seven years, are at present very common. Canada, which was formerly very cold and rainy, now possesses a mild temperature, owing to its inhabitants

having cut down great forests, dried the marshes, regulated the water courses, and built towns and villages. By these means the nature of the exhalations have been changed, the current of the winds and vapors have become more free, and their electric gas, which was hitherto absorbed by the water and vegetables, circulates more easily in the atmosphere.

Earthquakes, by giving place to abundant exhalations, frequently generate epidemics; these have made very frequent ravages since 1755, at which period, the earthquake that destroyed a part of Lisbon, occurred, and which shook not only all Europe, but also extended its terrible commotions into a great part of Africa and America, and even into some countries of Asia, and into *Terra Arctica*.

The aurora borealis has also been more frequently noticed since 1716, and perhaps earthquakes are the cause of this meteor. The matter or substance of which the aurora is formed, has become more abundant in the atmosphere, in consequence of the violent and augmented commotions that the globe has experienced since these periods; these commotions have opened issues through the earth's surface, by which a prodigious quantity of hydrogenous gas, or other inflammable matter is diffused, which inflaming by the electric sparks in the superior regions to which they ascend, owing to their lightness, probably produce these ignited meteors. If they depend on the diurnal motion, as some philosophers pretend, we ought always to observe them; but so far from this being the case, they disappeared for more than a century, but have reappeared frequently since 1716.

Let us observe, however, that the aurora borealis

is a meteor, which belongs in part, to electricity. During the appearance of this phenomenon, we notice stars falling more frequently; which are very probably electric fires—such as meteors and fire balls, and which we hear explode in the air resembling the explosion of electric fluid. Moreover, the aurora borealis causes the direction of the magnetic needle to vary sensibly, and perceptibly electrises the insulated points; finally, we cannot doubt but that when this meteor appears, that the abundance and play of the electric and magnetic fluids are obvious, and that during hurricanes, of which the aurora is ordinarily the precursor, these two fluids are still in action.

Observations seem to prove, that earthquakes have contributed, in a great degree, to the production of the remittent and intermittent fevers which have succeeded them; at least, it is very probable that that which occurred in 1783, at Messina and Calabria, gave rise to these diseases, which were epidemic during the autumn of that year; and that it also produced those dry fogs which appeared on the 18th of June, 1783, and which continued as veils or curtains for several months, to the astonishment of Europe. Many storms were the precursors of them, as they were the consequence of these. The sun appeared very glim through those fogs, and might be viewed for a considerable time with impunity; it was of divers colors, owing to the different refraction of its rays, occasioned by the fog, whose density varied accidentally in divers countries; it appeared pale and whitish when it was very high above the horizon, and resembled a globe the color of blood, at its rising and setting. The autumn which preceded was very cold and wet, the winter

mild and wet, and the spring cold and wet. Instead of three or four inches of water, which the three winter months ordinarily furnish, twelve had fallen, whilst in the south they complained of a drought for two years. After the melting of the snow, there were abundant rains and considerable inundations.

That dreadful earthquake of Calabria and Sicily, which lasted five months, occurred on the fifth of February. Continual rains preceded these violent convulsions. The earth had so completely absorbed the rain, as not to appear wet at its surface. The atmosphere felt its effect in all Europe, as was proved by the sudden and frequent oscillations, which the mercury in the barometer experienced during the months of February and March. The concussions of this earthquake were so strong, as to form a new island in the vicinity of Iceland.

This fog did not dissolve salts, nor raise the hygrometer; it did not obstruct evaporation, nor tarnish glasses; it sometimes diffused a sulphurous odour, and during the nights of the 26th, 27th, and 28th of June, it deposited upon vegetables, a thick and gluey water, of a disagreeable taste, a little foetid, and very caustic. In the environs of Narbonne, the flowers of the vine and the olive-tree, were burned, and the most of them fell. In other places, the fog killed the wheat, and produced harvest before its due time. From experiments which were then instituted, it resulted that the air differed scarcely any from the ordinary atmosphere.

However extraordinary this fog has appeared, it was not a new phenomenon. In the year of the death of Cæsar, the sun was darkened, and for several

months only emitted a pale and languishing light; it appeared red and surrounded with circles. In the two hundred and sixty-fourth year of the christian æra, there was an earthquake and darkness several days. In the course of July, 1764, a fog similar to that of which I have just spoken, was observed.

Finally, it has been remarked, that those countries in which the fog of 1783, remained the longest, were those in which diseases were the most violent and dangerous, and the patients the most numerous. Countrymen, and those who worked in the open air, were sooner attacked by disease, and more violently held, than those less exposed. Moreover, the number of sick women was very small, because being assiduously engaged in domestic labors, they were much less exposed to the action of the fogs. Of ten sick persons, there were scarcely two women.

There is no question but that other meteors produce useful or pernicious alterations and changes in the atmosphere, and occasion epidemics and contagious diseases analogous to their nature. We know that thunder and lightning, in a word, stormy weather, rapidly promotes putrefaction, and renders the sick state worse. But our knowledge respecting the influence of the greater part of the other meteors, is too limited to enable us to apply them to men and animals. Perhaps, by dint of observation, we may one day have certain data upon this subject, by means of which we shall be able to obtain results useful to the healing art.

### 3. Atmospheric electricity.

The electric gas is universally diffused throughout nature; every body or substance contains a quantity

of it, proportionate to its nature. It remains in substances in a state of inertia, which prevents them from manifesting its presence, until by some cause or other its equilibrium is broken. Thus, if we accumulate in one body a superabundance of this fluid, (positive electricity or *in plus*,) or if we abstract from it a portion of what it naturally possesses, (negative electricity or *in minus*,) then the electric virtue discovers itself, by a multitude of different effects; such are, among others, the attraction and repulsion of light bodies, the impression of blowing, scintillation, commotion, &c. &c.

Bodies or substances present three different states of electricity: 1. Some are electric by friction, or *idio-electrics*, *electrics perse*; such are glass, rosin, sulphur, &c. 2. *Non-electrics*, or conductors; that is to say, they do not receive electricity by friction, but by communication; such are water, especially in a state of vapor, metallic substances, &c. 3. There are *pyro-electrics*, that is to say, those that become electrics by heat, as tourmalin, the emerald of Brazil, that of Siberia, &c. But what particularly interests us in this place, is the prodigious quantity of electric gas diffused in the globe and in the atmosphere. The first may be regarded as a non-insulated conductor, and the atmosphere as an electric body. The electric fluid is continually carried from the one to the other by a very rapid commotion; besides they both have divers motions in different directions. The earth is the *rubber* of the electric machine of nature, and the atmosphere the electric body. The clouds are insulated bodies which communicate with the air, and which frequently pass through it in a very rapid man-

ner; in addition to which, an alternation of heat and cold completes the whole of the causes that produce natural electricity.

The atmosphere naturally contains an immense quantity of elastic matter, which is manifested in the most sensible manner, either by electric flying kites, or by raising insulated rods. When clouds, even without rain or thunder, pass above these, they give sparks by contact, and when the atmospheric electricity is weak, they only attract dust and other light bodies. Ravens have sometimes been seen flying through the air, whose bills gave out the electric fire. We know that this bird, whose wings are very long, rises very high, even to the upper regions, where the electric fluid is very abundant, especially when it thunders. It is probable, that it was from some observation of this nature, that the eagle acquired the name of the *minister of thunder*, for there are but few fables, that do not contain the germ of some truths. During storms we also observe upon the masts and yards of vessels, an electric light, known by mariners under the name of *meteors*, *Saint Elme*, *Castor and Pollux*, and *Helen*. All these facts, and a multitude of others, which it would be superficial to relate here, prove that the atmosphere is a vast reservoir, which contains an abundance of electric gas.

The electricity of the atmosphere, accordingly as it is positive or negative, produces different effects upon vegetables and animals. It is positive when the air is dry and freely penetrated by the solar rays. It is generally manifested in this manner, in high situations, especially when winds from the north and east prevail, in rarified air, and principally in that which

is highly oxygenated. Mephetic gasses are not at all favorable to electricity; a rod of iron well electrized, plunged into an æriform fluid of this nature, does not exhibit any signs of electricity.

The atmosphere is negatively electrized, or in *minus*, in deep and mephetized places, in cloudy and moist weather, and when winds from the south and west blow. Under these circumstances, the natural electricity of vegetables and animals is absorbed, as well as that of the air, by the watery vapors with which it abounds, and which hold the first rank among the conductors of electric fluid. The electricity of the atmosphere is also negative, when the clouds electrized in *minus*, passing over a country, absorb the electricity of the earth and air, and consequently that of other bodies.

Living animals are constantly electrized by the vital energies. In fact, they are provided with parts, some of which, such as the nerves, cartilages, bones, &c. are electrics; and others, as the blood, serum, fat, muscles, &c. are non-electrics. The nerves possess also the conductive property; they possess this in common with glass, which always possesses the *electric per-se* and *non-electric* virtues. Animals sensibly experience the influence of the double atmospheric electricity; this preserves or deprives them of what they naturally possess, it excites or diminishes it.

The effects of positive electricity, are to accelerate the flowing of the fluids in the capillary tubes, and of augmenting the motion of the blood in the vessels, promoting the secretions and especially transpiration, producing an appetite, exciting the animal energies, communicating to the body more agility and vivacity, and of hastening the development of the vegetable

and animal germs. Negative electricity does not act thus; it diminishes the number of pulsations of the heart and arteries, in the proportion of two to eighty, as is proved by Dalibard; the secretions are performed more slowly, and it produces languor and inertia. From what I have just said, we may easily conceive the effects of atmospheric electricity upon animals. When the air is *positively* electrized, the animal functions should be performed with facility, particularly the sense of pleasure. When *negative* electricity prevails, animals are feeble, languishing, and even in a dejected state. The latter sensations are what we all experience in those days, designated under the vulgar name of *oppressive*. The springs of the machine are deprived of their force and energy, we should say, that they are relaxed. Those circumstances ought to apply equally to the vegetable system, which presents the same phenomena under the influence of the two electrics, as has been proved by the experiments of Bertholon, Dormoy, &c.

The principal results of the experiments, which have been tried on animals, are the following:

1. An electric spark drawn from a muscle or nerve, causes very violent involuntary motions, and a very acute sensation. The irritability of the heart is more powerfully excited by an electric spark, than by any other stimulus.

2. A globe or a machine made of human nerves, substituted for a glass electric machine, gives obvious signs of positive electricity, it likewise insulates the conductors which are electrified.

3. Electricity is more powerful in the living body in proportion as life is more active and the more in-

tense. The leyden phial charged, loses its electricity more slowly, near a person laboring under a fever, a maniac, or one affected with pains or spasms, than near a healthy man.

4. Violent electric shocks destroy the irritability and the sensibility, and carried to a certain point, they produce sudden death.

5. There are animal electrics, that may be regarded as real leyden phials, and which, when touched, shock; such are the eel of Cayenne, the *trembleur* of Senegal, the torpedo, &c. These animals have one of their surfaces *positively* electrized, and the other *negatively*.

If we place nine persons upon a line, standing upon a brass rod, and holding their hands in vessels of water, and if the one at the end of the rod touch a torpedo, placed in another vessel of water, they will all experience the shock at the same moment.

6. The electric bath. Electricity by means of blowing and of sparks, are the most efficacious means in the treatment of the diseases, which are susceptible of a cure by electrization. Shocks are not always exempt from danger.

The nature of the electric fluid is unknown; it burns, produces light, detonates, and is perceptible to the touch and smell. The galvanic fluid, which has claimed the attention of the medical world for a short time, is, perhaps, nothing but the electric gas modified.\* This appears also to be very analogous to the

\* The first experiments upon native electricity or galvanism, are due to the learned Galvani and Valli. It is to Volta that we are indebted for the following means of using it, which is one of the most easy and simple:—Place a bit of pewter or zinc upon the tongue, and a bit of silver under it, and we shall not experience any sensation, until the metals are brought into contact; but if this is done,

magnetic fluid. The magnetic needle is agitated during storms, the same as by the aurora borealis; thunder changes its direction, and alters its properties. By electricity we not only influence the poles of the magnet, but also communicate to iron magnetic virtue; consequently, the old iron of buildings, which have long remained exposed to the action of the clouds, and that have been struck by lightning, possess the magnetic virtue. The loadstone is one of the minerals, that gives in its original state, the most sensible signs of electricity.

We may thence presume that this mineral is

or they are made to communicate by a metallic conductor, we feel at the moment a singular taste, which varies when the metals are changed, and which become the more intense, when one of the pieces is coated with mercury; it then even produces a copious salivation.

If we separate the hinder part of a frog, and dissect the crucial nerves, so as to leave them bare, and unite them afterwards by uniting their two extremities in a small piece of pewter leaf, and then place in a vessel of water, or, what is better, of oil, the members of the frog thus prepared, and afterwards place under their feet a plate of silver, we excite violent convulsions in the parts subjected to the experiment. This fact is not peculiar to cold blooded animals. Citizen Tarey having amputated the thigh of a man, dissected the plopliteal nerve, and after having insulated the trunk as far as its most minute branches, he enveloped it in a leaf of lead, after having laid bare the muscles; then he took a piece of silver in each of his hands, and as soon as he touched one with the armor of lead, and had put the other piece in contact with the muscles, considerable convulsive motions occurred in the leg and foot. Iron and steel do not produce these effects in so high a degree; but the latter becomes more intense, when we use a crooked silver probe, also when the member is nearly cold. Sealing wax, or a very thin lamina of glass prevents all these effects. We have recently seen water decomposed, and considerable commotions produced in it by galvanism. In short, the insulators and conductors of galvanism are the same as those of artificial electricity, &c. &c.

All these circumstances induce us to believe, that there is an identity, or at least a great analogy between the galvanic fluid, with which living bodies are penetrated, and the electric fluid. We may add, that men and animals do not produce by contact, any galvanic sensation or motion, and that opium, and other irritating substances, applied to the extremities of the nerves, act more powerfully, than when applied to their origin. The researches upon this subject are continued with ardor, and it is to be supposed, that some useful results will be obtained from galvanism.

nothing but iron, which has been thus changed in the bowels of the earth by means of thunder and electrical streams or flashes. This opinion seems to be supported by an observation of Dalibard; who remarked that the extremity of a rod of iron by which he introduced electric fluid, always pointed towards the north. The analogy of these two fluids is also supported by the observations of citizen Cotte, from which the following results; 1. That the magnetic needle has a diurnal periodical variation; 2. That the greatest variations towards the west take place at three o'clock in the afternoon, and the least about seven or eight o'clock in the morning; 3. That the greatest agitation takes place after eight o'clock in the morning; 4. That about the first of November it experiences a singular inclination towards the west, where it remains for a time almost stationary, but afterwards veers to the north, and that it is prodigiously agitated in November and December; 5. Lastly, that it experiences the greatest commotions during the appearance of the aurora borealis.

We may compare some of these results with those obtained by Dessaussure, from electric experiments made by him on the *Col du Geant*: "electricity augments gradually," says this celebrated philosopher, "from the fourth hour of the morning, when it is almost void, until mid-day or two o'clock, when it is at its *maximum*;" but as respects the menstrual variations, it appears, that it continues to augment from November until April, and that it afterwards diminishes until October. This last result is entirely opposed to the other observations, which indicate the natural electricity to be greater and more powerful in the summer than winter months.

## CHAPTER III.

*On Winds.*

THE atmosphere is a vast ocean which has a circuit of nine thousand leagues near the surface of the earth, and a height too considerable to be determined. Its equilibrium is continually disturbed by the incessant action of a multitude of causes, and a current is excited in it; as is the case in every fluid whose particles cease to be equiponderant. Wind is a sensible agitator of the air, which transports a certain quantity of it from one place to another, with a determined swiftness and direction. The swiftness of the wind is sometimes very considerable; according to the calculations of Mariette, the *maximum* is thirty-two feet per second; that is to say, it can traverse a space of about nine leagues and a half in an hour; however, in great tempests it has been observed to traverse as much as fifteen leagues in an hour. Moreover, the Jesuit Laval relates, that the impetuous wind of the north, that ravaged all the fields of France the 6th of January, 1709, commenced at Besançon at three o'clock in the afternoon and reached Marseilles by six in the evening; thus it traversed one hundred and eighteen leagues in three hours. The force of wind is in proportion to its swiftness; it is sufficient to transport ships in the open sea—it has a swiftness of two fathoms per second.\*

\* Professor Mitchell of New York has presented the readers of the Medical Repository, in vol. V. 1st Hex. of that invaluable work, with an interesting history of a snow storm, which took place on the 21st, 22d, and 23d of February, 1802, and which swept over a sea coast of almost 1100 miles in somewhat more than eleven hours.—*Tr.*

Winds are divided into general or constant, periodical and variable.

The first are those that constantly blow in the same part of the atmosphere; such are the trade winds, which prevail perpetually from east to west in the great seas between the tropics, where no local cause can change them, except it be the different declinations of the sun, which produce periodical changes. These winds are not felt on the land, owing, doubtless, to their being broken by the mountains, course of rivers, islands, archipelagos, and other obstacles; they are also changed in the sea, near the coasts, by particular winds that come from the land.

The periodical winds commence and terminate at fixed and determined periods; they are also called *anniversaries* and *monsoons*; they are very useful to navigation, since their periodical return always takes place at the same time of the year; such are those that blow from the south-east from October to May, and from north-west from May to December between the coasts of Zanguebar and the island of Madagascar. To these winds we may refer those that daily prevail in warm countries and in the temperate zones, during hot weather; these have been called land and sea breezes, or *vent du large*.

The variable winds are those that blow sometimes from one coast and sometimes from another, and which observe no regularity in relation to places, time, direction, duration and swiftness.

There are also local winds, such as the *mistral* in Provence, the *harmatan* upon the coasts of Guinea, the *beef's eye* at the Cape of Good Hope, and the fifty days wind in Egypt. The *mistral* is a north wind,

which only prevails in that large basin, formed on the one side by the Alps, and on the other by the mountain of *Vivarais* and *Languedoc*; the mass of air enclosed in this basin, being warmed to a great degree by the sun, suddenly dilates and escapes with impetuosity by the only issue left, upon the Mediterranean.

The *harmatan* is a particular wind on the coast of Guinea, which begins to blow about the end of December and beginning of February; between these two terms it lasts two or three, and sometimes five days. It is so strong and piercing as to disjoint boards from houses, and the decks and sides of ships above the water; these openings continue as long as the wind is in force, after it ceases, they are closed. During this period men and beasts remain within doors, otherwise they would perish unless their bodies were coated with oil or fat. This wind blows between the east and north-east; it is so dry that it crisps parchment and leather nearly as fire. It is very cold, without lightning, thunder and rain; during its duration the sky remains cloudy, but so soon as it terminates, the ordinary wind, which upon this coast is west south-west, or south-west, recommences to blow, and the sky resumes its serenity.

The *beef's eye* of the Table mountain at the Cape of Good Hope, is a small cloud that the mariners perceive scarcely soon enough to lower their sails, so quick is the tempest. They have given this little cloud this name because it appears at first in the heavens as a little round spot, which is tranquilly formed, without any perceptible motion in the atmosphere, but which suddenly produces the most terrible

storm, which would precipitate ships to the bottom of the sea if their sails were unfurled.

Upon the coast of Guinea furious hurricanes, called *travades* or whirlwinds, are also experienced; these last scarcely an hour. A cloud, that resembles a very small point, moves at first in the air, then it extends with an inconceivable rapidity, covers all the horizon and finally, forms a dreadful tempest, producing lightning and thunder. Such is the swiftness of this storm that those who are in the open country have only time to throw themselves upon the ground, and those who are sailing, of lowering their sails and cutting their rigging, to avoid being submerged by the waters.

On the top of the *Canigou*, in the Pyrenees, there is a singular fish lake, which gives place to an analogous phenomenon; if a stone is thrown into it, a small vapor rises, which forms a pretty considerable cloud, whence proceeds a tempest accompanied with rain, hail, and violent claps of thunder.

The fifty days wind is not peculiar to Egypt, it is common in Syria, Arabia, Persia, Africa, and even in Spain; its effects in these countries are the same, but its direction is different: in Egypt the most violent is from south south-west. It is called fifty days, not that it continues this number of days, but from its blowing within the fifty days next to the equinox: it is also called the *empoisoned* wind; and, more correctly, the hot *wind of the desert*. So great is its heat, says Volney, that its impression can only be compared to the mouth of a hot oven at the moment that the bread is drawn from it. When these winds begin to blow, the sky, always so pure in these climates, be-

comes clouded, the sun assumes a violent aspect, and the air is filled with a very fine dust, which does not fall but penetrates every where. Whilst this tempest lasts, men and animals experience obvious changes; respiration becomes short and laborious, the skin dry, and an extraordinary heat and thirst which nothing can diminish, is the tormenting companion of those exposed to it. During its continuance, the inhabitants confine themselves to their apartments. It ordinarily prevails three days; if it exceeds this time, it becomes insupportable and dangerous, for it instantly suffocates and produces immediate death; especially at the moment of the sudden burst of wind. These accidents may be avoided by closing the mouth and nose with handkerchiefs. Camels, guided by their instinct, plunge the nose in the sand, and there they stay until the heavy blow is over.

This wind is so excessively dry as to evaporate in a few minutes, the water with which the apartments have been washed. It withers and dries the plants, crisps the skin of animals, closes the pores, and causes a febrile heat which accompanies suppressed transpiration.

We observe in the atmosphere, the same as in the sea, two grand general motions. The current from the east to the west, or the general east wind; and two other continual currents, each from the poles towards the equator, in the inferior or lower atmosphere; whilst in the superior or upper part of the atmosphere, these currents produce opposite effects, proceeding from the tropics to the poles.

The current from east to west, or the general east wind that blows between the tropics, is owing to the

rotation of the globe from west to east; which motion is, in consequence of its mass being more accelerated than that of the atmosphere, and the action of the sun and moon upon the ærial ocean.

The two other currents, each established from the poles towards the equator, or anniversary periodical winds, depend upon the annual motion of the earth; local circumstances, and some other secondary causes, modify their action.

The principal causes of the other winds are:—1. Heat, which more or less rarifies the air; 2. Cold, and especially that which, suddenly taking place, immediately condenses it; 3. Ascension of gas and vapors in the atmosphere, and their more or less impetuous precipitation; 4. The pressure of clouds; 5. The appearance of ignited meteors; 6. Lastly, the rarifying action of the sun and subterraneous fires. Such are the principal causes which, by disturbing the equilibrium of the column of the atmosphere, give birth to these meteors; which are as useful in the natural order, as they are sometimes pernicious by their violence, and the exhalations with which they are charged.

There are as many kinds of winds as there are degrees in the horizon, but usage has prevailed in dividing them into thirty-two points; the four principal, are the north, south, east and west winds; the intermediate ones are divided into north-east, south-west, south-east, and north-west; these participate of the two cardinal winds between which they are placed. They are further divided into winds of north north-east, south south-west, &c.; the first is that which is one point nearer the north than east, the other one point nearer the south than west, &c. This division

commonly extends to thirty-two, as I have already said; beyond this term it is not possible to observe their variations.

The nature of the earth, and the species of climate that the winds pass over, decides their qualities; thus the north wind is cold, because it circulates in the cold countries before it reaches ours; it is rainy in Africa, having passed the Mediterranean. The east wind is dry; coming from the sandy plains of Asia, it almost always produces dry weather. The south wind is warm, owing to its passing through the torrid zone. Lastly, the west and south-west winds are damp; being loaded with the vapors of the ocean. Thus the winds are warm or cold, dry or rainy, according to the places from which they come, and those through which they have passed. In general those that pass over continents are dry, whereas those that traverse the seas are moist; hence, in France, the south winds which pass over the Mediterranean, and those of the west that traverse the Atlantic ocean, are damp; whilst the winds of the east and north-east, which have passed through the extensive continents, are very dry. Toaldo has remarked, in relation to the winds of the south-east and north, that they blow nearly an equal number of days for eighteen years; which indicates a certain relation between them and the nodes of the moon, and the double revolution of the perigee.

Hippocrates has not acknowledged, in the winds of the east and west, any proper and determined quality. He has reduced them all to two principal ones—the north and south winds; according as their direction approaches more or less to one of these

two points, "the south wind renders the hearing dull, the head heavy, enervates the body, and makes the person timid and lazy; those of the north produce cough, dry the throat, constipate the bowels, occasion a difficulty of urine, produce chills, pain in the side and breast."—Hipp. Ap. 5. sect. iii.

The action of the wind upon the body is relative to the qualities of the air, and differs according as this is warm or cold, dry or wet, more or less oxygenated and electrified or charged by noxious, malignant and deleterious exhalations. Besides, they exercise by their impetuosity, a mechanical action in a greater or less degree, upon the skin, whose sensibility they consequently modify; they act by compressing, as if the weight of the air was augmented; they apply to the surface of the body in a given time, a greater mass of air. Hence, the atmosphere exercises much greater activity upon animals, when the wind blows than when it is calm. Winds are dashes of air, and as dashes of water are more efficacious than the bath, the wind also acts to more advantage, than the air, that does not experience any agitation. Winds are of very great utility; they cool the air, moderate the heat of the atmosphere, and destroy the vapors and miasms which it contains. Even the most disastrous storms are the most powerful ventilators, which divide, carry from us, and bury in the abyss of the sea, pernicious and morbid exhalation. We also observe that the seasons, during which the air is calm and tranquil, are the least salubrious; they frequently give place, especially in summer, to contagious diseases. Still air is the same to animals and vegetables, that the muddy water of marshes is to the fish of

rivers. The succession of winds is not less useful, as has been well remarked by Hippocrates; he condemns Asia in consequence of the constant and moderate winds which prevail there, and attributes with reason the vigor of the body and mind of the Europeans, to the frequent changes of the winds, which occur in their country.\*

The winds afford many other advantages; they transport the clouds to water, and fertilize the earth of the different climates; it is upon their wings that the seeds of vegetables are carried to a distance, and it is by this means that plants and *unisexual* trees are reproduced and multiply. Among those plants is the male palm, the *pollen* of which, transported by the winds, is carried a great distance, to fecundate the female of the same species.†

Winds are frequently injurious, especially to delicate persons, and those of great sensibility, by their sudden transitions; as, for example, when the wind very suddenly changes from north to south, or from this to the north; those sudden changes produce the same, or perhaps a greater effect on the animal system, than the sudden transitions of temperature, as from heat to cold.

It is not only on the physical part of man, that winds exercise their influence; they also act upon the mind, and modify according to their divers qualities, its state. At Messina, when the south-east winds

\* Hipp. lib de ære, aquis et locis.

† Jovian Pontonus relates that there was in his time, two palm trees, the one male, cultivated at Brindici, the other female, in the woods of Otranto, more than fifteen leagues apart; and that the female tree never produced fruit, except when it grew above the other trees of the forest, which enabled it to receive the fecundating *pollen* of the male tree, wafted thus far by the winds.

prevail, the inhabitants are languid, debilitated, and without ideas. At Montpelier, when the wind blows from the sea-coast, one experiences weariness, heaviness of the head, debility, and an inaptitude to every species of application. The east wind, and especially that of the morning, produces by its purity and its coolness, cheerfulness, lightness, and a singular fondness for the labors of the mind. The air of the evening which is damp and cool, on the contrary, weakens the imagination, and destroys the clearness of the ideas.



## CHAPTER IV.

### *On Light.*

LIGHT is a very subtle, attenuated, and perfectly elastic fluid, which circulates with a prodigious swiftness,\* in the direction of right lines; it penetrates all substances, and one of its principal properties is to enable us to judge of objects at a distance, and to give these color and splendor.

Whatever opinion we embrace respecting the nature of light, we cannot think otherwise, than that it is diffused in all space. I think, with Euler, that it is a real fluid disseminated every where, that the luminous bodies excite motion to produce colors, as the sonorous bodies agitate the air to produce sounds.

\* The velocity of light is to the mean swiftness of the earth, as 10,000, or as 10,800 are to 1. It traverses 71,306 leagues in a second, whereas the earth only makes in this space of time, six leagues and a half. Light is more than 900,000 times swifter than sound.

Light is one of the greatest blessings bestowed on man. What would all the productions of the earth be without it? In vain would our eyes pierce the dark veil of night; the traits of nature would escape us, and the earth would be but a frightful desert, a horrible and confused chaos. But so soon as the light darts forth its rays, the darkness is dissipated, all objects are developed and painted upon our eyes. Besides the property that light has of rendering objects sensible to the sight, it has also other advantages relative to vegetables and animals.

1. It promotes transpiration, for it really has the property of evaporating fluids, as experiments prove. Two vessels of equal capacity, and which contained an equal quantity of water, were exposed many nights to the rays of the moon, which we know affords no heat to the thermometer or to the senses;\* over one of the vessels, at a certain distance, a covering was placed to intercept the direct rays of this planet, and it was constantly observed that the vessel exposed to the direct rays, lost in nine nights, two lines and a sixth of water more than the other.

2. Light disoxygenates bodies, and accumulates and concentrates hydrogen in them. Hence, vegetables exposed to its action, furnish great quantities of oxygen gas, become colored, and acquire taste, smell, and combustibility. Those that grow under a pure and serene sky, are more resinous, more odoriferous, taste stronger, and are more combustible, than those that grow in other situations. This is the reason that Arabia is correctly regarded as the country of per-

\* The light of the full moon is about 300,000 times less than that of the sun.

fumes. Plants which, on the contrary, vegetate in obscurity, run up, but become pale, small, slender, and in some degree cachetic; to change their state, light is necessary; they strongly desire it, and when in hot-houses if it only approaches them by a single opening, they incline by a spontaneous motion to this opening.

A great many experiments compel us to admit the influence of light on vegetables. The celebrated Bonnet was the first who investigated this subject, and who proved that premature vegetable decay was owing to the absence of light. Afterwards the minute observer, Meese, examined this subject in its minutest details; the result of his experiments, repeated by Wanswinden, are: 1. That the seed comes up in dark as well as light places, but that the plants decay and perish; this decay is in proportion to the darkness of the place. 2. Young plants can neither live nor grow in dark places; none but those that are large and full grown can produce branches in such situations. 3. Green leaves, from which light has been intercepted, perish, but those that have been produced in dark places, live very long. 4. The parts naturally green, turn yellow; but the purple colors do not change in the leaves and foot stalks, generated in obscurity. 5. Filaments are fewer in number, but larger, and their structure is not much altered. 6. Darkness retards the development of the radical leaves.

Since Meese, doctor Tessier has made many experiments, from which this learned writer has drawn the following conclusions: 1. Plants raised in subterraneous places, are green in proportion to the

quantity of light they receive. 2. Those which in subterraneous places, receive the light of the day, have a deeper green color than those that only receive it by reflection; the more the reflections are multiplied the weaker is the color. 3. The light of a lamp preserves the green color of a plant; plants thus preserved have a paler color, than those exposed to day light, direct or reflected, and although the color loses its intenseness in the light of a lamp, yet it does not cease to exist. 4. Plants even lose their color when in the neighborhood of light, if they do not receive it. 5. Plants that are exposed in the night to the light of the moon, and which remain during the day in a dark place, are much less yellow or white than those that are day and night in obscurity. 6. Young plants incline very sensibly towards the light, direct or reflected, even towards that of a candle, whether they vegetate at the surface of the earth, in subterraneous places, in apartments strongly lighted, or in those that receive but little light. Lastly. The inclination of plants to the light is in a compound proportion to their youth, their distance from the light, the manner in which their germs have been fixed, the color of the substances that surround them, and the greater or less facility with which their stems vegetate.

Light has not less influence upon animals. Worms and caterpillars, which live in the ground or in wood, are colorless. Birds of the night and moths are distinguished from those of day, by less lively and less brilliant colors. A similar difference is remarked between the animals of the north and those of the south. We also see men become spare, and decline

in sedentary labors, in confined lodgings, in narrow streets, where they rarely receive the light of the sun; on the contrary, they grow and spread in labors performed in the open air, where they are exposed to the sun. It thence follows, that pale and cachetic persons should respire a free air, and one influenced by the direct rays of the sun, as that of middling high mountains. It is the same with phlegmatic persons, whose solids are in a state of flaccidity and inertia. Light produces the same effect upon them, that it does on vegetables; it fixes and accumulates the hydrogen, disoxygenates them by disengaging the oxygen of the superabundant aqueous humors, and restores to the fibres its tone and action. It is doubtless to the disoxygenation which the light produces, that we are to ascribe the singular phenomenon, that takes place upon the glaciers, of which high mountains are covered. When the sun shines there, the visage blackens, although the thermometer only stands at a few degrees above zero; this inconvenience can only be guarded against by wearing a black gauze, as has been remarked by all those who have visited the glaciers of Sweden, and especially *Mont Blanc*.

Solar light has then the greatest influence upon men; it colors them more or less, according as it is stronger or weaker, and as its action is more or less continued. The shades that characterize the different nations of the globe are exceedingly various. Nature descends by imperceptible degrees, from the white of the Swedes to the tawny of the Spaniards, and from the ash color of the Siamese to the olive of the Moguls, to the yellow of the Brazilians, and lastly, to the deep black who inhabit the interior of Af-

rica. It is the color which forms one of the most remarkable physical varieties of the human species.

The different complexions of people, are principally the effect of the action of the solar light, which differs under the same parallels. The human species blacken in the heat of the sun, and whiten in the frozen regions. There are no negroes out of the limits of the torrid zone, and they are only met with where the action of heat is excessive; that is to say, where the thermometer rises to thirty or thirty-four degrees. In other situations, where the atmosphere is less burning, where it is cooled by the vapors of the ocean, by currents, rivers and marshes, by sea winds, by a diminution of the reflection of the rays of the sun upon a less naked and not so sandy a soil, there are no negroes, only men more or less swarthy. Moreover, it is essential to observe, in speaking of this excessive heat, that we mean a heat constant, habitual, and which continues for a long time about the same degree. Lastly, it is observed that as we leave the equator, the black complexion becomes tawny, then it changes into brown, and from this there is but a shade to white, which is the primitive color of man.

We shall easily conceive, from what I have just said, why all this great band of the globe—the torrid zone, is not entirely inhabited by negroes, that it depends upon local causes, which moderate the action of the sun. It is certain for example, that the country which is defended from the east by the peak of Teneriffe and mount Atlas, are not inhabited by perfect negroes, as the country of Nubia, Sierra Leone, and Senegal. If the nations of the Indian Archipelago, although placed under the line, are not so

tawny, it is owing to the vapors of the ocean which surround them, and also to the south-east winds that prevail there, incessantly agitating the column of the burning air, and thus diminishing the reflection of the sun. Finally, if every part of the new world which is situated between the tropics, does not contain negroes, it is because, according to the thermometrical observations of Lacondomine and Adenson, the heat of Peru is less by fifteen degrees than that of Senegal; a diminution which must be attributed to the exhalations of the damp soil of America, to the vapors that continually rise from the ocean, and especially to the immense forests in this continent, which present an almost impenetrable barrier to the rays of the sun.

The history of Ceylon tends strongly to prove this opinion. Those of the islanders who inhabit the cleared countries, have a copper color, whilst the Bedas are of a whiteness similar to that of the Swedes. The Bedas live in the woods, and are probably indigenous, since from time immemorial they have spoken the language of the kingdom of Candy.

Observation proves that woody countries are colder than those that are cleared; the trees attract the clouds, retain the moisture in their leaves and their branches, and are so many ventilators, which agitate and cool the atmosphere.

What demonstrates, in an incontestible manner, that it is the light of the sun which colors man, is, that the Europeans transplanted under the line, are there seen, after some time, with their complexion passing through all the intermediate shades between the perfect white and the ebony black; especially when they adopt the manner of living of the natives.

If we believe the learned author of *French Africa*, the posterity of the Portuguese conquerors who descended there about the middle of the fifteenth century, are become entirely similar to the negroes, as respects the wool of their heads, the color of the skin, and the stupidity which characterizes the latter. When the Saracens and the Moors migrated in the seventh century from the north-east of Africa, they were brown; now they have advanced further towards the equator they have become perfectly similar to the negroes, and it is impossible to distinguish them.

The Jews established in Abyssinia, are as black as the Abyssinians; this effect cannot be attributed to their mixing with other races of people, for they regard all mixture with those of a foreign blood as a crime which offends the deity. A circumstance worthy of remark, and which tends to support what I have just said is, that we find in the same nation, individuals and even whole families of a color more or less deep, according as they are more or less exposed to the heat of the sun. Amongst us the inhabitants of the country are browner than those of cities; in warm countries this difference is still more obvious. White men may then become black, and negroes white, by changing climates; but when Buffon said that this metamorphosis might take place in the eighth generation, he advanced the period too much; for it is certain, that after twenty-two generations passed in Spain, the Moors are as swarthy as they were at first; it requires a longer series of lineations to produce such changes. It is the mucous net-work, situated between the epidermes and true skin, which

is the seat of the coloring matter of the human body. This gelatinous substance, according to the observations of Meckel, is black in the African, and can only be separated by maceration or putrefaction. The epidermis, which is white in the European, has an ash color in the negro; the hairs which pierce the network and its envelopment, cannot pass through so dense a medium without twisting, and that is, probably, the reason why the Nubian has frizzled wool instead of hair.

There is still another difference which distinguishes the negro from the European; Meckel, in dissecting the corpse of a Nubian, found that the medullary substance of the brain was bluish, and the blood a very deep black, which communicated its color to linen. Le Cat has verified these facts; in addition, he observed that the spermatic liquor of negroes is blackish, as has been already remarked by Herodotus;—“*Genitiva quam in muliers emittunt, non alba, quemadmodum cæterorum hominum, sed atra, ut color corporis; quale virus Æthiopes quoque emittunt.*”\*

This observation gives the key to the phenomena of the generation of mulattoes, and explains the manner in which men have insensibly lost their primitive color in the scorching climate of Africa.

The paroxysms or increase of disease, which happens towards the evening or in the night, has been attributed to the absence of light; this opinion is probable, although it may be supposed to be the effect of the fatigue of the day and the weariness produced

\* Thal. on 104, in fol. Amstelod, 1763.

thereby, of the action of remedies used, to the approach of a new chill in the blood, and the irritation produced by it in the vascular system. One thing worthy of remark is, that of twenty patients who die, at least two thirds expire at the commencement or during night.

It cannot be denied that darkness singularly modifies the animal as well as the vegetable system. The influence of darkness is powerfully felt by delicate persons and those of a fine sensibility, as is proved from the effects of eclipses. There are those who, during the solar eclipse, experience fainting and other accidents equally serious. In general, we then feel exhausted and dull, and there are those who even complain of stupidity and other affections of this kind. Ramazzini observed, when an eclipse took place on the 12th of May, 1706, confused and irregular motions in the pulse of his patients; he had, himself, a fit of head-ache more acute than customary. Jean-Math Faber relates, that a gentleman who was naturally melancholy, became more thoughtful and gloomy than ordinary, the day preceding the eclipse; and when it took place, he ran like a madman, sword in hand, wounding all whom he met, breaking chairs, doors, and every thing he found in his way. Vallisneri remarks, that the deprivation of light during eclipses, diffuses over all animated nature, a sadness and a more profound consternation than the darkness of night; the songs and cries of animals are interrupted, and there prevails a dull and mournful silence, which does not cease until the return of light. Vegetables even appear to participate in this catastrophe; one would suppose that the soul of the world was about

to become extinct, and that in its infinite channels the immense current of life was retarded in its course. Bellini cites the example of a patient, concerning whom several physicians met to consult, just as a solar eclipse took place; the physicians left her for a moment to contemplate the sun, they were recalled in haste, the woman having become insensible; they prescribed in vain those remedies presumed suitable, she did not regain her senses until the sun had resumed its lustre. Rammazzi relates that the most of his patients died at the hour of the lunar eclipse, which occurred the 21st of January, 1693; some were at this period, struck with sudden death. Lord Bacon fell into a swoon whenever there was an eclipse of the moon, even if he did not foresee it; and he regained his senses in proportion as the moon came from under the shade of the earth.



## CHAPTER V.

### *On the Seasons.*

THE community at large experience the influence of the seasons; philosophers investigate their causes, and physicians determine their action upon the living body and presage their results. The good and bad qualities of vegetables, their abundance or their scarcity, depend on the regularity or irregularity of the seasons. The seasons have also a direct influence upon animals; they occasion useful or pernicious

changes in their constitutions, and thus concur to support health or produce disease; they also frequently produce epidemic diseases, which generally occasion destruction among men and animals. Meteorology is, then, essentially connected with the knowledge of the phenomena of animal and vegetable life; and this branch of medicine, which was very well known to Hippocrates, is one of those in which he has not shown the least genius. Physicians, who have cultivated this part of medical philosophy since the father of medicine, have added but little to what he has given us; hence, it is from his works that we shall extract what we have to say upon this subject; we will add the observations of the moderns, which, as I have already said, are but few, or rather only calculated to confirm his.

#### I. Regular constitutions.

Hippocrates recommends the study of the seasons in a particular manner to physicians; he even, in some measure, makes it a rigorous precept, so fully persuaded was he of its importance. "Apply yourselves," says he, "and become well acquainted with the constitutions of the seasons, their advantages and disadvantages, and the nature of the diseases peculiar to each season." "The year is divided," says Hippocrates, (Liv. 3, upon diet,) "into four seasons; winter, spring, summer and autumn. Winter commences at the setting of the *Pleiads*, and continues until the spring equinox; spring, from this equinox until the rising of the *Pleiads*; summer, from this period until the rising of *Arcturus*; and autumn from the rising of this constellation until the setting of the *Pleiads*."

From this passage we see, that Hippocrates as well as the ancients, did not, as astronomers do, divide the seasons by the equinoxes and solstices, but according to the rising and setting of the constellations, which he mentions in the preceding text. Winter commences at the *Pleiades Virgilicæ*, and terminates at the vernal equinox; that is to say, this season dates from the 11th of November to the 26th of March; its duration is, consequently, one hundred and forty-five days. Spring commences at the equinox, and terminates at the rising of the *Pleiads*; that is to say, extends from the 5th of April to the 25th of May, and has but forty-eight days. The beginning of summer was fixed at the rising of the *Pleiads*, and continued until that of the *Arcturus* constellation, (du Bouvier,) or rather from the 23d of May to the 13th of September; but Hippocrates, in some part of his works, gives a greater latitude to this season, and extends it as far as the autumnal equinox, or what is the same thing, to the 24th of September; from this division summer has one hundred and thirty-four days.

Autumn commences at the equinox and terminates at the setting of the *Pleiads*; it, consequently, lasts from the 24th of September until the 11th of November, and has a number of days equal to spring; hence, we see that the ancients did not, as the moderns, regard the solstices as the periods of commencement of summer and winter, but as the second parts of these seasons.

“The *pituitous* humors,” says Hippocrates, in his book on the *nature of man*, “augments in winter in the body; it is this humour which is the most analogous

to the nature of that season, because it is very cold. We may convince ourselves of it by these obvious symptoms; which are, we spit from the mouth and blow from the nose a quantity of pituitous humors, and are effected with humors and pituitous diseases during winter.

“In spring the pituitous humors still abound in the system, but the blood then accumulates, because the cold ceases and rains succeed; consequently, nothing contributes more to the production of blood, than wet and hot weather. Of all the seasons, this is the most unfavorable to the nature of the blood, for it is warm and wet. The following are obvious proofs of this position: it is in spring and summer, that men are subject to dysenteries, and bleeding from the nose, and they then have more heat and more color. During summer the blood still has its force, and the bile is formed in the body until autumn. In these seasons the blood diminishes, because they are contrary to its nature; but the bile predominates in summer and in autumn, for in these seasons persons spontaneously vomit bile, and when they take purges, the dijections are of a bilious nature. The character of the fevers that prevail during these seasons, as well as the complexion, proves the same fact. The pituitous is less in summer than in the other seasons, it being dry and warm. The blood also diminishes much in autumn, because this season is dry, and begins to cool the system, but black bile (*bilis atra*) abounds then; and so soon as winter takes place, the black bile, which predominated in the preceding season, is diminished, and the pituita becomes the pre-

dominant humor, as much in consequence of the dampness of the weather, as of the length of the nights."

It is from this succession of phenomena, which constantly takes place, when the year does not present great anomalies, that is to say, when it is regularly constituted, that the prince of medicine counsels, in the book on *salutary diet*, to vomit in winter.

"Winter," says he, "is more pituitous than summer. In this season diseases prevail in the region situated above the diaphragm, and in the neighboring parts of the head.

"But during summer," adds he, "we should use injections, for this season is warm, and the system is bilious. A person feels a heaviness at the knees, is heated and subject to griping pains in the bowels; it is then necessary to use cooling means, and those that cause the humors which incline towards the superior parts, to descend."

This text appears contradictory to the Aphorism iv. section 4, in which he expressly says, "that we should evacuate in summer upwards and in winter downwards." But this contradiction is not apparent, when we observe that he only speaks of the humors, which are in a turgescient state, as those that should be evacuated by the outlet towards which nature directs them; whereas in the passage just quoted, he recommends purging as a prophylactic, that is to say, to prevent the superabundance of humors and their orgasm.

When the seasons present their natural temperature, and there are not considerable and multiplied aberrations, they do not generate many diseases; epidemics as well as mortality, are rare. Nevertheless, the

most regular seasons produce some diseases, but they ordinarily only attack temperaments analogous to their nature. The diversity of seasons is not in itself pernicious, and if man did not deviate so far from nature in his regimen and manners, he would doubtless find in their succession new means of preservation and vigor. It is only irregular men, or those who possess a weak and delicate constitution, who are seriously affected by the seasons; to the temperate none are insalubrious. The sage is superior to the vicissitudes of the atmosphere; he braves the fogs of the morning and the vapors of the evening, the winds of the east and the clouds of the south; he can wrestle against the inclemency of the weather, and the tyranny of the elements. Hippocrates, after having spoken in a general manner of the seasons, in the *book on air, water, and places*, gives the signs by which we are to know when a year is regularly constituted, and consequently salubrious. "If the rising and setting of the planets are succeeded by the effects that they ought to be, if the autumn is rainy, and the winter moderate, that is to say, not too mild nor too severe, and the following spring and summer be temperate in regard to mild rains, which fall at proper periods, it is certain that such a year will be salubrious."

*If the rising and the setting of the planets are followed by the effects that they ought to be*, that is to say, if all the seasons are regular, and constituted in the order that our author represents.

It is principally by the rising and setting of certain constellations, as has been remarked, that Hippocrates distinguishes the seasons. Galen has entered into a general detail upon this subject. "It is at the

rising of *Arcturus*," says he, "that rains commence; and the cold winds that blow then announce the end of summer and commencement of autumn; afterwards the weather gradually grows colder, which change is very sensibly perceived towards the setting of the *Pleiads*; from this period until the spring equinox, the cold continues very near the same. About the equinox, the heat recommences; but from the rising of the *Pleiads* until the *Canicule*, the heat and drought augment, and the southern winds blow for some days; afterwards rains set in and continue as long as the *etesien*\* winds." Consequently, the year is regularly constituted and salubrious, when the spring is warm and qualified with mild rains, summer dry and warm, autumn cold and dry, and winter cold and wet; but it is requisite that these qualities should be moderate and not carried to excess. It is observed that regular annual constitutions are not only very healthy, but also that they give plentiful harvests; the fruits are very abundant and good, the wheat and rye furnish much flour, sheep an excellent wool, and the animals have their greatest degree of perfection. It is also observed, that the aromatic flowers afford by distillation, twice as much volatile oil, as in other years.

It is with men and animals as with plants, among which there are those that thrive well in dry grounds, and under a scorching sky, and that would perish in wet land or a cold country; whereas drought and heat are injurious to others, which can only grow in a

\* North-east winds, thus called from a Greek word, which means anniversary. In fact, they ordinarily blow every year, before the rising and setting of the *Canicule*, or Dog star.

damp soil and a cold country. The same thing takes place in relation to the climates and seasons.

Some persons enjoy better health in summer than in winter, and in warm than in cold countries; whereas warm countries are prejudicial to others, who enjoy the best health in winter and in cold places. There exists, as Hippocrates has already said, between temperaments and seasons, relations and oppositions, to which health and sickness are in a great measure owing. "Some constitutions are easily adapted to winter, and others to the summer seasons."—Aph. ii. sect. 3.

In general, persons of a pituitous or pituito-sanguine constitution, as in early life, enjoy good health during spring and summer; the bilious and atrabilious during winter. It was this which induced the father of medicine to say, (Aph. xviii. sect. 3.) "As to the seasons of the year, it is in spring and the commencement of summer, that children and young people enjoy the best health, and in summer and autumn, *until a certain point*, old people, and in winter those of middle age." In fact, spring and the first of summer, by retarding the progress of the pituitous humor, produce on children and adolescents, effects nearly similar to those of puberty. Old people, those only who possess a cold and moist constitution, accommodate themselves very well in summer, which is a warm and dry season. Autumn is also favorable to those, *to a certain period*, adds Hippocrates, that is, the first part of autumn, which generally resembles summer. The spring season is most congenial to old people of a dry constitution. Lastly, men at the age of virility, who are ordinarily bilious, enjoy the best health during

winter, which is a cold and wet season. It is the same with sanguine temperaments, because the winter engenders the pituitous humors; consequently, is placed between the pituitous and bilious. It is necessary, however, to remark, that Hippocrates intends in this aphorism to speak only of the regular seasons, when no quality predominates to excess, and of the ages which possess suitable constitutions. In contrary cases, the seasons become prejudicial and unhealthy. All that I have just said relative to the seasons, are applicable to climates. The qualities of climates are useful or pernicious, according as they are in relation with, or in opposition to the temperament of its inhabitants.

As the ancients remarked, spring promotes the production of blood in the system. In this season the action of the arterial system increases, the motions are freer and more regular; the eccentric forces have more energy, and diverge, as well as the humors, which constantly follow the current of the oscillations, towards the circumference of the body; the action of the exterior organ being augmented, the blood is deprived of the superabundant pituitous humor, which had accumulated in it during winter; the intermixture of the elements of the vital fluid is more intimately performed, and the proportion of the red part and gluten becomes more considerable. In addition, the action of the lungs is more developed, and acquires greater energy and intensity than it had during winter. We have already seen that the lungs are the centre of the arterial system; in fact, it is only in them that the venous blood is transformed into arterial, and where it regains the vital qualities, which

it has lost in going through the immense routes of the circulation. It is also in the lungs that we meet with the principal arterial trunks, as well as the vessels of the largest calibers.

Vegetation, which recommences in this season, exhales immense quantities of oxygen gas. As the atmosphere is more highly oxygenated, it follows, that there should be disengaged in the lungs, in the act of respiration, an abundance of hydrogen and of carbon; hence the proportion of azote augments in the pulmonary blood, this at the same time, receives a fresh supply of atmospheric air, which renders it more con-creasible, and oxydates to a greater degree, the iron contained in it. It thence results, that the red part and gluten ought to predominate in the blood; hence, we also see in years well constituted, the sanguine diathesis succeed, in the spring, that of the pituitous of winter. These two constitutions produce two opposite states, which mutually destroy one another; this is the reason the pituitous diseases are most ordinarily dissipated, when the sanguine constitution becomes established in spring, and we remark this same succession in almost all epidemics. Summer produces bile; in this season, the mass of the fluids continually tend to be converted into this humor, and when this tendency is increased by particular causes, as by the heat of summer, the production of bile is much greater. In summer the *azotization*, which has augmented during spring, is increased, and makes great progress; because the atmospheric air, which is more and more oxygenated by the proximity of vegetation, immediately carries off from the pulmonary blood, the greater quantity of hydrogen and carbon, and because the

animal forces display a greater activity, and are more powerfully excited by the atmospheric electricity. It is not astonishing then, that the humors contain more bile in this season, than in those that have preceded. Add to this, that the energies being incessantly attracted externally, and the humors constantly diverging towards the skin, the greatest part of the thin parts of these escape by transpiration, and measurably, there remains nothing in the vessels but bilious matter. Add further, that the action of the veinous system, of which the *vena porta* is the centre, having become more powerful by heat, (these are the reasons why the veins are then fuller of blood and in a state of greater distension than at other times,) and the blood almost entirely converted into bilious matter; this might excite more frequently and more powerfully the specific sense of the secretory organ of the bile, and cause this humor to be secreted much more abundantly; consequently, summer is the season of bilious diseases.

The bilious constitution then necessarily succeeds the sanguine. Those two constitutions are very nearly allied, and have numerous relations. Nature most ordinarily proceeds from the sanguine to the bilious; this is the reason why the fevers that prevail in the first part of summer, are almost always inflammatory and bilious; they commence inflammatory, and insensibly acquire the bilious character. The third epidemic constitution of Hippocrates, was evidently inflammatory in the beginning, and he prognosticated by the hemorrhages, that took place from the nose in young people, and from the womb among women. All those who experienced these hemorrhages, except

Philiscus, Epaminondas, and Silene, recovered. The cases in which this crisis took place on the fourth or fifth day, were incomplete.

This constitution afterwards changed, and took the bilious character; from that period hemorrhages were insufficient, and vomiting and diarrhoeas were requisite to complete the crisis. Heraclitus fell sick about the end of this constitution, and a prognosis in his case was formed from a nasal hemorrhage and a bilious diarrhoea. Hemorrhages were salutary and critical in this mixed constitution, in consequence of the inflammatory type still subsisting; and the flux from the bilious system was necessarily owing to the bilious character which was combined with it.

The observations of Sydenham exhibits to us a similar succession in epidemic constitutions. He has left us the history of a fever which prevailed in the years 1669, 70, 71 and 72, which was of the nature of a dysentery, and affected a great number of persons; it was inflammatory in the commencement, but after some time, became of a complicated bilious diathesis, which predominated towards the end of autumn.

Epidemic constitutions, generally, commence with the nervous character, but become humoral in proportion as they advance. This is the reason they are very mortal in their nature; but their violence diminishes in proportion to their progress; that is to say, as they take the humoral character. Hence, it is wrong to believe with the vulgar, who scarcely ever form an opinion except from appearances, that the physician loses fewer patients at the end of an epidemic, only in consequence of his having acquired,

during its duration, the experience necessary to enable him to combat it efficaciously.

From what I have just said, we may easily conceive why bilious diseases, and, especially, remittent and intermittent fevers, principally occur in the *dog days*. Bilious fluxes are also very frequent and much more dangerous in these days than at any other time; for the first passages are much more sensible and more irritable, and the action and humors are communicated in a greater quantity and with more force, than at any of the other seasons.

Sydenham remarked, that dysenteries were much more serious, and that the cholera morbus manifested itself particularly in August and September. This is, doubtless, the reason why Hippocrates recommends, from the knowledge he had of the extreme sensibility with which the intestines are endowed at this season, to abstain from violent purgatives in the dog days, and especially towards their termination; which occurs on the 21st of August. "Avoid," says he, "purgatives in summer from the rising of the Dog-star, and for forty days; but use injections."

This converging of the forces and humors towards the intestines has, nevertheless, a useful effect; i. e. of preventing the degeneration of the bile; for as summer and autumn tend strongly to *bilify* the humoral system, it is necessary that the excretion of the bilious productions be augmented; to accomplish which, it is requisite that the humors be directed towards the abdomen, which encloses the organ destined to evacuate the bile.

Autumn produces the atrabilious. This is nothing but the bile desiccated, become more acrid, and acidi-

fied by the progress of oxygenation and animalization; perhaps, also, by the action of the electric fluid. "This bilious production," says Galen, "is much more acrid and more pernicious than the yellow bile: it is formed in autumn and in the age which succeeds vigor: the dysentery, which is produced by this humor, is mortal, as Hippocrates has said." Aph. xxiv. sect 4.

The effects of the atrabilious are sometimes terrible; it is not only the cause of many serious, long and obstinate diseases, but it sometimes produces sudden death, and almost always disturbs the functions of the brain. It frequently causes wakefulness, fear, pusillanimity, sadness, delirium, &c. and it often produces quartan fevers; which is the reason why the father of medicine says, in the book on the *nature of man*—"You certainly know that the quartan fever participates greatly of the atrabilious, when you observe that it chiefly prevails in autumn, in the age which succeeds that of vigor; and that autumn is the most favorable to the production of this humor. Those who are attacked with this fever in any other season, and of another age, are sooner cured, at least, if it is not complicated with another disease.

The pituitous constitution, also, frequently unites with the atrabilious diathesis, during autumn. This complication happens, especially, when the heat of summer has been excessive and continued, and the autumn which succeeds it is cold, damp, and similar to winter. This mixed constitution produces diseases of a very bad species; such as the *hemitritæus* or *semi-tertians*, and remittent fevers. Protagoras made these fevers to depend upon the *vitreous pituita*, or glassy phlegm; which is of a cold and tenacious

nature, and which is in reality only the atrabilious mixed with the *pituitous*. These diseases are generally fatal, especially among old people and those who have passed the middle age.

It is essential to remark, that autumn does not certainly generate the atrabilious, except when the first part of this season resembles summer, and the succeeding is cold and dry; when the autumn is moderately cold, and watered by mild rains, it serves, in some degree, as an antidote to summer, by counteracting the bilious tendency. It is useful also to observe, that the autumnal diseases are not only long and difficult, owing to their being the production of the atrabilious, but also, because during this season we frequently experience sudden variations, such as pass rapidly in the same day from one temperature to another; or, rather, we experience the effect of many seasons in the same day. These sudden changes of temperature, produce, instantly, contrary actions, which disconcert the effort that nature makes to perform the concoction, and thus renders the diseases irregular and tedious, being opposed to the crisis; this is the reason why Hippocrates has said, (Aph. iv. sect. 3,) "In the seasons in which the day is sometimes hot and sometimes cold, we should expect autumnal diseases to prevail;" that is to say, long and obstinate diseases, as those are peculiar to this season.

The pituitous constitution is particularly affected in winter, which is naturally cold and wet. It is the effect of the relative predominant action of the cellular, glandular, and lymphatic systems. This season causes the energies and the humors to concentrate in the interior; it retains the perspirable hu-

mor, and renders the mass of fluids more watery. in consequence of the inhalation of water, with which the atmosphere is surcharged; it deprives bodies or substances of their electricity, and this concurrence of circumstances weakens and relaxes the solids. During winter we eat much more than in the other seasons, and also sleep longer; nevertheless, *animalization* is not so well performed, owing to the progressive disoxygenation of the atmospheric air which the sleep of vegetables occasion. Consequently, the hydrogen and carbon are not exhaled from the lungs in such great quantities, the relative proportion of azote decreases, and the oxygen, by being fixed in less quantities in the blood, this is less oxydated and loses its concrescibility, and its vital qualities; it contains more mucuous matter and less of the red part and gluten; in a word, it is more pituitous: this is the reason that diseases, which are principally owing to this humor, generally prevail in winter and in the anomalous seasons that resemble it.

From what I have just said, it follows, that the order of the constitutions in the regular years, is such, that the pituitous predominates in winter, the sanguine in spring, the bilious in summer, and the atrabilious or atrabilo-pituitous in autumn; but what is important to observe is, that each of these seasons affect certain organs in preference to others, and cause them to become the seat of disease.

Sydenham and Stahl have acknowledged that winter, particularly, influences the head, spring the breast, and summer and autumn the abdomen. It has been observed, that when an epidemic commences in the spring with affections of the breast, it produces, if

continued until autumn, affections of the abdominal viscera. It appears, also, that inflammatory and bilious diseases occupy, more especially, the right side, and the pituitous and atrabilious the left. It has, also been remarked that the affections of the *primæ viæ* extend most frequently towards the right side in spring and summer, and the left in winter.

The humors have then in the pituitous constitution, a marked tendency towards the head; the utility of this determination is to prevent the extreme quantity of phlegm which would necessarily take place if the pituitous productions were not carried off in suitable quantities as they are secreted.

They tend towards the breast and skin in the sanguine constitution of spring, in order to divert the pituitous humor. Lastly, in the bilious and atrabilious constitutions, the humors are directed towards the abdomen in order that the bilious juices may be thrown out by the inferior passages. We see that this successive change which the seasons introduce into the system, are destined to mutually moderate each other, and to destroy what the diathesis of the preceding season possessed in an excessive degree; this is the reason that the diseases of winter, as Hippocrates has already said, often cure themselves in summer; and vice versa, there are diseases of summer which are only cured in winter.

## II. Irregular constitutions.

Irregular seasons are those which are not conformable to the ordinary course established by nature; and during which, meteors, that should not, do occur.

“If winter,” says Hippocrates, (*book on air, water and places*), “is dry and north winds blow, and the

spring is rainy, with south winds; fevers, dysenteries, and inflamed eyes necessarily succeed in summer;" he adds, (Aph. ii. sect. 3,) "and especially among women and men of a humid constitution." We clearly see that the diseases which he says should prevail in summer, are the pituitoso-bilious, or bilious catarrhs of the moderns.

"If the rising of the *Canicule* (Dog-star) is accompanied with rains and winds, and cooled by the *etesia*, we hope to see the diseases produced by a rainy and southern spring, which succeeds a dry and northern winter, and to have a very salubrious autumn; but if the contrary happens, women and children are subject to diseases, but not old people; and those who escape the diseases produced by these seasons, are attacked with quartan fevers, that terminate in dropsy."

The rising of the *Canicule* happens on the 18th of July, when the heat is moderated by the *etesian* winds and rains; at this period the diseases that have been prevalent, should cease; if the latter part of summer is, as the first has been, very warm, this is not the case.

During summer persons of a pituitous temperament, as women and children, are affected with the diseases above mentioned, because the heat of this season completes the degeneration of the pituitous and bilious humors which began in spring. Old persons of a dry and cold constitution, are not affected with these diseases, because the seasons which produce them in other constitutions, are the most favorable to them; such as a spring, which possesses a relaxing dampness, afterwards summer, the heat of which carries off

the excess of this dampness. Quartan fevers, into which the diseases of this season terminate, occur in autumn, and are the production of the pituitoso-atrabilious diathesis.

“If the winter is southern, rainy, and calm, and the spring dry and northern, pregnant women whose delivery happens in the spring, are in danger of miscarriage, and those who go their full term, bear infirm children and valetudinarians, who die soon after birth, or remain weak and languishing all their lives. Other persons are subject to dysenteries and dry ophthalmias.” Hippocrates adds, (Aph. xii. sect. 3.) “and old people are affected with fatal catarrhs.”

The southern and non-electric constitution of winter alters and depraves the nourishing juices, debilitates the system, and attracts a considerable sum of the energies externally; the child must then be weak and extenuated. The northern and dry constitution which succeeds, causes the motions and actions to reflow briskly towards the womb, which, during gestation, is the centre of the most active sensibility; the energies concentrating there, degenerate into spasm, and an abortion is the consequence. Children who come to their full term, soon die, or remain infirm all their lives, owing to the nutritious matter, which serves for their nourishment, being badly elaborated, and only a thick puita or phlegm, destitute of the necessary qualities to enable it to assimilate itself. In addition, the constitution of winter having thrown the solids into a state of laxity and inertia, the *vis vita* has not possessed a sufficient energy to develop the organs of the fœtus, and give them their proper action and vigor. The diseases of this constitution are

pituitous or *pituitoso* bilious. Old people are subject to fatal catarrhs, because, in addition to the natural feebleness of this age, the two seasons oppose the concoction of the morbid matter. "This is the reason," Hippocrates says, (Aph. xl. sect. 2.) "catarrhal affections rarely admit of concoction in old people.

"If the summer is rainy and southern, and is succeeded by a similar autumn, the winter will be unhealthy. Those who are upwards of forty years of age, and the pituitous, will be exposed to ardent fevers, and the bilious to pleurises and peripneumonias."

The northern and non-electric constitution, which continues during these two seasons, is very unhealthy; the diseases produced by them, are very severe, and terminate more difficultly than those of dry constitutions.

"These diseases are occasioned, in a great measure, by rains, especially the fevers of long continuance, and those of a putrid nature; also epilepsies, apoplexies, and pains. In dry seasons, consumptions, ophthalmias, gout, stranguraries, and dysenteries unexpectedly occur." This warm and damp constitution continues during two seasons, and produces pituitous diseases in the pituitous, and atrabilioso-pituitous among those who have passed the fortieth year of life. Nothing promotes putrefaction, and consequently putrid diseases, more than a constitution of this kind.

"But if the summer is dry and northern, and the autumn wet and southern, the diseases of the winter are of the head; apoplexies, hoarseness, rheums,

coughs, and phthisics.” We here see the effects of the pituitous constitution carried to excess.

“If the autumn is dry and northern, and if there are no rains, neither before the rising of the *Canicule*, nor after the setting of the *Arcturus*, that is to say, neither at the end of summer, nor beginning of autumn, this season will be salutary to the pituitous, to all those who naturally possess a humid constitution, and especially to women. On the contrary, it will be very pernicious to the bilious, whom it desiccates extremely; in these it produces dry ophthalmias, acute fevers, and melancholy.”

Such an autumn is colder and dryer than it ought to be; it causes the actions and the humors to flow, and it constipates the bowels, this being the property of the northern constitutions. (“Southerly winds attended with moisture, affect the head, and render the hearing dull; but when stagnant, they relax. Whilst these prevail, the above mentioned symptoms are visible in diseases; but when the north winds predominate, coughs, hoarseness, constipation of the bowels, difficult micturition, chills, pains of the breast and side occur; whilst this constitution of the air continues, we should look for such symptoms in the diseases of this season.”—Aph. v. sect. iii.) It augments the action of the *vena porta*, and in the end, the bilious productions of summer, at the same time that it presents obstacles to the excretion of the bile. It must then be pernicious to persons of a bilious temperament, and produce analogous diseases. This same constitution is, on the contrary, very favorable to the pituitous; for nothing answers better to moderate and arrest the secretion of phlegm, than the

causes which tend to introduce into the system, the bilious or sanguine diathesis.

“The two solstices are very dangerous, but more particularly that of summer. The two equinoxes are insalubrious, but particularly that of autumn. We must also pay attention to the rising of *Arcturus*, as well as to the setting of the *Pleiads*, for in diseases, these are critical days, and patients die or get well in them, or rather the nature and character of their diseases change.”

The solstice of summer and that of winter, mark the second part of these seasons; the rising of the *Canicule* happens in the second part of summer; that of *Arcturus* takes place at the end of it, and the setting of the *Pleiads* terminates autumn.

It has been constantly observed, that the periods of the year, the most fruitful of diseases, are the equinoxes, especially that of autumn; it is also the period in which they are most serious, owing to the inequality of the season, and of the atrabilious humor which then predominates. In our country (France) it is not the same with the solstices, except when the year is not regularly constituted, or, to use the expression of Hippocrates, when the seasons are not legitimate; in this case, the predominant constitution exceeds those points, and the diseases which previously prevailed, make so much the greater progress, and become so much the more fatal, as they are the more approximate to the autumnal equinox.

## CHAPTER VI.

*On Waters and Localities.*

HEALTH does not depend less on the waters we use, and the places which we inhabit, than on the aliment that supports us. Moreover, the best nutritive substances cannot preserve us from disease in an unhealthy country, whereas one may enjoy very good health by using nourishment less salutary, in a country possessing salubrity and affording good water. The knowledge of water and localities is then of the greatest utility. For this reason, Hippocrates expressly recommends physicians to observe, at first, the constitutions of the seasons and the winds peculiar to each country; also the qualities of the water, the nature of the soil and its exposition. This is the only proper method of discovering the nature of epidemic diseases, and of preventing and curing them.

This great man has left us certain and invariable rules, by which we may obtain this knowledge. The doctrines taught in his book on air, water and places, are so many truths, that will serve at all times and among all nations, as a compass to professional men, to whom the love of humanity alone directs in their labors, and who do not suffer themselves to be dazzled by the erroneous and dangerous light of systems.

“Every town which is exposed to warm winds, that is to say, to the winds which blow between the rising and setting of winter, and which is sheltered

from the north, abounds in waters; but they are salt, not deep, warm in summer and cold in winter.”

*Every town exposed to warm winds;* that is to say, every town that has a southern situation, is very unhealthy, because this exposition is warm and wet.

*The winds that blow between the rising and setting of winter;* that is to say, between the south-east; called *Vulturnus* and *Curus*, from the side of the rising winter, and the south-west, *Africus*, to the side of the setting winter; hence, this southern exposition comprehends the winds between the south-east and south-west.

*The waters are salt;* they contain salt in solution. *Not very deep;* they are near the surface of the earth. “*Towns that have a good exposition, whether as regards the winds or the sun, and which have good water, are not so subject to diseases that depend upon the preceding causes; but those that have waters of marshes or lakes, and which are not well situated as regards the winds and sun, are very subject to them.*

“*As to towns whose situation is contrary to what I have just mentioned, and which are sheltered from the hot winds, but open to the cold ones that blow between the setting and rising summer; their waters are hard and cold, but ordinarily become soft. In such situations men are generally large and of an arid constitution, they have a hard and contracted belly, and the breast soft and humid, are more bilious than pituitous, are not subject to diseases of the head; the most of them are subject to ruptures of blood vessels.*”

*The winds cold between the rising and setting summer:* the cold wind of the setting summer is north-west, *Caurus;* the cold wind of the rising summer is

*Aquilon*; north-east, and that of the middle, is *Borealis*, or the north-wind.

*The waters there are, ordinarily, hard and cold, and generally become soft, that is to say, insipid. Water loses its taste by freezing, doubtless, in consequence of the disengaging of the air to which it gives place.*

*They have a hard and contracted lower belly, and a soft and humid superior belly. The former is hard and contracted, owing to the north-winds that prevail in these towns;\* this wind diminishes the moisture of that region of the body, by producing an abundant secretion of urine and mucous. The superior belly is soft and moist; that is to say, digests with promptitude and facility.*

They are not subject to diseases of the head. The health of the head depends, particularly, on its good organization; consequently, this is an advantage that the inhabitants of towns, situated as above described, possess; these towns being sheltered from the southern winds, receive those that blow between the rising and setting summer. The inhabitants have a well organized head, and its functions are performed with ease and in the most regular and most suitable manner: the sutures of the cranium are also very close, and the bones of it very compact; which gives them a greater force of resistance against the external offensive causes.

*The most of them are subject to ruptures of the vessels, because they are very hard, and rupture rather than dilate, they lose the power of distension necessary to their discharge.*

\* Aph. v. Sect. 3.

“Respecting towns which are exposed to the winds that blow between the rising of summer and that of winter, and those which have a contrary exposition, the following has been observed. Those that face the rising, are more healthy than those which are to the north, or than those exposed to hot winds, when there is only the difference of a furlong; for, 1. The heat and cold are more moderate, and the waters that receive the rising sun are clear and limpid, agreeable to the taste, very soft and very healthy, owing to their being purified by the first rays of the sun, and the air retaining, for a long time, the impression of the morning. In such situations the inhabitants have a fresh and beautiful complexion, unless impaired by disease; the sound of the voice is clear, and they are more intelligent than those of the north; they are also more valiant and more courageous. All the productions of a place thus situated are better than those of a different position; and the place may be said to enjoy a perpetual spring, in consequence of the mild temperature of the air, which is neither too warm nor too cold. In those places diseases are rare, they are less serious and of nearly the same nature as those which prevail in towns exposed to the warm winds. The women are fruitful and bring forth without serious consequences.”

*Between the rising of summer and that of winter; that is to say, those which are to the east; between the north-east at the rising of summer, and the south-east at the rising of winter.*

*And those that have a contrary exposition; that is to say, those situated at the west, between the setting*

of summer, north-west, and the setting of winter, south-west.

*A town which is similarly situated possesses a perpetual spring, &c.* Spring resembles the morning; this situation has the morning sun the whole year, and, consequently, a perpetual spring; and as there is no season more healthy than this, they should be but little subject to diseases.

*And of nearly the same nature as towns exposed to warm winds;* or, to better express it, the diseases of these places are rarely serious, and are easily cured. "But towns which face the setting, which are sheltered from the winds of the rising, and only receive the warm winds and those of the north, are, necessarily, very unhealthy; for, 1. The waters in those places are not clear, because, as I have already said, the air retains the first impression of the morning, and this mixes with the waters and alters them, and the sun cannot shine on them until it is very high. Every morning during summer, the cold winds blow, and during the remainder of the day, dews fall. The setting sun warms and dries persons thus situated; this is the reason they are feeble, colorless, and subject to many diseases; they have a coarse and rough voice, in consequence of the grossness and impurity of the air, which is not purified by the winds of the north. In fact, these winds continue a very short time and the others which predominate, are very moist and rainy, for the winds of the setting resemble autumn. The exposition of these towns is such, that frequent changes are daily experienced in them, and the morning and evening are entirely different."

*The air retains the first impression of the morning, &c.* It is not purified by the rays of the sun, but remains thick and turbid, and communicates these qualities to the water with which it mixes.

*For the wind of the setting resembles autumn,* in relation to their irregularity; it is cold and the mornings rainy, and at mid-day it is dry and warm: in these places the evenings and mornings are alike.

*There the mornings and evenings are entirely different.* It is cold early in the morning, but warm through the remainder of the day until evening, when the cold and dampness re-appear. "The waters of marshes, those of lakes, and, in general, all those that are stagnant, are necessarily warm, thick, and, in summer, offensive, because they are stagnant; they always receive new rains, and are heated by the sun; this is the reason of their being of a yellowish white, bad and bilious. In winter they are cold, frozen, and turbid, as much owing to the snows as to the rains; hence, they are thick and pituitous, and those who use them have obstructed and enlarged spleens, the belly hard, bound and hot, the shoulders, clavicles, and visage lean, for the flesh dissolves and is received into the spleen; this is the reason they are meagre and lean. It thence follows, also, that they almost always experience the sense of hunger and that of thirst, and that they have the superior and inferior bellies very dry and warm: they require strong purges; the above affections do not leave them neither in summer nor in winter, and the greater part of them perish with dropsy. In these places, in summer, dysenteries are prevalent, also fluxes of the belly and very tedious quartan fevers; consequently, when these diseases

continue long, they terminate in dropsy, and those attacked with it, generally die."

During winter, the young people of these places are subject to inflammations of the lungs and phrenzy, and the old to acute fevers, which are the effects of excessive constipation of the bowels. The women are subject to tumors, they are surcharged with a white pituitous matter; they conceive and bring forth with difficulty. The children which they bear are very large, but, after some time, fall into a decline and continue very unhealthy. After their parturition, their evacuation from the womb has a very foetid smell. The children are subject to hernias, and adults to varicous and ulcers of the legs, so that they cannot live long; hence, premature old age. It also frequently happens that the women think themselves pregnant when it is only a swelling caused by a collection of water in the womb: I therefore suppose these waters to be very unhealthy."

We here clearly see the pernicious effects of stagnant waters, both in summer and winter. In the former, the miasms which exhale from these waters, and which are produced by the animal and vegetable productions that perish in them, produce dysentery, remittent and intermittent fevers of a bad species. In winter, the cold is opposed to putrefaction, but a quantity of aqueous vapors are disengaged, which render the atmosphere damp, and which produce in weak persons, such as the inhabitants of these countries, pituitous diseases.

In general, the inhabitants of marshy and damp countries, are short lived; the smallness of their stature, their complexion, and the weakness of the do-

mestic animals, all announce these countries the abode of disease and infirmities. In these situations, the atmosphere is almost always negatively electrized, and thunder is rarely heard, because the electric fluid is transmitted to the common reservoir, by the watery vapors with which the atmosphere is incessantly supersaturated. Thus all the animated beings of these places languish, and are destitute of that vital energy, with which those are endowed that inhabit climates, where the heavens and the earth are united by similar electric conductors.

Epidemic and contagious diseases are very frequent in moist and marshy countries. Solonge has frequently been ravaged by destructive diseases. The city of Bordeaux was formerly subject to those afflictions, and its parliament was, in consequence, obliged to move to a neighboring town. These diseases have entirely disappeared with the marshes that corrupted the salubrity of the air. On the contrary, *the town of Ville-neuve les Avignon* has become subject to epidemics since the giving way of an arm of the Rhone has produced marshes near it.

It is very important then to dry and reduce to cultivation marshy ponds, not only to prevent the contamination of the air, and its dreadful effects upon men and animals, but also to extend and multiply our resources and productions. Here the interest of territorial riches is united to that of the preservation of man, and there are but few objects more worthy of the serious attention of those charged with the care of public prosperity.

Another advantage we have to expect from the dry-

ing of marshes, is the manure that may be obtained from them to fertilize the lands. Hence, in addition to the salubrity of the air, and the covering of the lands from draining, we should render the mud of the exhausted and putrified marshes useful. Accumulated under the stagnant waters, this mud occasions death; dispersed upon the fields, it will give life with fecundity. In fact, these drainings are not without some danger, but this danger is only momentary; besides, it would be almost null, if the period from its performance was judiciously selected, and if it was executed with intelligence. Experience proves what I have advanced. Brown, in his history of Jamaica, relates that the first colonies of Europeans that were sent there, perished to such a degree, that they were obliged to entirely renew them every ten years, and that so soon as the marshes were drained, and the ground cultivated, life was prolonged as much there as in Europe.

The first Europeans who established themselves in Pennsylvania and the neighboring countries, found marshes in the flat countries, and they perished with putrid bilious fevers. Since they have drained these marshes and cleared the lands, these diseases have disappeared, and life is as long there as it is in other place.

The immense plains of Hungary are very unhealthy; they are destitute of trees and culture, and in many places of canals for the flowing of the waters. It is the same with a great part of the plains of the environs of Vienna, in Austria, and of those of Rome. Hence, putrid diseases almost always pre-

vail in these places.\* These countries can only be rendered salubrious and fertile by cultivation.

The defect of cultivation is not one of the least causes of insalubrity. This was the principal reason why the Europeans who first settled in the warm countries of South America, found that climate unhealthy. There the air was deprived of the advantage of vegetation, and was incessantly contaminated by the unhealthy emanations of the insects, which increased and multiplied beyond imagination, owing to their invading with impunity and without molestation, all the productions of nature, which augmented the degree of fecundity in proportion to the smallness of the animals. If the hand of man neglects to oppose the overwhelming of animated nature, either by raising clouds of smoke, as the Laplanders do, or by clearing the land and promoting the flowing of stagnant waters, there is soon a frightful accumulation of winged or non-winged insects, such as flies, gad-bees, musquitoes, gnats, ants, and various others, which contain in their stings a venom more active, than that of those of cleared places. The first Europeans who settled in America, caused at every step clouds of gnats and musquitoes to arise, by which they were enveloped.

*The belly hard, bound, and hot; that is to say, meagre and contracted, especially around the navel.*

*For the flesh is dissolved and received into the spleen.* We observe this viscous to increase in proportion as the fat diminishes and the body becomes lean.

\* When we are obliged to sail in an unhealthy country, it is prudent to do it when there are considerable winds, for the winds dissipate the morbid exhalations which vitiate the atmosphere.

“The most unhealthy waters, next to those of which I have just spoken, are those which flow from rocks, for they are hard, and those whose sources are warm, and in which exist mines of iron, copper, silver, gold, and minerals, as sulphur, vitriol, bitumen, and nitre; for these substances are owing to the violence of heat. These waters then cannot be good; they are hard and hot, and pass off with difficulty by urine, and impede the functions of the belly.

“The best waters are those of elevated places, and of high hills, which only consist of earth; for they are mild and clear, and can support a moderate quantity of wine; they are warm in winter and cold in summer, which prove their fountain to be deep. We must particularly recommend those that flow towards the rising, and especially that of summer, for these are necessarily the clearest, lightest, and most agreeable to the taste. Those that are salt, crude, and hard, are generally bad. There are, however, temperaments and affections in which the use of these are proper; but it is necessary to remember, that these that are at the rising are better, than those that flow between the rising and setting of summer, and more towards the rising than the setting. Lastly, the third degree in goodness are those that flow between the setting of summer and that of winter.”

*They can support a moderate quantity of wine;* that is to say, it requires but very little of this to color and communicate its taste to them; which indicates that they are very light, colorless, inodorous, and tasteless; for those that are heavy (which occasion a sense of weight in the stomach) colored and possessing taste, requires much more wine to retain its quali-

ties in them. For the same reason, the more spirituous the wine is, the more it communicates its qualities to them.

*There are, nevertheless, temperaments and affections in which their use is proper.* It is proved by this passage, that mineral waters were not unknown to Hippocrates.\*

*Towards the rising of summer;* between the north and the rising, towards *aquilon*, the north-east.

*Towards the rising and setting of summer;* that is to say, to the north; but as Hippocrates has said that the waters exposed to the north are not good, he adds, *and more towards the rising than the setting;* that is to say, towards the *aquilon* and north-east.

*Between the rising of summer and that of winter;* between the north-west, *Caurus*, and the south-west, *Africus*, that is to say, towards the setting. But Hippocrates has said above, that the waters exposed to the setting are insalubrious; they are bad only because they are turbid, and this defect may be corrected by filtration.

“The most unhealthy waters are those that flow towards the south, and those between the rising and setting of winter. But they are not so bad in cold as in warm countries. The following are my sentiments as to their use.

“Those who possess good health and much energy, may use indiscriminately all kinds of water; but those who do not enjoy good health, ought to choose the most salubrious. The following rules should be observed: those who have constipated bowels, tense

\* See article 3, appendix, vol. i.

belly, disposed to inflame, should use the most mild, clear, and light water; those who have a lax belly, who are moist and pituitous, should drink water which is hard, crude, and a little salt, because it consumes the phlegm and moisture."

*The most unhealthy waters are exposed to the south*, because they are crude and hold salt in solution. Next to these, those of the north are the most unhealthy; because they are hard and cold; they are not, however, so bad as the first, for by boiling they may be somewhat corrected.

"All the waters that cook easily, which penetrate meats, relax the belly; those that are crude, hard, and which cook meats difficultly, dry and contract. There is a popular error respecting salt waters; they are thought proper to relax the belly; they have, however a contrary effect, for they are crude and will not cook meat; this is the reason why they are more proper to contract, than to open and relax."

Hippocrates called these *waters soft* which cook easily, and which possess the proper qualities to maintain health; and those *hard and heavy*, which possess the contrary qualities, and which communicate a sense of weight to the stomach.

"Rain water is very light, mild, and limpid, for the sun attracts the lightest and most subtle parts of the water."

Hippocrates only regarded the waters from rain storms bad.

"Snow and ice waters are very bad, for any water that has been frozen, never regains its first quality." The use of snow and ice water occasions diseases of the lymphatic and glandular systems.

Water is a diaphanous, colorless, inodorous, and insipid or tasteless fluid, which nature has destined as drink for man and animals. It is one of the greatest dissolvents, for this reason it is never found pure, but always combined with foreign substances; it dissolves the air, saline gasses, salts, &c.

Chemistry has demonstrated that this fluid is not, as the ancients thought, an element, but that it is a compound of eighty-six parts of oxygen, and fourteen of hydrogen. Water is a most active agent, which incessantly influences our planet; its actions, currents, and motions, have, by degrees, changed the nature of minerals, and have, in some measure, created a new world upon the old.

There are no waters which do not contain the sulphat and carbonat of lime; there are those which hold in solution the carbonic acid, alum, iron, and vegetable and animal substances changed by putrifaction. There is in nearly the whole of them, a certain proportion of vital or atmospheric air, which may be disengaged by distillation, or by means of a pneumatic machine. It is thought, not without foundation, that the slight taste which waters possess, is owing to these gasses.

It has been ascertained by chemical experiments, that snow collected in a large mass, and evaporated in a glass vessel, does not leave any residue. Hassenfratz has demonstrated, that snow is water oxygenated, and that it has an influence on vegetation: 1. That it preserves plants and their germs intrusted to the earth, by supporting the temperature of the melting ice. 2. That it furnishes them with the oxygen and moisture necessary to their nutrition and develop-

ment. The experiments of Ingenhouz upon germination, have taught us, in fact, that the presence and contact of oxygen, is an essential condition to the development of seeds, and that the more abundant the oxygen is, the more rapid is the germination.

The waters of snow and ice, recently melted, are, generally, unhealthy; those who make habitual use of them are subject to glandular diseases; this is the reason why these affections are frequent in the Pyrenees, Alps, Switzerland, Tyrol, &c. &c. These waters are charged with heterogeneous substances, which communicate to them their noxious qualities. I do not think with Hippocrates, that their insalubrity is only owing to the loss that they experience, of their most subtle and attenuated parts from congelation, nor that they cannot recover their goodness; otherwise, all those of currents, rivers, &c. would produce the same effects, since they, in a great measure, are produced from the snows and ice of high mountains melted by the sun. From the observations of Pallas and several other physicians, the diseases of the glands, and especially, the endemic goitre, is not owing to the use of melted snow water, but is in consequence of the waters containing a great quantity of the sulphat and carbonat of lime. Perhaps these diseases also depend, more essentially, on the air of certain cantons charged with vapors and fogs, and not very often renewed by salutary winds. We see, in fact, in some valleys at the foot of the high Alps, inhabitants pale, and of a small size; whereas in the upper vallies, or in the plains between these mountains, we meet with men of a large size, well made and robust; these drink, nevertheless, snow water almost always.

Snow waters contain, according to Bergman, a small quantity of the muriat of lime and nitrous acid; those of rain, according to this chemist, hold in solution the same substances, but more abundantly. Boerhaave found in them the seed of seed weeds, mosses and *animalcula*: this is the reason he regarded rains as waters impregnated with an infinitude of particles volatized and disseminated in the air.

Rain water also contains oxygen, according to the experiments of Hassenfratz, but dissolved and not combined as in snow; for, submitted to a vacuum, it gives out air which contains a greater proportion of oxygen than river or fountain water, and even than the atmospheric air. Atmospheric air exposed to the action of phosphorus in the cold, diminishes 0.20 of its volume; the air extracted from the Seine affords the same diminution. That of rain water diminishes 0.32 to 0.40: the mean term of this diminution is, according to a great number of experiments, 0.35; hence, the air contained in rain water recently fell, contains a greater quantity of oxygen than the air of other waters, and even than the atmosphere; it does not, nevertheless, act upon the tincture of tournsoil, which snow water reddens, nor upon the sulphat of iron, which that precipitates, in part, in the form of an oxide of iron. Hence, it is, at least very probable, from these experiments, that rain water influences the vegetation and germination in proportion to the oxygen it holds in solution.

The most pure fountain waters are altered by heterogeneous substances, but in a small degree. The carbonat and sulphat of lime is found in them; sometimes the muriat of lime and soda, the sulphat of magnesia and iron.

The waters of wells and lakes contain the same substances, and especially the carbonat of lime, but in a greater proportion; they also, sometimes, hold in solution nitrous salts. They are less limpid and not so light as others, and not suitable to cook legumes and dissolve soap. The use of these waters, newly drawn, frequently produce cholic and diarrhoea. The most unhealthy are those of marshes, ponds—those which give out a smell and have a taste, as has already been remarked by the father of medicine. As vegetables and insects almost continually perish in these waters, they incessantly give out ammonia and *azotized hydrogen gas*; this last appears to be the cause of remittent and intermittent fevers, and of the putrid bilious dysenteries which almost always prevail in marshy countries, or those covered, in a great measure, by stagnant waters.

The running waters of large and small rivers are very healthy; fewer extraneous substances are found in them than in the preceding; they contain the carbonat of lime, sometimes the sulphat of chalk, but in a small quantity, and rarely the muriat of soda or the carbonat of potash. They are purer than those of fountains, and this is in proportion to the rapidity of their course, and to the extent of the bed over which they flow, and to the insolubility of this bed.

The good or bad quality of water depends, principally, upon the nature of the earth over which they flow. Those that pass over a considerable surface of calcareous soil, conveying large quantities of the carbonat of lime, form depositions and incrustations of this salt. It is this salt that gives birth to concretions, petrifications and stalactites; it is very probable that

the carbonat of chalk is dissolved in these waters by the influence of the carbonic acid. These waters, as well as those that contain a certain quantity of the sulphat of chalk, possess very unhealthy qualities; they are heavy and of an insipid taste, earthy and crude, they boil with difficulty, do not dissolve soap, but harden it. These are the species of mineral waters called hard, crude waters, because they produce a disagreeable sense of weight in the stomach.

Rain waters collected in a calm time (after raining for some time) in the open air, far from the habitations of men and animals, and received in earthen or stone vessels, or in cisterns\* made of these or other insoluble materials, are the best and purest of all waters, because they have been purified by a kind of natural distillation.

The waters which flow over a sandy or stony earth, and which are in contact with the air, are also very good. These earths are not attacked by the water; on the contrary, water which passes over chalk, plaster, or marble, and those which remain upon turfs, bitumens, mines, or in subterraneous cavities, are more or less impure, and should generally be rejected from use.

It is important to observe that it is dangerous to use tunnels or pipes of copper or lead as water conduits,

\* Cisterns are a kind of subterraneous places made with stones or flints united by cement. In order that the water may enter them purified, small cisterns are formed on the sides which communicate towards the foundation of the large one, and which are partly filled with gravel and sand. In this manner the water is conducted slowly in these small cisterns, whence it filters through the gravel and sand into the large one, and the water becomes very pure. The sand should be renewed from time to time, or, at least, washed to cleanse it from the filth that collects in it.

for these metals are very easily oxydated by the action of water, and in this state they are real poisons.

It is safer to conduct water through pipes of stone, cast iron, wood, or burnt earth; these materials impart nothing noxious or pernicious. It is not less dangerous to leave water standing, and still more so wine and acids, in vessels of copper or lead. The domestic use of these metals should be entirely proscribed. In proof of their evil effects, many fatal accidents could be given. Nothing contributes more to the preservation of health than the use of good waters, and nothing is more capable of destroying it than bad. The Romans spared neither expense nor pains to procure good water; when the country did not possess such, they frequently had them brought from a great distance by means of very expensive aqueducts; so much were they persuaded of the great importance of procuring themselves a healthy drink. It is desirable that the French government attend to this object, so worthy of its notice, and that the indigent, whom the dearness of wine will not permit to repair the loss of their energies from excessive labor, by its use, should not find in these impure and noxious waters the seeds of destruction.

The most suitable water for use, is that which is light and which does not produce a sense of weight in the stomach; which is clear, limpid, colorless, without smell, tasteless, and agreeable to the palate, that which is soon heated and as soon cooled, which easily dissolves soap, and which cooks and softens legumes; water that possesses these qualities, gives, by analysis, very little heterogeneous matter.

Water is, also, known to be good when no rushes,

mosses, or aquatic plants grow on the borders of the fountain, current, or stream; when it proceeds from the cleft of a rock, clear and limpid, and when it flows over a bed of sand or gravel, without mud or sediment.

Finally, its salubrity is confirmed by the good health of those who use it, by the energy and vigor of the animals and plants of the country. When the inhabitants of a country preserve healthy eyes, white teeth, and are not subject to diseases of the skin, it is an indication which should induce us to judge favorably of the water that they drink. In general, their good qualities almost always attest the purity of the air; it is rare that this is unhealthy in a country which has the advantage of good water.

Well waters and, generally, all those that are hard and crude, cease to produce cholics, when, after having boiled them, they are exposed for twenty-four or thirty hours to the open air, in large open earthen vessels, if filled; the salts held in solution are precipitated by evaporation, and the noxious miasms, if any be contained in them, are volatilized and set free. After this process they retain, at furthest, only a slight purgative effect, which is owing to the deliquescent salt insusceptible of precipitation; but it is safer, previous to using them, to filter them through sand.

Lind proposes a very simple and easy method to accomplish this object; it consists in taking a cask headed at one end, and to place in it another cask which is longer but not so large, but with both heads. The first is *one* third filled with sand, and the smaller and interior one, about one half. The water is to be filtered in the latter. It passes through the sand of the

two casks, and raises above the outer one, whence it is drawn off by a cock, in proper vessels. When circumstances will not permit this process, it is useful to mix a small quantity of wine, brandy, or vinegar with the water. The water will be still purer if we take care to have it boiled previously to filtering. Distillation is the surest and most efficacious means of purifying water from all extraneous matter with which it is impregnated: this process is, perhaps, the only one that can render sea water potable. We may completely deprive water of its salt in the alembic, but we are not always able to execute this process, not always having on a voyage, chemical vessels at our disposal.

Navigators frequently experience the inconveniences which the corruption of the pure water they take on board, produce on the crew.

Providence has created animals with so much profusion, that the air, earth, seas, the waters of large and small rivers, animated bodies, carcasses, and even acid liquors, are filled with a multitude of insects; no water, not even the most pure, is exempt from them. It is these insects and their eggs, imperceptible to the sight, which gives birth to the momentary putrefaction that fresh waters experience when enclosed in casks. The water becomes thick, gluey, viscous, contracts a bad taste and smell, which becomes more and more disagreeable in proportion to the progress of the fermentation. The fermentation having ceased, the heterogeneous substances are precipitated to the bottom of the cask, and the same water becomes sweet and clear; this frequently occurs at the end of twenty-four hours.

Lowitz has discovered a process which, in some

years, is of the greatest utility to preserve water from corrupting and to purify it when injured. To accomplish the first object it is necessary, at first, to pay the greatest attention to the cleaning of the casks; they should be well cleaned with sand, then rubbed with powdered charcoal; afterwards, about six or eight pounds of powdered charcoal should be put in every ordinary size cask, and a sufficient quantity of sulphuric acid to communicate a slight degree of acidity to the water. The carbon is to be occasionally agitated. Before using it, it should be strained through powdered charcoal.

When we wish to purify spoiled water, we throw this same powder, a little at a time, into the cask, until the water no longer exhales a bad odour; then a small quantity of it is to be filtered through paper, or a linen filter, to see if it comes off clear; if turbid, charcoal is still to be added; then it must be filtered through a large filter.

When we have sulphuric acid, a sufficient quantity of it is to be put into the cask, to make the water slightly acid, previous to adding the coal. Should this water be destined to cook aliments, the muriatic acid (sal marine) or common salt should be substituted. All these operations may be performed in five or six minutes.

It is necessary that the carbon which is to be employed, be well prepared; that it contains no ashes nor fatty substances; and that it has been preserved from smoke and inflammable vapors. The same parcel may be made use of several times; it is requisite for this purpose, that it be dried, or, what is better, that it be subjected to a strong heat, in close vessels,

and afterwards repulverized. Charcoal considerably weakens the taste of sulphuric acid, no doubt by disoxygenating it and reducing it to sulphur. Two drops of this acid will make four ounces of water pretty sour; but it is almost entirely destroyed when we mix a small quantity of powdered charcoal with it. Pure and fresh water quenches the thirst and refreshes; it gives tone to the stomach, and thence to all the system; it aids digestion, furnishes a necessary vehicle to the humors, dissolves the excremental matters, and conveys them with it out of the body. Drinkers of water, ordinarily eat much, digest well, and reach a great age, exempt from the infirmities to which other men are subject. The use of this drink, which nature has destined to satisfy the wants of men and animals, is proper in all ages and for all constitutions; it possesses the greater part of the medicinal virtues, according to the divers degrees of temperature, which merited it the name of *panacea*, or *universal remedy*; and, in fact, there are but few diseases in which it cannot be usefully employed, and to the cure of which it does not contribute conjointly with a proper diet; it is the basis of most of the medicinal drinks, potions, mixtures, decoctions, apogems, and their pharmaceutical preparations.

It is with water as with the other most salutary things; it is good as long as it is used moderately, and becomes injurious so soon as abused. *Omene quod nimium, natura inimicum*. Water drank to excess in summer, as has been remarked by Hippocrates,\* sometimes occasions dropsies. It produces

\* Lib de affect. intem.

acute diseases of the breast, such as the pleurisy and peripneumonia, when it is imprudently drunk while the body is very warm and in a sweat, owing to its suddenly determining the energies to the interior, which by changing into spasm, prevents the re-absorption of the perspirable fluids, or produces an increased action in the part in which they concentrate; such is the most ordinary cause of most of the diseases that exercise the greatest ravages in the armies, among country people and tradesmen. They might be easily prevented, if persons were to take the precaution of not drinking until after resting some moments, during which the body will become cool, and regain its natural state. Cold water, says Hippocrates, is salutary in coughs and in inflammations of the breast; it is not proper in a fever when the patient has cold feet. It is very useful in bilious affections, in excruciating pains of the head, and in spasms. To drink much water soon after eating, is prejudicial to digestion. It is also very dangerous to make habitual use of cold water or teas, in addition to their throwing the organs into inertia, and weakening the activity of the digestive juices; they also dissolve and carry off the mucous, which lines the interior coats of the alimentary canal, and lay bare the nerves, whose sensibility is violently excited by the aliments and drinks; from which results a bad digestion, cardialgia, pains, anxiety; and this continued irritation of the nerves of the stomach, habitually extended to the nervous system, with which the *primæ viæ* have the greatest interest, produce this extreme excitability upon which depends the multitude of nervous affections, that put on the form of all kind of diseases,

and obstinately elude all the aids of the art of medicine.

“Asia,” continues Hippocrates, in treating of *air, waters, and places*, “differs especially from Europe, in regard to vegetables and man; in that country they are both handsomer and grow better than in Europe; the climate is milder, and the manners of the inhabitants more polished and better cultivated, in consequence of the mild temperature of the seasons; for Asia is situated towards the south of the rising, and equally distant from great cold and heat; consequently, a temperate air, and one that has no predominant quality, contributes more than any other cause to the growth and good qualities of the productions of a country.”

*In the nature of vegetables.* In addition to the vegetable productions being excellent and superior to those of Europe, we also remark this difference, that in the east the greater part of plants are hairy, and the most of the shrubs and bushes are thorny. In Asia there are species of trees that are furnished with thorns, which have none in other places.\*

“It is not that Asia is temperate throughout; I only speak of that section of it situated between the cold and hot districts; it is there that all kind of fruits abound; it is that which is covered with trees, which possesses a pure air, and which, in addition to the rains that sufficiently water it, possesses also the water that the earth furnishes. It is not scorched by great heats, much dried nor whitened with hoar frosts, but moderately heated by the winds of the

\* History of Discoveries made by divers learned travellers in many countries of Russia and Persia. Tom. ii. p. 380.

south, moistened and cooled by the waters, rains, and snows, so that it is impossible that the fruits should not come to perfection, as well those produced by nature, as those cultivated by the hand of man. Flocks succeed better there than elsewhere, and are better fed. Children are raised with greater ease, and men are better constituted, more handsome, larger, better made, more attached to their country, and have a more agreeable sound of voice. There is scarcely any difference among them, and one may assert that this climate approaches, more than all others, the constitution the most natural and the most favorable to man. But it is as impossible that energy and courage, vigor and patience in labor, can be met with in such constitutions, as it is to met with constancy in love. Voluptuousness prevails; thence we see so many monsters among the animals. It is is the same in Egypt and Lybia.”\*

*I only speak of that part situated between the cold and hot; that is to say, between the rising of summer and that of winter.*

*There is scarcely any difference among them.* This uniformity is owing to the temperature of the climate, which is always the same.

*And we may assert that this climate approaches, more than all others, the most natural and most favorable constitution to man,* as much in consequence of the purity of the air, as the good productions of the country; consequently Asia is the mother country of man, and the cradle of the arts and sciences.

The people of continents are the most ancient, those

\* Lybia, now the countries of Borea, in Africa.

of peninsulas are of an intermediate period, and the most modern are the islanders. Asia being the most elevated of the continents by its convex and pyramydical eminences, was the first abandoned by the waters, which formerly covered the whole globe; it was also, consequently, the first inhabited by man. Its colonies afterwards populated the centre of Africa, and lastly, the population must have extended progressively to Europe, and a long time afterwards to America, and in times much more modern, to the northern regions.

*But it is impossible that energy and courage, vigor and patience, can be met with in this constitution.* A temperature always mild and uniform, necessarily produces indolence and laziness. Indolence is not at all allied to genius, nor laziness to invention. It requires an active and changeable sky to vary the ideas, and inspire them with that life, that gives birth to discoveries.

The Asiatics, enervated by the constant temperature of the seasons, are also enfeebled by the idleness which an abundance produces; they hence, lose with the energy of the body, the courage of soul and strength of mind; they see nothing beyond what is established, and preserve their ancient manners and primitive usages; they support an iron yoke without murmur, and contemplate the most beautiful heavens with indifference. It is only in severe and difficult countries, where man is compelled to contend with an ungrateful and sterile soil, that he displays strength and energies. Industry, then, springs from want. We remark that among animals those which find an easy and abundant subsistence, become lazy and stupid,

whilst others, such as the wolf, fox, &c. which live by rapine, are courageous and sagacious. Want makes them oppose cunning to precaution, and to supply, by the boldness of enterprise, the rarity and difficulty of the occasions. If industry belongs to a certain conformation of the organs, these are the means which develope them, both in man and animals. In truth, the Asiatics, whose sensibility is incessantly excited to a high degree, have an extremely lively and an exalted imagination, but it has no rules, owing to the want of that strength of mind which renders them subject to it; consequently, among them enthusiasm has no bounds; expressions the most exaggerated seem too weak to convey their sentiments, and the verses of Pindar would seem prose to them, compared with theirs. The monsters and chimeras which the pencils of their painters, and the chisels of their sculptors produce, proceed from the same source that the metaphors, allegories, and exaggerated figures of their poets. The disorder of the imagination causes them to surpass the limits of common sense, without which one can neither say nor think any thing extravagant.

*Hence we see so many monsters among the animals, &c.* Aristotle attributes this effect to the following circumstance: the water being very scarce and the heat constant, animals of a different species meet in great numbers in the same places to drink, that they there familiarize, couple, and produce monsters. This opinion is erroneous; it appears more probable that the coupling of the different species are an effect of climate, which exciting in the animals the urgent want of enjoyment, does not leave them masters of their

choice, but silences instinct, which would attract them towards their species.

“As to the people who inhabit to the right of the *Levant*, as far as the *Palus Meotis*, (these are the confines of Europe and Asia) they differ more among themselves, than those of whom I have just spoken, in consequence of the frequent changes of the seasons, and the nature of the country; for the nature of a country, as well as that of its men, is different, according as the seasons are subject to changes, and in every place where the changes of the seasons are more frequent and extreme, the country is more dreary and irregular. In these situations, we find forests and mountains, meadows and plains. In those places where the changes of the seasons are less obvious, there is the most regularity. This will also extend to men.”

*As to the people who inhabit the right of the Levant, as far as the Palus Meotis.* Here Hippocrates is to be understood as speaking of northern Asia, whose inhabitants occupy that part of Asia confined by the *Levant* and by the *Palus Meotis*, and the *Tanais* to the west, which separates it from European Scythia. It is bound on the north by the ocean, and on the south by *Mount Taurus*.

The *Palus Meotis* is a feeble elongation of Point Euxine, on the coast of Tanais; it is now called Asoph. The Tanais, or the Don, is a large river which empties into the Asoph. The *Palus Meotis*, from the report of the father of history, was formerly nearly as large as Point Euxine. Here then was a time in which these two seas covered a part of Asia and Europe, and navigators could communicate towards

the east from one coast, and from the other to the Caspian sea.

“I shall not speak of nations who offer but slight differences, but shall confine myself to those that present the most obvious diversities, either by nature or from customs. I will commence with the *Macrocephales* (Macronissa.)

“The *Macrocephales* are thus called because they have a very long head. Custom, alone, was at first the cause of this excessive length of head, but nature afterwards supplied the place of habit. These people think that those who have a long head, are the most valiant; this is the reason they, formerly, as soon as a child was born, moulded its head, still soft, with their hands; they lengthened it as much as possible, then they squeezed it, and bound it with plates of metal and bandages, so that it could only grow in length. This, which was at first only usage, changed by degrees and became natural; and this, in time, grew so powerful as to require no further assistance from habit. In fact, the semen comes from all parts of the body, and partake, equally, in its health or its diseases. If those who have bad eyes, beget children with bad eyes, and squint-eyed persons, squint-eyed children, and thus the same with all the other configurations of the body; why may not men with long heads beget children with long heads? It is true, they are not now born with heads so long as they were formerly; which is owing to the parents having neglected their custom, and to nature’s having resumed her first state.”

The *Macrocephales* were of the nations of the *Themiscyria*, in *Capadocia*.

*In fact the semen comes from every part of the body.* If the authority of one of the greatest men of antiquity, and a most skilful observer, can have any weight in theories, that of the father of medicine is favorable to the ingenious hypothesis of Buffon, upon generation. Buffon thought, with Hippocrates, that the seed is prepared throughout the body, whence it repairs to a common reservoir, and that generation is performed by a mixture of those of the man with the woman's: we see that there is in two philosophers of the rarest genius, the greatest conformity of opinion on this subject. "I shall now speak of those who live on the borders of the Phasis\*. This country is marshy, warm, damp, and uncleared, and is, at all times, subject to great rains. Its inhabitants live on marshes and in the midst of waters, where they build houses with wood and cane. They rarely frequent towns and markets, but they wander hither and thither upon their numerous canals, in small canoes made of the trunk of a tree. They drink waters that are warm, stagnant, affected by the sun, and rendered thick by rains."

"The Phasis, itself, is but a stagnant water, for of all the large rivers it is the most tranquil. The fruits used by the Phasiens, have but little meat, and they are not ripe; the excessive moisture of the country does not permit them to grow to an ordinary size, nor to acquire a proper maturity. This moisture renders the air of this country very thick and very heavy. All these circumstances cause the inhabitants of the Phasis to differ much from other nations in form and

\* A celebrated river of Asia, in Colehidia; at present Rione, or Faz.

figure; they are excessively gross and large, no joints nor veins are seen upon their bodies, they have a coarse and rough voice, in consequence of the heaviness and dampness of the air, and are slothful in their labors. The changes of the seasons are not less obvious in this country, neither as regards the heat nor cold. All their winds come from the south, one only excepted, called *cenchron*; which frequently blows with violence, and which is always very disagreeable because it is hot. North winds never extend as far as them, or if they do, they are so weak, that they can scarcely be felt. I have here related what is the most remarkable concerning the nature and conformation of this people, and what distinguishes the Asiatics from the Europeans."

*Upon the canals, which are very numerous, in consequence of the multiplied circuits the Phasis makes in its course.*

This large river is tranquil in its course, and flows slowly, previous to having received the large rivers of Claucus, Hippias, and several others; but after having been swelled by them, it is very rapid until it discharges into Point Euxine. Strabo said, that the Phasis was very rapid and impetuous, in his day; there were six hundred and twenty bridges over it.

*The north wind never extends to them, in consequence of the mountains arresting its course.*

"As to the weakness and slothfulness of the Asiatics, and the mildness of their manners, the causes should be principally attributed to the equality of the seasons, which never experience sudden and great transitions from heat to cold, nor *vice versa*; which prevents the mind from ever experiencing great shocks,

or the body sudden and violent changes; two things that determine the passions, and make persons lively and courageous. Those who inhabit a mild climate, whose temperature is always uniform, cannot experience those advantages, for it is the changes of the seasons which arouse and stimulates the soul, and which do not permit it to rest. In addition to these causes, the laws and customs, also, contribute much to render the Asiatics weak and slothful; for the greatest part of Asia is subjected to kings”.

Hippocrates is only to be understood as speaking of the despotic government of the kings of Asia, who leave no kind of liberty to their subjects.

“In Europe, near the *Palus Meotis*, there is a Scythian nation that is different from all others, and which is called the Sarmartes.\* Their women ride on horseback, lance the javelin, and combat until they are married. It is requisite that they should have killed three of their enemies to be permitted to marry, and they do not cohabit with their husbands until they have made the sacrifice ordained by the law. Those who are married are excused from riding on horseback and going to war, except when all the country is forced to take up arms, as in very urgent cases. They have the left breast only, for in youth their mother takes care to burn the right one with a brass instrument adapted to this operation; so that this part receiving no more growth, all the force and nourishment

\* The ancients divided Sarmatia into that of Asian and that of Europe: that of Europe, of which Hippocrates speaks, situated between the Vistula, Danube, Point Euxine; Tanais, and the Riphian mountains, comprehends Poland, Russia in Europe, and little Tartary; that of Asia is what is now called Kasan, Astracan, and Circassia, situated in Scythia; the northern part of Asia, at present Grand Tartary.

designed by nature for its support, is communicated to the right shoulder and arm.”

This is all that the famous history of the Amazons amounts to, of which, succeeding ages have made a nation of women who lived without men. What Hippocrates says of their burning the right breast, is a proof that, before his day, they mixed fable with history, and he only speaks on the faith of others.

*After having made the sacrifice commanded by the law.* \* \* \* It was a sacrifice to the god Mars and the goddess Pallas.

“As to the rest of the Scythians,\* they are similar to each other, and have no resemblance, in any respect, to other nations. It is the same with the Egyptians, except that they are debilitated by the excessive heat of the weather, whereas the Scythians are hardened by an excess of cold. What is called the desert of Scythia, is a vast, naked plain, rich in pastures, and watered with many streams and springs. It has, also, large rivers, whose waters are discharged upon the plain by troughs or canals. This is the country of the Scythians, who are, likewise, called a wandering people, owing to their having no houses, but lodge in wagons, the smallest of which have four wheels and the others six, and all of which are covered with blankets and constructed like three-story houses; they are sheltered by their covering from snows and rains, and, also, guarded from the violence of the winds.”

“The chariots are drawn by two or three pair of oxen, that have no horns, in consequence of the great rigor of the cold. The women live in these chariots,

\* Hippocrates here speaks of the European Scythians.

and the men follow them on horseback, at the head of their flocks and their steeds; they continue in the same place as long as they find forage, and when they have consumed what it affords, they decamp and go elsewhere. They eat boiled milk, and drink mare's milk, of which they also make a cheese, that they call *hippace*. There is no nation less fruitful, nor in which the animals are less numerous and of a smaller size. The Scythians also inhabit a country situated precisely under the *Bear* and the *Riphean mountains*, whence the north winds blow. They have not the sun until the end of the summer solstice; it then warms them for some time. Warm winds very rarely occur among them, and, notwithstanding, they are very feeble; they have almost always north winds, which are rendered very cold by the snows, ice, and waters, and which constantly blow from the mountains; these mountains are rendered uninhabitable from the excessive cold. The inhabitants live in damp places, and in an air thick and rendered obscure by the fogs. Winter is perpetual, and summer continues but a few days; the heat of this season is not great. The plains of the country are naked, without a shelter from the mountains, and entirely exposed to the north. \*

\* \* \* \* \* The seasons do not experience great and obvious changes; they are always the same, and but little variable; hence the Phasiens all resemble one another. They constantly observe the same regimen, and wear the same clothes in winter as in summer; they only respire thick and damp air, and drink none but snow and ice water, and are without strength and vigor; for it is impossible that the body can have strength or the

mind energy, in a climate that is not subject to great changes. All these circumstances cause them to be fat and fleshy, to have lax and humid joints, and the upper and lower bellies always surcharged with humors. In fact, it is impossible that the belly can be dry in such a climate, and in men thus constituted; that mass of fat and flesh with which they superabound, render them so similar to one another, that one can scarcely perceive any difference either among the men or women; this is owing to the uniformity of the seasons, which produce no change nor alteration in the semen, except when it succeeds some disease, or some other violent accident."

*They are similar to one another.* The Scythians inhabit a country which is always very cold, and which never experiences much variation in its temperature. It is owing to the same reason that the Egyptians resemble one another; they always have an excessive heat.

*The desert of Scythia is a vast plain.* It comprehends the deserts of Sarmatia and of Tartary, which are of an immense extent.

*It has also large rivers*—the Rhea, Boristheans, and the Tenais. The cold is so severe in Scythia, says Strabo, that the inhabitants cannot raise asses; oxen are raised there without horns, the horses are very small, but woolly beasts grow to a very great size.

*And the Riphean mountains.* This was the name given to the North mountains by the ancients; from a Greek word which means, always beaten by the winds.

*It then warms them a little.* It is very hot there, but the heat is of short duration.

The greater part of the Scythians, according to the report of Hippocrates, cauterize their shoulders, arms, joints of the hands, breast, thighs, and loins, in order to consume the superabundant serum of the body.

We see that cauterization is a very ancient practice, and cannot be claimed as a modern discovery.

The Scythians were subject to impotency, of which Hippocrates has spoken. Those who were affected with this defect, thought themselves changed into women by the will of the gods; they wore female clothes, spun, spoke as the women, in a word, fulfilled all their labors, &c.; they were called womanish. Superstitious people thought that this disease came from the gods, and rendered homage to those attacked by it.

Hippocrates thought that this impotency was owing to their cutting the veins situated near the ears, and letting the blood flow until they fainted. They experienced fluxions in their joints, which made them lame, an inconvenience to which they were very subject, as Hippocrates says, because being continually on horseback, and having the legs always hanging, it produced a debility in those parts, to which this defluxion in the articulations succeeded, this being inveterate, contracted the nerves and rendered them lame. It appears that the father of medicine was not exempt from the errors and prejudices of his age, when he attributes the impotency and defluxions of the joints to such causes, for observation has not in

reality proved this sentiment to be correct. *Errare humanum est.*

“All the other Europeans are very different among themselves, both in stature and figure, in consequence of the sudden variations of the seasons, which are frequent in their countries, for they have severe winters and insupportable summers, great rains and droughts, and violent winds, which occasion great damage. It is this which causes a difference in the generation by the great diversity of the semen, which are not always of the same nature in the same man; they are quite different in winter from what they are in summer; the same may be remarked between very dry and very wet weather.”

“I thence judge that the Europeans are more courageous than the Asiatics, for the equality of the seasons engender laziness, and their inequality occasions the exercise and labor of the body and mind. Cowardliness springs from idleness and inaction, and courage is nourished and fortified by exercise and action; this is the reason the nations of Europe are more warlike than those of Asia. Government has also much influence, for the Europeans are not, as the Asiatics, subject to kings, and in every country where kings command, the people are cowardly, they are slaves even as to thought, and they will not expose themselves voluntarily to perils for others. The Europeans are free; hence, brave dangers, because it is for themselves that they are thus exposed; they have all the glory of the victories that they gain, and gather for themselves their trophies. It is thus that cowardliness and bravery are in a great measure the effect of government.”

*The Europeans are not subject to kings.* In the time of Hippocrates, there was scarcely a king in western Europe. Government has a real influence upon the character and the manners of a nation, as Hippocrates has said, the observations of whom served as a basis to the principles which the immortal Montesquieu has developed in his work upon the *spirit of the law*. The action of government upon a nation, may be compared to the effect which culture produces upon trees: the latter do not produce the same fruits; though alike and living in the same district of country, and under the same sky, there is a difference depending entirely upon cultivation. It is the same in relation to governments relatively to nations; it produces the same effects on them that culture does upon plants. Such is the reason why certain nations have so much degenerated from their ancient splendor, whilst others, after having regained the liberty that they lost under kings, have succeeded in obtaining a government which has secured to them safety and happiness.

“There are, in Europe, nations differing in their height, figure, and in their mental qualities; the cause of these differences are owing to reasons that I have given above, and which I shall explain still more clearly. All those who inhabit a mountainous, hard and dry country, are subject to considerable changes; they, are, consequently, larger, more active and more courageous; and these kind of temperaments cannot fail to be austere and ferocious.”

The mountaineers respire an air pure, highly oxygenated and electric; they have, consequently, warm blood, much strength and vigor. But what contri-

butes the most to render them agile and strong, is the habit of working, and sudden and frequent changes of temperature, which occur in the different seasons of the year, and to which their system is habituated from most tender youth; so that they support without inconvenience, the shock of contrary motions, the flowing of the actions from the exterior within, and its reflux from the centre to the circumference; these divers determinations frequently and precipitately occur in the same day from the one extreme of temperature to the other, and *vice versa*; consequently, these causes powerfully fortify the body, and promote its increase. The more the organs are agitated, the more do they develop and acquire vigor; it is not astonishing then, if men, in such countries, are large and vigorous: they, having the sense of their strength, are courageous; they are austere and ferocious, for the labors and assiduity with which they apply themselves to work to gain subsistence in a sterile and arid soil, abstracts them from the commerce of polished and civilized society; they do not apply to the cultivation of the sciences and fine arts, which soften and temper the savage manners and the natural cruelty of man.

Observation proves that, in general, indolence and servitude inhabit the level countries, and that mountains are the real abode of energy and liberty. The most of the ancient and modern nations that have displayed great activity, were mountaineers. The Assyrians, whose conquests extended from the Indus to the Mediterranean, came from the mountains of Atouria; the Chaldeans were, also, originally from these mountains; the Persians of Cyrus were from the mountains of Elymais, and the Macedonians from

mount Rhodope. In modern times the nations the most energetic, free, or difficult to subject, are the Swiss, Scotch, Miquelets, Asetrians, and the inhabitants of Cevennes. There are, however, moral causes which can give a strong impulse to the inhabitants of plains, and render them conquerors. We may cite the Arabs and Tartars in proof of this position: the invincible arms of these people have diffused, far and wide, the fire of war, and spread terror and desolation.

“Those who live in a low, stifled country, which abounds in meadows more exposed to warm than cold winds, and only affords warm water, cannot be so large, straight, nor well made; they are fat and fleshy, have black hair, and, generally, the complexion dark. They are less pituitous than bilious, and have not so much strength and courage as those nations of whom we have just spoken, unless they acquire by habit those qualities which nature withholds from them. If these countries are watered by rivers, that receive rain water and that which is not stagnant, they enjoy a good health, and have a good complexion; but if there are no rivers, and they are obliged to use stagnant and foetid water, they have, necessarily, affections of the belly and spleen.

The constitution of the inhabitants of a country thus situated, is such, that the energies and the actions are almost incessantly attracted to the exterior organ by the action of the warm winds which prevail in it, and that of the warm water which they use. The inhabitants cannot be of a large size, because, the action being unequally divided, and the exterior organ receiving it in a superabundant degree, at the expense of the others, the development of these can only be

incompletely performed. But they should be fat and fleshy, because the eccentric force tends, habitually, to the exterior. They are not straight, and many among them are deformed, owing to the muscles not possessing a sufficient force to retain the trunk and members in their proper attitude; hence, the body is abandoned to its own weight and becomes deformed, especially in early life. It is thus, for example, that the legs bend and become crooked in children who have walked too soon, before the muscles have acquired a sufficient sum of the energies. At this age the bones are soft and ductile, they easily give way and curb: add to this cause, another, not less powerful, the rickets, which must be very prevalent in these countries; seeing the powerful causes of enervation found in them, which gives place to a considerable inequality in the respective growth of the different parts in which this disease is seated.

They have, also, very soft and humid bellies, because the water which they drink is very relaxing.

*They have black hair and the complexion is dark:* such is the effect of heat upon the exterior of the system.

*They are less pituitous than bilious.* The bilioso-pituitous is the effect of warm and damp winds; the influence of which is constantly experienced by those people. They do not support the labors of the body and mind; the tension of the epigastrium, which is necessary to mental labors, cannot be constant, and the diversion of the energies to the exterior, does not permit it to be otherwise.

Nevertheless, these nations enjoy health when they do not use stagnant waters; but if their country is not water-

ed with rivers, and if they drink stagnant and fetid waters, they are subject to affections of the belly and spleen; because, from these waters there is exhaled marshy miasms, which produce remittent and intermittent fevers, bilious dysenteries, and other abdominal affections,\* to which they are already disposed by the bilioso-pituitous constitutions that they possess.

“Those who inhabit a country elevated, cleared, exposed to the winds, and abounding in water, are of a large size and straight; they almost all resemble one another; they possess less courage and more mildness than those of the countries less pleasant.”

We easily conceive why they are large and straight, for the energies and the actions are equally divided, and in suitable proportions, throughout the system.

*They resemble one another*, because they are subject to the constant influence of the same causes. *They possess a mildness*, in consequence of the equality and clemency of the seasons, and owing to their not being compelled to pursue laborious works to obtain a living; their country is fertile and does not require a long and difficult culture to furnish the necessaries of life. Nations who do not experience the extremes of temperature, whose successions are rapid, are not subject to those violent concussions of the epigastrium and brain which cause or predispose to strong and violent passions. It has been observed that these are the nations who have the mildest manners, and which show the most humanity. We here see that the physical powers have an especial influence upon the morals.

“Those who inhabit naked, poor, and dry coun-

\* We must observe that the ancients made the paroxysms of fevers depend upon a disease of the spleen.

tries, not subject to great variations, have a robust and strong body, and a skin rather yellowish than black; they are arrogant, choleric, obstinate and firm in their opinions."

*They have rather a yellowish, and not black, complexion,* owing to their having, alternately, great heats and colds. Nations who constantly experience an excessive degree of heat, are black, and those of cold countries are white; but those who live in countries whose temperature is not excessive, and which but rarely varies, have a yellowish complexion. This color, in the human species, is the intermediate between white and black. As to intrepidity, courage, and firmness of character, these moral qualities depend, in a great measure, upon the strength and vigor of the body.

"In every country where the changes are great and frequent in the seasons, we find men whose figure is very different, and who do not resemble one another in any respect, either as regards the complexion or manners. This is owing, 1. To the temperaments not being the same; 2. To the productions of the soil and waters which they use. We almost always remark that the form and manners of men are analogous to the nature of the country that they inhabit."

In this text, Hippocrates is to be understood to speak of a nation which inhabits a large extent of country, and which has a variety of soil, seasons, waters, and, consequently, alimentary productions. The effects produced by these dissimilar causes upon an extensive nation, must be very different relative to the localities of the country which they inhabit. Hence, for example, mountaineers are constituted

differently from the inhabitants of valleys; these, in the north of France, for example, differ in almost every respect, both as regards the body and mind, from those who reside in the south. The same holds good in relation to the vegetable productions of these two districts of country.

“In all places where the earth is rich, soft, and damp, where the waters are so superficial that they are warm in summer and cold in winter, and where the seasons possess a mild temperature; the men are fleshy, humid, and have large joints, they do not support fatigue, are cowardly, lazy, sleepy, stupid, destitute of address, and unable to cultivate the arts.”

We here remark the effects of an extreme softness of fibre, of its laxity, and of the superabundance of the pituitous humor; especially in the joints, which it enlarges. *They are feeble, and, consequently, without courage. They are unskilful in the arts;* owing to the defect of a constant tension of the epigastrium, which is essential to mental labors, and owing to the brain having imbibed a great quantity of serum, thereby deprived of a part of its play and spring.

“But, throughout, where the country is naked, open and arid, where the inhabitants experience the rigors of winter and the ardent heats of summer, the men are meagre and hairy, but strong, robust, vigilant, laborious, arrogant, and obstinate, austere, rather than mild, adapted to the arts, and are valiant. In a word, every thing that grows in any land whatever, participates in its qualities. This fact is sufficient to explain the greatest differences which occur among men, both as regards their figure and temperament. From what has been said of the countries of which

we have spoken, we may draw correct inferences respecting all others which we have omitted to notice.”

We see in the constitutions of the nations of which we have just spoken, the effects of the strength and vigor of the fibre, which do not permit the mucous and pituitous humors to accumulate in its interstices, in the cavities of the body and the articulations. The epigastric region receives and sends back freely the effort of action of the different parts, and the brain possesses great energy. Hence, men who inhabit these countries, are calculated for the labors of body and mind; as they experience the rigors of winter and the heat of summer, they are strong and vigorous; they have courage, an aptitude for the arts, and all the qualities that are essential to form warriors.

From what has been said, it results, that the physical and moral qualities, of which the characters and manners of nations are composed, are materially dependent upon the place which they inhabited, upon the air respired, the seasons experienced, the aliments and waters used, and the worship and government. It is to the greater or less influence of these causes, that we should attribute the obvious differences that we meet with, not only among nations, but also among individuals of the same society.

We have spoken of the nature and forms of bodies the most opposite; keeping these in view, in considering others intermediate, you cannot be much deceived.

## CHAPTER VII.

*On Substances applied to the surface of the Body.*

CLOTHING, frictions, bathing, lotions, and all things relative to cleanliness, are the principal ones that are applied to the surface of the body, and are those of which we shall treat in this chapter. Clothing is indispensably necessary to the inhabitants of a country, subject to great changes in the temperature of the atmosphere, as well as to civilized nations. The rigors of cold, and the sudden variations of the air, which continually sap the foundation of life, and the depravation of the manners, the inevitable effect of an advanced civilization, imperiously demand their use in both cases. It is not the same with nations who continually breathe a warm and scorching air, to these clothes would only be an inconvenient and superfluous burthen; they are still less useful or necessary, so long as these nations, not corrupted by the taste of imaginary pleasures, live in the simplicity of innocence; for modesty covers nature with her veil, and mystery, the child of vice, is absolutely unknown to these people; for this reason, these nations are generally found in a state of perfect nakedness.

Clothing should correspond with the period of life, the country, and the seasons; it should be convenient, and not cause any uneasiness, otherwise it is injurious. Warm and heavy clothing is not proper for young people at the period when the organic forces develop themselves, and especially towards the ex-

terior and superior parts; they would produce abundant transpirations injurious to the system at this age; and by determining too great a quantity of the nutrimental juices towards the circumference, would prevent the free development of the other organs, produce congestion in the brain, and thus occasion a multitude of real evils, the least of which would be habitual defluxions. It is proper then, that young people and especially children, wear clothes made of light stuffs, and principally of cotton; to accustom them at an early age to the vicissitudes of cold and hot weather, and to make them familiar with the intemperate seasons; this is the way to render them healthy and robust. In advanced age, when the fibres of the exterior organ have become hardened, when its tissue has become contracted and compact, and when the concentric forces predominate, to render slower the progress of the concentration, which characterizes cold old age, and to promote the transpiration, the suppression of which is the cause of most of the diseases of this age, it is useful to wear clothes of thicker and warmer stuffs, such as cloth, wadding, &c.

The clothing should correspond with the season; it should be light in summer and warm in winter; it is also necessary to change with the greatest precaution, if we wish to guard against the diseases, which too sudden transitions of the atmosphere produce. It is, consequently, proper to be careful not to change too early in the spring, our winter clothes, for those that are thinner, and to put them on as soon as the cold weather commences.

It would be an efficacious means of preventing man from the dangerous effects which the sudden changes

of temperature, so common in our country, frequently produce, to familiarize him with them from his infancy. We should surely attain this object, by never dressing him warmer at one period than at another, and by accustoming him to do without fire; (in early age nature inspires a kind of aversion for fires and for a sedentary life, but creates a fondness for exercise and motion,) such as swimming, after being strongly exercised in wrestling, hunting, or dancing, and to resume immediately these exercises.

These were the means by which the inhabitants of Rome succeeded in rendering their youth strong and vigorous; no people were more robust nor more valiant, none better supported the labors and fatigues of war. Nothing is more efficacious, says Galen, to the acquirement of vigor, than to expose one's self to the sudden transitions of heat and cold; we thus in some degree temper the body. We augment the strength and hardness of steel, by heating it several times in the fire, and by cooling it each time in cold water.

Clothes produce different effects upon the body, according to the materials of which they are made and their colors. Those made of wool and of silk are warm, and retain the heat of the body; not being conductors of heat, they insulate that produced by the vital energies, and prevent its being absorbed by the surrounding air. Garments of silk, skins, hair, &c. are electric; those of wool excite electricity by the friction which they occasion. The first retain and, in some degree, concentrate the animal electricity in the body, and intercept the communication of the electric fluid of the atmosphere, whereas the second establishes a free circulation of this fluid between the

body and the atmosphere. It thence appears, that garments of silk, hair, in a word, those made of materials possessing the insulating property, are especially useful in humid constitutions, owing to their retaining the electric gas, which excites the vital energies, and which the aqueous and non-electric vapors tend forcibly to carry off; whereas those of wool, cotton, linen, lastly, those non-electrics, are proper in dry constitutions, because they prevent the animal electricity from accumulating in too great a quantity in the body. Vestments of wool, though very advantageous and of a very extensive use, are not, nevertheless, without inconveniences. In addition to the contagious miasms attaching more easily to wool, and adhering more strongly to it than to other substances, these vestments imbibe the sweat, which, when the body is heated, soon becomes putrid and exhales miasms; and these miasms, when arrested, very frequently communicate their impression to the skin, and produce the itch, ringworms, &c.; besides, the moisture penetrates woollen stuffs in a greater degree and sooner, than other substances. These kind of vestments not only contract and compress the body, when thus affected, which it is true, is but a slight inconvenience, but they also suppress the transpiration, especially in cold weather, and thus occasion a multitude of serious diseases.

It is very dangerous to suffer wet clothes to dry upon the body, by exposing one's self to the heat of the sun or to that of a stove, especially when the garments are of a bad color and give out the dye. In this case, the skin becomes impregnated with the coloring substances which leave the stuff, and it becomes an

additional obstacle to the excretion of the perspirable humor; perhaps the action of the heat also develops the miasms of the coloring substances, which absorbed with the moisture and perspirable humor, by the inhaling vessels of the subcutaneous cellular tissue, increase the causes of disease. I have observed, that the soldiers of the republic, who are attacked with diseases originating from a suppressed transpiration, experience the most serious symptoms, and even that putridity is developed more frequently and sooner, when their garments have communicated to the skin the blue color of the dye, than when they have only been simply wet. Several health officers belonging to the hospital, have made the same observations.

It is then the interest of government to take into consideration this subject. Economy and humanity require that the citizens called to the defence of the country, be well clothed, and that their garments be dyed in such a manner, as to make the dyes resist soap and other agents capable of destroying and carrying off the colors. In contrary cases, the clothing is not only prejudicial to the health of the soldiers, but they are also of a short duration; for when but little exposed, they rot and fall into rags.

Light clothing of linen, cotton, and hemp, are excellent conductors of heat; they permit it to pass from the body to the open air, and do not prevent the passage of the cold of the atmosphere to the surface of the body through their tissue. They are then the most proper in warm countries and during summer; but we should not be indifferent respecting the colors; these ought to vary according to the season and the climate. Experience has taught us that substances

which are not dyed, are not so warm as those of deep colors, and especially those dyed dark or black. If we blacken the surface of a burning mirror with the smoke of a lamp, it will not reflect light nor caloric or heat, for if the bulb of a thermometer be placed in its focus, the fluid will not rise. If two coffee-pots of an equal size, containing the same quantity of water, be placed at an equal distance from the fire, the one being white and the other black, the water in the white will boil first. Undyed clothes are the most congenial to warm seasons and to southern countries. Those dyed dark or black are most suitable during winter and in cold countries.

Garments should always be conformable to the temperaments. Robust and sanguine persons support heat and cold better than delicate ones, or than those liable to experience sensible aberrations by every change of the temperature of the air; these should be more warmly dressed in all seasons, and those wear clothing that is lighter and not so warm. It is also necessary that the garments be clean and easy; they should not be too tight nor confining, otherwise they obstruct the progressive motion of the blood and humors, and may occasion very serious accidents. We have frequently seen swooning, vertigo, apoplexy, oppression, cough, spitting of blood, and many other fatal affections caused by the compression of garters, buckles, cravats, and especially stays.\*

\* Physicians have always opposed the pernicious use of swaddling clothes, stays, &c. Philosophers have united with them, and their combined efforts have not been without success. This happy revolution is already advanced, but not yet finished, so difficult are prejudices and old usages to overcome.

“Coming from the hands of nature, all is correct” says J. J. Rousseau; “but every thing degenerates in the hand of man.” It were well to make a just ap-

If I were to propose a standard in the manner of clothing, I would select that of the Quakers. A simple and full habit, fine linen, without ornament, and an almost superstitious neatness, distinguishes this peaceable and humane class of men, from the other religious sects.

What I have just said respecting the fullness and ease necessary to clothes, also applies to shoes. Shoes too tight have caused more lame than elegant people; they are at least very inconvenient, and injure the walk. Whoever would have Chinese feet, should expect to have collosities and corns; these are not only painful, but they also deprive us of the use of our toes, and injure our walk. High heels are not less inconvenient. In fact, they make those who wear them appear taller, because they are obliged to walk on the toes, but they do not walk so well in this manner. The motion of the articulation is prevented, the members are in a forced position, the person is con-

plication of this truth on the subject in question, for the custom still pursued by many people, of binding the delicate body of the new-born child, and afterwards inclosing the breast in cases of whalebone, is a most pernicious practice, and decidedly contrary to the views of nature. Those cases or stays are particularly injurious, for they prevent the development of the breast, and cause it to take a direction opposite to that which nature designed. In fact, their form is precisely in an inverse sense of that of the breast, which represents an inverted cone, whose point is above and whose base is below; but the stays are large above and small below; whence it results, that not being shaped conformably to the thorax, which they compress inferiorly, they prevent its expansion, and render the respiration difficult. Fatal hemoptosis and phthisics have frequently been produced by this cause. The functions of the stomach are also impaired by it, in consequence of the constant compression which it experiences; thence these anxieties, cardialgies, &c. which are solely produced by these compressions, and of which young girls frequently complain. Independent of these inconveniences, stays are not favorable to the elegance of shape and beauty. The philosopher of Geneva has not inaptly compared the shape, which women contract from the use of stays, to that of wasps. They frequently, in order to produce a fine shape, cause deformity or the consumption.

strained to hold the body bent forward, and walks without grace as well as without gentility. There is not one woman out of ten, who can be said to walk well; this defect is owing to high heels. But happily for them this fashion is declining.

Frictions are prophylactic and curative means, and are, in many cases, very efficacious. The ancients made frequent use of them, and obtained great benefit from these applications. Galen recommends them as a specific in chronic cases depending upon a laxity and inertia of the solids. Friction consists in rubbing the whole, or some parts, of the body with linen, flannel, or a brush. It should not be performed until digestion is finished, and should be continued for fifteen or twenty minutes.

Friction attracts the energies and the action to the exterior; it gives tone and vigor to the solids, and accelerates the progressive motion of the blood in the veins, and afterwards in the arteries. It is not requisite that it should be hard or severe; otherwise it inflames the skin, hurries the circulation, and produces fever. Its effect then, is to augment the action, and to give mobility to the stagnant and affused humors: hence it is advantageously employed to attenuate and resolve indolent tumors, to reanimate the languishing action of the vessels, and to reestablish the circulation in parts where it is difficultly performed. These effects are not limited to the parts upon which the direction is applied, for it frequently excites a general transpiration, and determines the radiations of the energies from the epigastrium to the exterior organ; thus its sphere of action embraces the whole body: this is the reason Celsus recommended friction, principally, in

affections which were owing to the fixation and concentration of the energies in the interior of the system, as in melancholy, hypocondriasis, &c.

The use of friction requires some precautions: 1. It should be abstained from in plethory; 2. It should not be applied upon the stomach and abdomen, when there is an embarrassment in the *primæ viæ*, with heat and a tendency to putridity.

The ancients made great use of unctions with oil; they used them previously to going into the bath, to prevent too great an evaporation. The soldiers used these means to preserve themselves from the effects of colds, and also to preserve the pliancy and flexibility of the skin and members, when they took the field in the cold seasons. We read that Xenophon had his soldiers rubbed with oil and grease at the time of their retreat, whilst they were benumbed with cold.

Livy relates, that Hannibal used the same means when his soldiers, after pursuing the enemy in water, and having suffered by a considerable rain during the following night, had their bodies stiff and almost motionless, so as scarcely to be able to handle their arms; this general had fires kindled before the tents, and distributed oil among his army to anoint their limbs; which had the desired effect.

The most indolent nations of the northern countries of Europe and America, anoint their face, hands, and feet with oil, in order, not only to guard them from the sting of insects, which are very numerous in these countries, but, also, to render them less sensible to the cold. When they have taken this precaution, they can walk a long time in snow without experiencing any inconvenience. These means might be usefully

applied in armies which are compelled to expose themselves to great cold; taking care, when the necessity, which subjects them to this exposure, shall cease, to wash themselves in warm water, or what is still better, in warm soap suds. This preventive of the too great expenditure of heat, is not to be neglected; the experience of the ancients guarantee its success, and we have nothing to fear from the suppression of the transpiration, which they seemed to dread, since they practised frictions with oil previous to bathing, to prevent too great a dissipation of the humors which the bath attracts to the exterior; for observation proves that, on the contrary, they excited the transpiration. I think with *Mercurialis*, that it was only with a view of producing pliancy and lightness of the limbs, and not to prevent too great deperditions, that the Athleta rubbed themselves with oil and pomatum previous to a combat.

There are four kinds of baths, distinguished by the temperature; the hot, tepid, cool, and cold baths. The hot bath is of a high temperature, and those who plunge into it experience a considerable increase of heat; it produces an abundant transpiration, or rather sweat, especially upon the forehead; it causes agitation, uneasiness, anxiety, vertigo, and impetuously determines the blood towards the brain; the face becomes strongly colored, the eyes red and sparkling, the caroted and temporal arteries have a strong pulsation; in a word, this bath determines the action of the blood towards the head, and, sometimes, produces apoplexy and death; hence, physicians have almost entirely abandoned its use. The tepid bath produces a heat, mild, temperate, and not inconvenient, or

rather, in which we are not affected with great heat, nor a sensation of cold. The cool bath is of nearly the same temperature as the atmosphere of summer. Lastly, the cold bath is at the degree of congelation, or below it. Baths clean the skin from the filth which transpiration leaves upon it; lotions produce a similar effect; both promote this excretion.

The tepid water relaxes the solids, attracts the action to the exterior, and renders the humors more fluid; for water is absorbed by the inhaling vessels, and mixes with the blood and humors, which it dilutes. It is only, as Galen has said, by admitting the penetration of the waters of the bath, that we can conceive the promptitude with which it refreshes, fortifies, and appeases the thirst of persons overcome with fatigue, and of whom the interior parts of the mouth, oesophagus, and stomach, are in such a state of dryness that they can neither swallow nor speak. Moreover, the absorption of water is proved by a multitude of decisive experiments; there are but few persons who are ignorant that the water in which they remain for some time, is generally found sensibly diminished, and the weight of the body is obviously increased.

The tepid bath is useful in all cases where the fibre is hard and contracted, but, especially, where the action is fixed and concentrated in the epigastrium. It is, consequently, advantageous to those who have a small, dry, and vibratile fibre, to old persons, the melancholic and hypochondriac, in excessive fatigue of the body and mind, and in strong passions.

When the tepid bath is used, it is necessary to take care, 1. That it is not used immediately after a repast;

as Juvenal, who knew the dangers of which they are the consequence, has very well observed:

“But mark him soon by signal wrath pursued,  
When to the bath he bears the peacock crude,  
That frets and sweats within; thence every ill—  
Spasm, sudden death, and age, without a will.”

Gifford.

2. It should only be sufficiently warm to prevent us from experiencing the sense of cold. 3. It is pernicious when the *primæ viæ* are distended with fœces; also, when we have a feeble viscus. 4. We should abstain from its use in cases of debility, or exhaustion. 5. Lastly, it would be dangerous, as Hippocrates has observed, in bleeding from the nose, unless it be moderate.

It would be pernicious to use the bath immediately after eating, because the energies are directed towards the stomach for the labor of digestion, and the bath, by attracting them towards the exterior organ, would, necessarily, disturb the digestion. There is, however, a state in which it is useful to bathe soon after eating, it is when the organs of digestion are laboring under a violent spasm. In this case the bath communicates an impression of dilatation and relaxation to the skin, which, by diverting the energies from the digestive organs, destroys the spasm. Tissot saw very nervous persons, who only digested well in the bath. We thence conceive, why Hippocrates recommended its use when the intestines were irritated by a violent purge: *post veratum epotum lavare oportet*. Galen observes that the bath used after eating, may be advantageous to persons extremely bilious; for an abundant and very acrid bile may, by considerably

stimulating the digestive organs, convert their action into spasm: *hoc a cibo quoque balneum Juvat*. But he recommended it to be abstained from when it determines a sense of weight, tension, or pain in the region of the liver, because obstructions or inflammation in this viscus might be the consequence.

Cold and cool baths have the property of causing a reflux of the action and humors from the exterior to the interior, and when the body is susceptible of a suitable degree of reaction, of promoting and establishing the free circulation of the energies from the exterior within and from the interior without; they are very efficacious to diminish the mobility and the excessive sensibility of the system; they augment the *robur physicum* of the solids, and, consequently, the vigor of muscular contraction.

The best means of using the cold bath is, to plunge the whole body in water, and remain in it for one, two, or three minutes, on first using it, and to prolong the immersion, by degrees, to seven minutes, or, at farthest, to one fourth of an hour.

In infancy the use of this bath may prevent the diseases owing to a constitution extremely pituitous; such as scrophula and rickets. It is proper for persons who have a very sensible nervous system; and the most happy effects have frequently been obtained from its use in nervous affections, depending on this cause. By the use of the cold bath for four months, I have seen women cured of an irritability so great, that the least unexpected noise or surprise, produced convulsions or fainting.

From time immemorial the northern nations have been in the habit of plunging their children in cold

water, from the moment of birth. The Spartans bathe them in the Euphrates, the Germans in the Rhine, the Scythians and Britons observe this custom; the inhabitants of Latium, according to Virgil, plunged their new-born children into large and frozen rivers, long before the foundation of Rome:

“Strong from the cradle of a sturdy brood,  
We bear our new-born infants to the flood,  
There bathe amid the stream, our boys we hold,  
With winter hardened, and inured to cold.”

*Æneid, lib. ix. v. 603. Dryden.*

The Laplanders, Peruvians, whole nations of the Indies, and especially, the inhabitants of Terra Firma, have always bathed their children in cold water. When William Penn arrived in North America, he found this custom prevalent in that country. It is no doubt, the general use of the cold bath which has induced the poets to feign Achilles invulnerable, because, at his birth, he had been plunged into the waters of the Styx. It is these examples that have given rise to the general advice to bathe children in cold water to render them strong and robust. Galen rejected this practice as prejudicial, in early life; he only recommends bathing when the growth is advanced. He supposes the child to be well constituted and healthy; “because it is requisite,” says he, “to preserve the state which is conformable to the views of nature. But,” he adds, “when children have extremely soft flesh, and when there is reason to apprehend the development of the affections which excessive pituesency produce, the cold bath is very beneficial and proper to prevent those diseases.”

The cold bath is more proper for the inhabitants

of the north than for those of warm countries, and the tepid bath for the latter than for the former; because the diseases to which the heat of the summer exposes one, in hot climates, are generally owing to internal causes; and, besides, the crisis, ordinarily, takes place through the medium of the exterior organ, and, in order to promote it, this organ should be in a habitual state of expansion and softness. In northern countries the contrary is the case; the diseases of northern countries are, commonly, produced by external agents; and, in order that the system be in such a state as to react with advantage, it is necessary that the exterior organ present to the action of these causes, a force of resistance which will be greater in proportion to its increased firmness and density. This was the opinion of Galen, and is rendered very probable, from the great inclination which the northern nations have for the cold, and the inhabitants of warm countries for the tepid bath. Nature suggests to man, as well as to animals, a desire for those things which are necessary to his preservation, and an aversion to those which are injurious; medicine, as well as all the other sciences, is only the result of reflections upon the knowledge acquired from instinct. Instinct always discovers, reflection and reasoning succeed, and the theorist has only to distribute the results in the order which he thinks the most proper to enable the mind to comprehend and retain them with facility.

The cool bath is more salutary when used in a river or running water; the waves of which communicate to the body a useful friction, and cleanse the skin better than a bathing tub or still water. The exercise

of swimming is still more advantageous, it augments the good effects of the bath.

The cold and cool bath require the same precaution in their use as in the tepid; they should be abstained from when the action and heat of the body are augmented, as well as when there is an extreme exhaustion, and the energies are concentrated in the epigastrium. We should not go into the bath when we are very warm and sweating; in this case, we should wait until the system becomes cool, otherwise we run the risk of contracting severe diseases, produced by the sudden reflux of the actions and humors. For this reason these baths are pernicious in eruptions, such as the itch, herpes, &c. &c.

Lotions produce, in some degree, the same effects as baths; they cleanse the skin, consequently promote transpiration, and fortify the system, when cold ones are used, or relax and soften it when tepid water is used. They cannot be too much recommended, for they possess a number of advantages; hence, some legislators, as Moses and Mahomet, who knew the necessity of them in countries, where the people transpire and sweat almost continually, have made them an essential object of their worship, by prescribing ablutions and purifications as indispensable acts of worship in their religion.\*

Baths and lotions are proper in every age and in all countries, were it but to preserve cleanliness, so useful to health; for they cleanse the skin, and preserve its activity and pliancy. The skin is one of the

\* The lotions which our author recommends, are not those invented or sold by charlatans, and which are recommended as possessing wonderful effects, but those of a more simple order. Of the lotions or washes, I suspect that of soap and water to be as salutary as any thing.—*Tr.*

principal excretory organs, it is by means of it that nature throws out of the body a great quantity of excremental humors, under the form of vapors or sweats, and which, when retained by a defect of activity, or by an obstruction of the pores, cause severe febrile diseases, or cutaneous affections, such as the itch, herpes, &c. It is especially to a want of cleanliness, that these diseases are owing, as well as the different vermin that affect men. Besides, the skin is the seat of the most universal sense—the touch, which establishes a great number of relations between man and the things by which he is surrounded. It is also, as I have already said, one of the most powerful antagonists of the epigastrium, and it is the principal organ by which the crisis of a disease is formed. I doubt not but that hypochondriasis, melancholy, embarrassments of the abdominal viscera, and gastric fevers, so common in our time, are all owing to our having neglected the means, which the ancients employed to preserve the tonic force and flexibility of the skin. These means consisted principally in baths, lotions, frictions, and unctions. We see from what has just been said, how important it is to take care of the skin, from the most tender infancy, if we wish to support health; and also to how many diseases the neglecting of this precept necessarily gives rise. It is then proper to frequently change the linen and bed clothes, to wash every day with water, to use frictions upon the skin, and to bathe from time to time. It is not only in the linen and clothes that cleanliness should prevail, but also in dwellings; and we should shun filthy persons and houses, as we would the plague; they are, in fact, true beds of this contagion.

Some physicians have proposed to substitute woollen stuffs for linen, in the persuasion that the use of the former worn next to the skin, would be more salutary. As this is an object of general interest, I will present the following reflections, by means of which the question may be easily decided.

1. Woollen worn next to the skin, irritates and excites it more than linen; hence, by increasing the sensibility of the skin, it habitually attracts to it a greater sum of the forces and more of the humors, and thus considerably augments the transpiration.

2. Woollen insulates the caloric of the body, and linen permits it to pass off freely. It therefore follows, that woollens retain the heat more than linen, which causes the first to promote the evaporation of the perspirable humors; whereas linen, which is not so warm, converts this fluid into drops; hence, when we transpire much, we are not wet with the former, but are with the latter. But an inconvenience attached to woollen is, that the abundant vapors with which it becomes imbibed, acted on by the heat, corrupt, and rapidly contaminate, and communicate the noxious impressions to the skin. It has been observed, that diseases of the skin are much less frequent since linen has been used, than they were when woollens were worn.

3. Lastly. Woollen attracts moisture and noxious miasms more, and retains them longer than linen. We thence see that the use of woollen next to the skin is not so salutary as that of linen. In general, linen merits the preference, especially in youth, because at this age, there is less need to augment the heat and transpiration, as well as the sense and activity of the

skin. There are, nevertheless, cases in which woollen is preferable, but then it is requisite to wash the body more frequently, and to change it oftener, than when linen is worn.

Woollen is useful to those who have passed the fortieth year of age, because at this period of life, the concentric force predominates over the eccentric, and the action of the skin and transpiration has obviously diminished. It is advantageous to pituitous and cachectic persons, and to those who have a lax and soft fibre, and who have but little heat and diminished energies. It should be recommended to those who lead a sedentary life, and especially to studious men. Among these transpiration is difficultly performed, and the skin requires a stimulus to support the free circulation of the energies. It is salutary to persons subject to colds, catarrhal fluxions, rheumatism, asthma, hypochondriasis, to the hysterical, infirm and valetudinarians, or convalescents; in a word, to all those who are very sensible to the variations of the atmosphere, to the inhabitants of countries where these changes are frequent and sudden, to navigators, and to those whose occupation subject them to sudden changes.

Woollens worn next to the skin, is equally proper for those who have an habitual diarrhoea or looseness of the bowels, *cutis densitas ventris raritas*. Inevitable bowel complaints have sometimes been cured by the use of flannels.

The use of woollen is pernicious to sanguine and bilious persons, and to those who are meagre and thin, to those who naturally transpire a great deal,

and whose vital energies are very active, and to those subject to diseases of the skin and vermin.

Cosmetics have a close relation to this subject, seeing that they communicate their impression to the skin. Hence, I shall speak of them in a summary manner, before I conclude this chapter. The desire to please, so natural to the female sex, has caused them in all ages and in every country, to seek the means of increasing their beauty, to perpetuate its duration, or to reestablish its decay. Antimony is the most ancient cosmetic used by them. The eastern women formerly rubbed the contour of the eye with a preparation of antimony; at present the women of Syria, Babylonia, and Arabia, use this means in the same view, of having the eyes black, large, and well shaped; those barbarians stain the hairs of the eye-lashes and the eyes with powdered molybdenia. The Greeks and Romans borrowed this fashion from the Asiatics; but in order to extend the empire of beauty, and to reestablish the fading colors, they invented two new cosmetics, which have been handed down to us—the white and the red.

The greater part of the nations of Asia and Africa, are still, as I have said in the natural history of man in the different climates, in the habit of painting divers parts of the body of different colors, according to their idea of beauty.

Before the Moscovites were civilized by the czar Peter the first, the Russian women used, even at that period, rouge, pulled the eye-brows, and painted them, and formed artificial ones. In fact, the white and the rouge have produced fortunes in Europe, and especially in France. This fashion was introduced

into Europe by the Italians, who visited the court of *Catherine de Medicis*; but it was not until the end of the seventeenth century that the rouge, the *crepon* of Strasburg, and the *nakarot* of Portugal, gained favor, and their use became general among the women of nobility, the *Petit maitres* or rakes of quality, comedians, and prostitutes.

The cosmetics of which the metallic oxyds, such as lead, mercury, bismuth, talc, alum, &c. form the basis, are not only incapable of repairing the injuries of time, and effacing the wrinkles of old age, but produce quite the contrary effects. Under cosmetics, the features become deformed, the skin wrinkles, and the complexion fades. How many women, who, in order to please the more, lose by dint of art the advantages of appearing young. The fugitive graces of youth do not disappear soon enough. An elegant neatness without affectation, and a noble simplicity without study, can alone render beauty more seducing, or mitigate homeliness and weaken its effects. We cannot too often repeat to the fair sex, what Jaucort has said with as much wit as truth: "Simple and native graces, the blush of modesty, sprightliness and mildness, are the most seducing cosmetics of youth; as for old age, there is no cosmetic which can embellish it, except it is wit and sense." The proper cosmetics are the aqueous lotions for cleanliness, and the unctions, which may be employed to anoint and soften the skin; among these are emulsive substances, fresh oil, whale oil, butter, the oil of cocoa nuts, soap, almond paste, and other articles of the same species. No metallic oxyds ought to be applied to the skin; for they not only dry and tarnish the lustre of the complexion, but

also cause a multitude of accidents. Experience has proved, that their use affects the eyes, and produces pimples on the face; they cause defluxions and diseases of the head and teeth; they destroy the enamel of the teeth, produce a preternatural heat in the mouth and throat, infect and corrupt the saliva; finally, penetrating by degrees into the substances of the lungs, they corrode it, and produce very serious diseases of the breast, which are the more difficult to cure, owing to their real cause being rarely suspected.

It is not less dangerous to apply oxyds or metallic substances upon the hair, with the intention of coloring it. These active substances, if their use be long continued, communicate their action to the brain, the functions of which they disorder.

Phrenzy has frequently been brought on by the use of very weak lotions of the nitrat of silver and water applied to the hair. I have seen an attack of the apoplexy, which was near proving fatal, on a man aged sixty years, who wished to conceal his age from the eyes of beautiful women, whom he still endeavored to please; he blackened his white hairs with a composition, the basis of which was the sugar of lead.

It is very salutary to frequently comb the hair, especially when pomatum and powder are often used; for this mixture forms, with the sweat and perspirable humor, a paste, which by intercepting the transpiration, occasions catarrhal defluxions, diseases of the eyes, throat, ears, &c. and promotes the production of vermin. It is said that sailors are exempt from vermin because they wear blue shirts, dyed with indigo; if this be a fact, it would be very advantageous to

make the soldiers wear them during a campaign; they would find an additional advantage in their use; i. e. the diminution of the expenses incurred by frequent washing.\*

\* It is very probable that these advantages might be derived from wearing shirts thus dyed; but cleanliness is absolutely necessary to health, and perhaps an injunction of this nature could not be better dispensed with in the camp than elsewhere.—Tr.

## SECTION III.

ON ALIMENTARY SUBSTANCES, DRINKS, SEASONINGS,  
AND ON THE PREPARATION OF ALIMENTS.

### CHAPTER I.

*On the digestion of aliments.*

**D**URING every moment of our existence the body experiences losses; the humors strongly tend to an alkaliescent state, when they are not renewed, and the energies abandon the epigastrium so soon as the stomach and intestines cease to be excited by the mass of aliments. In order to obviate the debility and to prevent a stupefaction, which would result from too long an abstinence, it is necessary that animals take aliments and drink; they should be excited to take these by the sense of want, and the pleasure of satisfying this sense. Hunger and thirst are two sensations which nature has given animals for their preservation. In a state of nature, thirst indicates the necessity of swallowing liquids, and constantly corresponds with the dryness of the stomach, oesophagus, throat and mouth. So soon as these sensible organs, moistened by the proper humors which they secrete, become dry, owing to any cause whatever, we experience an incon-

venient and an insupportable sensation; those inconveniences and the consequent danger, is in proportion to the duration of the thirst. Death, which necessarily succeeds when this sensation is not satisfied, is preceded by a very acute putrid fever. On opening the bodies of those deceased from this cause, we find vestiges of inflammation in the stomach, a considerable dryness in the neighboring parts, and evident symptoms of putrefaction in the rest of the body.

Hunger is announced by a particular sensation of the stomach, and of the various parts of the mouth; it produces sensations of irregular drawings towards the epigastric region, and a singular change throughout the system. These sensations are not manifested every time the stomach is empty, but only, as has been well remarked by Bordeu, when the energies are so much dispersed towards the exterior organ, as to deprive the stomach of them to such a degree as to cause it to experience a kind of contraction.

Hunger, too long continued, produces the same effects as unquenched thirst. It produces an acute fever, with extreme prostration of strength; the breath and perspirable matter is very foetid, the urine is very acrid and voided in small quantities, grievous pains, with a sense of heat, is felt in the stomach; lastly, succeeds a delirium, which is frequently furious, watchfulness, and hemorrhages of dissolved and attenuated blood from the different emunctories, and death. On opening the body of a person who has deceased with hunger, we find the stomach inflamed and corroded in its interior surface, the gall bladder much engorged, a small quantity of blood in the blood vessels, and an almost general putrefaction.

We may distinguish three degrees of abstinence; the first is that which is only relative to habit, as when we do not dine nor sup at the accustomed hour; the second, which is accompanied with an injury of the functions; but this may be remedied by means of nourishment taken with circumspection; the third, and last, is that in which abstinence is carried so far, that the corruption of the humors to which it gives place, can only be corrected by the aid of art, and that very promptly administered.

Hippocrates has described the first degree of abstinence, in these terms: "Immediately a great weakness arises, with tremor and fainting, the eyes become pale, the urine is evacuated turbid and hot, the mouth becomes bitter, the viscera appear to protrude, the person is seized with dimness of sight and giddiness, becomes violently angry and sorrowful."\* All these symptoms, to which we may add the nausea that ordinarily precedes the fainting of which he has spoken, give way as soon as we take nourishment.

But if fasting is long persisted in, all these symptoms augment, and hunger degenerates into fury, which causes mothers to devour their own children; a sense of erosion is soon experienced in the stomach, oesophagus, and mouth, the saliva is more acrid, and the bile becoming caustic, reflows towards the stomach and produces cardialgy. This state of the stomach is one of the causes of obstinate vigilancy or watchfulness which those experience who are very hungry. The peristaltic motion of the intestines is unequally excited by the residue of the bile and pro-

\* Lib. de prisca medicina.

duces borborygma; the breath is extremely offensive, the urine, in flowing, produces excessive burning, and it is more oily. Finally, all the humoral system manifestly tends to putrefaction, and the energies continue to become weaker. Such are nearly the symptoms of the second degree of abstinence, which may, however, be dissipated by liquid aliments, and, afterwards, those that are more consistent but which do not surcharge the stomach.

Abstinence, too long continued, produces a general weakness, so much so, that the organs can no longer perform their functions; but the scene totally changes as respects the stomach: to a violent appetite succeeds nausea, a loathing of food, which even extends to horror, and the sense of erosion, which is at first experienced, is converted into an acute and powerful burning; frequent faintings succeed, and the excretions augment as much in the badness of their quality as they diminish in their quantity: lastly, an extremely putrid fever is excited, with phrenzy, and the patient soon falls asleep. This degree of abstinence is generally fatal; we have, however, sometimes succeeded in rescuing persons from death by counteracting the putridity, and by administering mild and liquid aliments, easy of digestion, and taken from the class of those most opposite to putrefaction. The wisdom of the physician consists in restoring strength by degrees, and in proportioning, exactly, the aliments of the proper strength. From the observations made by Levillant, it appears, that carnivorous quadrupeds resist the effects of hunger better than any other species of animals. The human species, among nations who use more or less flesh, furnish an obvious proof of this

fact. The Hottentots, who live upon milk, roots, and dried locusts, do not support fatigue and abstinence near so well as the savage huntsman, who is frequently constrained to fast several days without experiencing any inconvenience.

Among birds, the granivorous generally perish with hunger in the space of from forty-eight to sixty-eight hours. The entimophagus resist the effects of hunger longer; but of all the species, that which endures abstinence the worst, is the frugivorous; which, digesting the most promptly, experience the more frequently the want of eating. However, the rapidity with which digestion is performed in these animals, supposing the exhaustion to be equivalent, is the sooner remedied, and they recover, more promptly, the energies; it is not the same with granivorous animals; their energies, exhausted to a certain point, cannot be reestablished by ordinary nourishment. The carnivorous preserve to the last moment the faculty of digesting; the juices of meat being very nutritive and digesting easily, soon repairs their loss from abstinence; hence, they require but a short time to regain their energies, if they receive their usual aliments.

Seed, in order to be well digested, should remain some time in the stomach; it is requisite that they be softened and undergo the action of trituration; but this operation is tedious, it supposes, besides a gizzard, a vital action and energies, which fasting dissipates. Levaillaint made two sparrows fast until they were extremely weak, they were of the same age and health, he made one of them swallow powdered seeds, to the other he gave meat finely hashed; the latter was

restored in a few minutes, the former died in two hours.

Of all the species of birds, none are more subject to hunger, and the necessity of eating frequently, than the piscivorous; this is the reason why they have large gullets, in which they keep a great quantity of nourishment for future supply. Birds of prey, on the contrary, support hunger for a considerable time.

It appears, from the greater part of the facts collected relative to man, on the subject of abstinence, that he can scarcely endure fasting beyond seven days, and that death, generally, is the consequence, when extended to this period. There are, in fact, examples related of men, but more frequently of women, who have existed for whole months, and even years, without taking any nourishment; but the most of these related examples do not merit credit. As regards those that are certain, they relate to hypochondriacal and hysterical persons, to maniacs, and those in a state of lethargy. Among persons laboring under those diseases, as among some animals, such as bears, marmotts, &c. there are very small deperditions, and a slow alteration of the humors.

The first state of the digestion of aliments is performed in the mouth; they are divided, ground by the teeth, and impregnated by the saliva; this fluid is secreted more abundantly during mastication than at any other period. The saliva is absolutely essential to digestion, and the integrity of this function depends very much on the mastication. To digest well, it is necessary to masticate or chew well. Those who do not chew their food sufficiently, and those who habitually spit out their saliva, generally digest bad, and are frequently subject to indigestion. Mastication has,

also, other advantages, it converts a greater quantity of the nutritive particles to the profit of the body, and requires a smaller quantity of nourishment to support the system. It also contributes to the preservation of the teeth; in a word, its utility is incalculable, and we cannot too strongly insist on its proper performance.

We may easily conceive, from what I have just said, respecting the influence of chewing on the digestion of aliments, that the filthiness of the teeth, so frequent among many persons, is attended with the most serious inconvenience. When we neglect to clean the teeth, they become covered with a thick fetid tartar, which injures the saliva, destroys the gums, causes these to bleed, and produces in them pains, inflammations, and abscesses; lastly, it occasions loss of teeth, which deprives the stomach of the aid of mastication, a process so necessary to digestion; and, especially, among those who have a weak stomach, and one that badly performs its functions.

The aliments received into the stomach, there undergo a second digestion, and act in this viscus as tonics, even previous to their elaboration; they make their first impression upon this organ, and this impression is communicated, sympathetically, to every part of the system. This circumstance proves the great influence that the aliments have upon the animal economy, whose play they periodically reanimate, owing to their increasing the energies of the system, as soon as they are received into the stomach. So soon as they are taken, the exhausted energies of the system revive, and the pulse rises, the respiration becomes fuller, the animal heat augments; finally, every part of

the body is freely disposed to perform its functions. Hence, Bordeu correctly regarded digestion as a general function—as an effort of the whole system, that reanimates the organs of motion and of sensation; in a word, as an organic function. The absorption of the alimentary effluvia which has taken place in the mouth, and is continued throughout the alimentary canal, is not sufficient to explain the sudden increase of the energies, and the immediate reanimation that occurs in persons exhausted by abstinence and by labor, so soon as they swallow the aliment. Gorter and Haller have remarked that young persons, who skate, are exposed to swoonings that may prove fatal to them, if they do not previously take some solid aliments of an easy digestion. Bears, that pass the winter in a kind of lethargy, occasioned by cold, swallow leaves of trees covered with gum, which they disgorge when reanimated by the return of mild weather. The wolf, as Buffon observes, is very voracious and is frequently exposed to long abstinence, in this situation, its instinct induces it to swallow earth from which its stomach can extract but a small quantity of nourishment, but the earth, by its weight, excites the action and tone of this organ and reattracts to it a part of its energies, and preserves for some time at least, the equilibrium between the centre and circumference. It was an instinct, similar to this, no doubt, which taught the Scythians to compress the abdomen strongly with broad girdles to enable them to support the vigorous abstinence to which they were frequently exposed. This usage has lately been found to prevail among some hordes of savages in the interior of Africa.

The digestion of the aliment in the *primæ viæ* is then not only intended to extract the nourishing juices, which are to be converted into the substance of the animal, but it is also of another not less important use, viz: that of reestablishing the free circulation of the energies, which, if too long fixed in some parts, would in these degenerate into spasm, and soon produce aberrations in the functions. From what I have just said, there results a very important corollary of hygiene, which is, that the choice of the aliments should be regulated by the vigor or the effeminacy of the constitutions, as well as the labor we pursue. In fact, experience proves that aliments very easy to digest, are not proper, but on the contrary, very injurious to robust men who labor much, although they may be as nutritive as those of more difficult digestion. Hence, they should use the most compact and heavy alimentary substances, which exercise the energies of the stomach, and attract the action to this part, which being too abundant in the muscles, would convert them into spasm, and prevent their play. Moreover, there is no remedy more efficacious in indigestion, from the abundance of aliments among this class of people, than substances salted and highly seasoned, especially soup with very warm cheese; this is much used in the country. In strong and robust constitutions, viscous and tenacious aliments digest more easily than other substances naturally more soluble, and reanimate the digestive energies better than the latter. It is not the case with persons whose delicate organization renders them incapable of supporting a strong or long continued action; these require aliments of a soft and easy digestion, and even then their

digestion is sometimes exceedingly difficult and painful. From what I have just said, it results that in regimen, much attention should be paid to these two qualities which aliments possess, the tonic and the nutritive, being of the greatest consequence; for all aliments which contain much nutritive matter in a small compass, would nourish too much without strengthening, and those that are too heavy and not very nourishing, would fatigue the digestive organs, and throw the body into extreme languor, for want of suitable reparation.

The digestion of aliments should not be considered merely as a chemical operation, or as a kind of particular fermentation; it is also the effect of organic labor, to which every part of the body concurs. To be convinced of this truth, it is only necessary to refer to what we have said takes place during hunger, and immediately after we have taken nourishment. During hunger we experience irregular drawings about the epigastric region, and a singular alteration throughout the system. But so soon as we take nourishment, the stomach becomes a centre of action, towards which all the organs lend a part of their energies, so that when digestion is laborious, we feel drowsy, the head is heavy, we experience a weariness and considerable weakness in all the members; each organ appears to be deprived of a part of its action to concur in the labor of digestion. This function may be compared to a fit of the intermittent fever; it has, in fact, three distinct periods. When the aliment is first introduced into the stomach, the energies of the system become almost immediately increased, and the agreeable sensations which the stomach experiences,

are diffused throughout the body. In the second period, when the digestion commences, we are seized with a slight chill, the tissue of the skin spasmodically contracts, which evidently indicates the flowing of the oscillations and of the humors towards the organ in labor. Lastly, in the third period, when the digestion is in full activity, the epigastrium insensibly reflects, in proportion as it advances, to each of the organs their proper energies; at this period, there occurs a conversion of the action from the interior to the exterior, the skin distends, the pulse increases, and the heat becomes equally distributed. All these phenomena are indicated in a manner which is the more obvious in proportion to the difficulty of digestion.

It is this organic force, and the anti-septic quality of the gastric juices, that counterbalances and moderates the motion of fermentation, by means of which the aliments, which are in their nature very fermentable, are converted into a kind of greyish pap, called chyme. Were it not for these juices, the aliments would be converted into a putrid matter, and so far from serving as nourishment, they would become mortal poisons.

Reaumur concluded, from experiments that he made upon granivorous birds, that digestion depends entirely upon the trituration which the stomach exercises upon the aliments. It is necessary to observe, that these animals have two *intestinum cecum* and a stomach or gizzard entirely muscular. The gizzard possesses in reality the property of grinding the grain with a prodigious force, so much so, according to the report of Reaumur, as to be equal to a weight of four hundred and thirty-seven and an half pounds. This tri-

turative force is so great in the stomach of the turkey-cock, according to the experiments of Spallanzani, as to soften and break steel needles and points of lancets, with which we hirsute balls that they are forced to swallow; and that rough granite which is justly ranked amongst the hardest of substances, is polished by its force.

This celebrated naturalist, after having repeated the experiments of the French physician, and instituted new ones, the results of which go to prove that the trituration performed by the stomach, could only supply in these birds the masticative power, and that they do not digest when the aliments escape the dissolvent action of the gastric juices. Besides, carnivorous birds digest flesh very well, although their stomachs, which are entirely membraneous, cannot exercise any kind of trituration. It is the same with reptiles, and some fish destitute of teeth. Nature has compensated these for this defect, by augmenting the activity of the gastric juice.

Spallanzani divided the stomachs of animals into three general classes—the muscular, membraneous, and membranaceo-muscular; of this class is the stomach of man, dog, cat, &c. His researches which equally embrace these three kinds of stomachs, convinced him that digestion supposes an action of the gastric juices upon the aliments, and that the muscular stomach is limited to the exercising of a mechanical division. As to the membraneous and the membranaceo-muscular stomachs, they do not perform any trituration. He tried upon himself the same experiments that he made upon animals. After swallowing small tubes in which different alimentary substances were enclosed, he ex-

cited vomiting that enabled him to judge the change those substances had undergone in the stomach.

The chyle gradually passes from the stomach as it is formed into the duodenum, where it receives a new elaboration. In this intestine it is operated upon by the bile, which aids the digestive process. The bile destroys the oily, resinous, and resino-extractive particles of the aliment, which have escaped the gastric juices; but all the bile which flows into the duodenum, does not combine with the chyle; it is on the contrary, only the smallest part of this fluid which enters into its composition; the residue is employed for other uses. If it were otherwise, the chyle would not be mild, but bitter, and it would have the yellow color of bile. The greatest proportion of this fluid unites with the parenchymatos or fibrous and earthy substances, while it separates from the chyle, and thus promotes their conversion into fœces. The bile should then, be regarded as a precipitant of the excremental part of the chyle.\* Astruc has observed that the chyme which, after having passed from the stomach is liquid and homogeneous; but it curdles and becomes thick, where the bile mixes with it. Verdue (*lib. de usu partium*) saw in a living dog, the *intestinum jejunum*, which he tied during digestion, a quantity of the thick chyle below the ligature, whereas the chyme that entered the duodenum, was entirely liquid. It thence appears that the bile acts upon the chyme, by separating from the chyle which the albumen retains, the soda and the other salts contained in the bile

\* This opinion has been supported for twelve years in the school of Besançon, it is therefore not new.

and the excrements with which the oleo-sebaceous or adipo-sarouse portion of this fluid is combined, which, by means of this substance, executes the functions of a stimulus, and solicits the peristaltic motion of the intestines and the expulsion of the fecal matter that it colors. This is the reason Galen (*de usu partium*, lib. v, cap. 3.) calls it a natural clyster.

The pancreatic juice also mixes with the chyme in the duodenum. This fluid appears to be of the nature of the saliva, of which it has the color, taste, and consistence. Besides, the pancreas which secretes it, presents internally a structure similar to that of the parotides and maxillary glands. The principal use of the pancreatic juice appears to be to moderate the too great acrimony of the bile. In fact, it has been observed that animals, such as the crocodile and those that do not drink, and whose bile is very active, have a very large pancreas.

The chyle separated from the magma, is absorbed by the absorbing vessels of the intestines, and especially of the jejunum. Every little villi of the interior tunic of the intestines, is a small spongy conic ampulla, pierced with one or more orifices at its point, and into which open a small artery and an accompanying mesenteric vein, as well as a lacteal branch. It is in these little ampullæ that the chyle is absorbed and mixes with the fluid which transudes from the artery, to be afterwards taken up by the lacteal vein, and in a less proportion by the mesenteric veins. The portion which is absorbed by the mesenteric veins, goes by a very short rout to mix with the blood of the vena porta, and the other part which is taken up by the lacteal veins, is conveyed to the mesenteric

glands, where it is diluted by the fluids which these glands secrete, and then absorbed by other larger lacteal veins, which are not so numerous, and are called lacteal veins of the second order, to distinguish them from the first. These vessels convey the chyle to the *receptaculum chili* and to the *thoracic duct*, where it mixes with the remaining nutritive lymph, which comes from all parts of the body, and thence to the left subclavian vein, where it mixes with the ocean of blood, and goes to the *vena cava*, the *auricle*, and left ventricle of the heart, and lastly to the lungs, where it is converted into blood.

The chyle taken in the lacteal vessels, is an homogeneous milky fluid, the primitive source of the blood and other fluids, and the production of the organic energies, and of the animal fermentation, which the aliments undergo with the digestive juices, the mixture of which imparts to them the character of *animalization*. This fermentation, this mixture, as well as the play of the organic energies, is continued not only in the chyliferous vessels, but also in all the organs. The white color is not essential to it. That of herbivorous animals is sometimes green, that of the wolf blackish, and that of capoons very frequently inclines to yellow. The greatest part of the chyle is absorbed in the jejunum, because it is in this intestine that the greatest number of lacteal vessels open; these vessels afterwards gradually decrease in number, so that there are scarcely any of them in the rectum. However, there is performed in all the intestines, even in the large ones, an absorption by means of the common absorbing vessels, and the effluvia which they inhale is so much the more acrid and more fetid as the

magma becomes more feculent, and as it approaches the anus.

The mass of aliments pass through the large intestines slowly; the absorption continues to be performed in these, and the gross matter, after having remained a short time in the cecum and in the body of the colon, ascends in this intestine, and having traversed the cells of its great flexure, accumulates in the rectum, where it remains, until its quantity and the irritation which results from it, indicates to us the necessity of its being evacuated.

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## CHAPTER II.

### *On Alimentary Substances.*

By aliments we understand all the substances that can be assimilated into our parts, and converted into our own substance. This assimilating faculty supposes them subject to a certain degree of alteration or fermentation, more or less easy, according as they are more or less allied to animal nature. Thus, there are in reality no nutritive substances but those subject to a spontaneous motion, which is produced by water and heat. For this reason Hippocrates, Galen, Oribaze, &c. regarded water and heat two conditions essential to aliments, and even as the only two that were essential. Every substance that possesses these properties, changes the state of the body, and is either a

medicament or a poison, which only differs relatively; whereas the essential character of the aliment is that of being changed, without causing any alteration in the animal economy, when it is correctly proportioned to the energies and to the necessities of the animal.

The ancient inhabitants of the earth, only, knew the simple aliments, and those without preparation; and this nourishment procured to them the greatest advantages. The simplicity of aliments and temperance are, in fact, the abundant sources of health and life, without which we cannot hope for the preservation of either. It is sufficient, says Plutarch, to have the taste of true pleasure, to be temperate. Intemperance ruins health, and when this is destroyed, we are no longer sensible to any pleasure. What are all the most exquisite meats to a sick stomach? And who does not know that there is no better seasoning than a good appetite? It is said that Alexander the Great, when upon a long march, sent back his cooks, saying, that he carried an excellent one with him—a long march, to be performed in the morning, procured him an appetite for dinner, and a frugal dinner rendered the evening repast delicious. It would not be difficult to prove, by a multitude of facts, that the greater number of persons perish prematurely, or drag out a miserable life, under the weight of pain, from becoming the habitual and excessive votaries of the table; and that those who, on the contrary, are contented with a quantity of simple aliments proportionate to the wants of nature, are those who enjoy the best health, and who live the longest. We might cite Augustus, Barthellus, the immortal Newton, and a great many others;

but one of the most striking examples of this kind, was that of the celebrated Cornora, a Venetian, who was attacked at the age of twenty-five, with a diseased stomach, pains in the side, a slow fever, and the gout. His health continued to be impaired until the age of forty, in despite of all the assistance of his physicians; he abandoned all medicines, and imposed upon himself a simple and moderate regimen. The effect of this kind of life was such, that his infirmities disappeared, and were succeeded by the most brilliant health, which he enjoyed beyond his hundredth year.

Regimen has the greatest influence not only upon the physical, but, also, upon the mental part of man. The taste which the flesh of animals possess, varies according to the species of aliments with which they are nourished; whence, the flesh of rabbits smell of cabbage during autumn, and that of the thrush of the juniper berry. Whatsoever good we may derive from an improper nourishment, for the time being, it shortens life, and retards the development, or even reduces the growth of the body. Buffon observes, that many foreign animals, or the wild ones of our country, raised and nourished in menageries or small parks, never attain their entire growth, and their members never acquire their natural size; this degeneration depends, in a great measure, on the quantity and quality of the nourishment which they use. He raised a stag, and after having nourished it properly for four years, it was at this age much higher and larger than the old stags of the finest size.

Regimen has an influence upon the manners of a nation, and even upon the fate of empires. The Hindostan nations, which are, according to the relation of

voyagers, the most sober and most temperate people, keep their annals from being sullied with those enormous crimes which constitute the disgrace of the most of other nations. It is also observed, that amongst these people, those who live on fruits and legumes, are the mildest and most humane. The Hindostans have an horror for blood, which even induces them to respect that of animals.\* It is not the same with nations who eat flesh—they are ferocious and cruel; among these is frequently repeated those great crimes which are shocking to nature. “It is certain,” says J. J. Rousseau, (Emilie, liv. ii.) “that great eaters of meat are, in general, more cruel and more ferocious than other men. This observation holds good throughout the world, and in all ages the barbarity of the English is notorious; the Gauls, on the contrary, are the mildest of men.† All savages are cruel, but their manners do not incline them to be so; it proceeds from their aliments; they go to war as to the chase, and treat men as bears. \* \* \*

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\* \* \* \* \* Great miscreants inure themselves to murder by drinking blood. Homer made the Cyclops eat the flesh of hideous men; and the Lotophagis, a people so amiable, that so soon as an intercourse was established with them, those who

\* The Banians do not eat flesh; they even fear to kill the least insect; they throw rice and beans into the water for the fishes to eat, and seed or grain upon the ground for birds. When they meet a huntsman or fisherman, they immediately intreat him to desist from his enterprise, and if he is deaf to their entreaties, they offer him money for his gun or line; when he refuses to sell, they disturb the water to frighten the fish, and make a loud noise to scare the game.

Hist. de Voyages.

† J. J. Rousseau was not an Englishman.—Tr

went among them became so much attached to their manners and were so infatuated with them, as to forget the place of their nativity, and remain with them quite reconciled." Lastly, if we take a cursory view of those nations whose alternate rise and fall have astonished the world, we shall see that it was to temperance and frugality that they were indebted for their glory; and that their ruin must be attributed to intemperance. As long as the Greeks and Romans lived soberly, they were the masters of the world; but when luxury presented itself to them in the fatal booty of the conquered nations, by new aliments and refined seasonings, they soon degenerated, and became, themselves, trophies to barbarous but sober and temperate nations.

The earth is the inexhaustible and common source from which men and animals draw their subsistence. All animated nature, says Buffon, live upon vegetables, and these in their turn live upon the remains of every thing that has lived and vegetated. Destruction is necessary to life, and it is, in fact, only by destruction that animals can live and propagate their species.

The organic kingdom in which life circulates, and which comprehends vegetables and animals, furnish the whole of the alimentary substances. The inorganic or mineral kingdom, affords only some condiments, but no substance capable of animalization. History and reason teach us, that the first regimen of man was that of Pythagoras,\* and it is an indu-

\* Varro, Pliny, Lucretius, Horace, &c. pretend that our forefathers lived upon acorns; but, as Tribonian the lawyer, observes, the Latin word *glans*, designates every species of fruit.—*Glands appalione fructus omnes præcipiuntur.*

bitable fact that the taste and smell serve as guides in the choice of aliments; in fact, these two senses are given to man and to animals, as two safeguards, destined to preserve them from the use of injurious and dangerous substances. Afterwards, experience taught which vegetables repaired the energies to the greatest degree. This regimen was not of long duration; in proportion as society increased and became more numerous, vegetables were insufficient for the nourishment of man; and, in addition, the animals becoming troublesome from their excessive propagation, it was necessary for the master of the earth to shed their blood, and to use their flesh as nourishment.

The regimen of Pythagoras has had partisans in every age of the world. Plutarch, and in our day, J. J. Rosseau, have pretended that man has violated nature by living on the flesh of animals, and that it was intended by his Creator, that he should only live on aliments obtained from the vegetable kingdom.

“Thou askest me,” says Plutarch, “why Pythagoras abstained from eating the flesh of animals; but I ask thee, on the contrary, what courage must the man have possessed who first brought to his mouth the flesh of a butchered beast, who first broke with his teeth the bones of a dying animal, who had their bodies served up before him, and buried in his stomach the animals which the moment before bleated, lowed, walked and saw! How could his hand plunge the knife in a sensible being? How could he see a poor defenceless animal bled, skinned and dismembered? How could he support the aspect of the palpitating flesh? How happened it that the smell of them did not sicken his heart? How happened it that he was not

disgusted, repulsed, and seized with horror, when he handled the filth of these wounds, to clean away the black and coagulated blood with which they were covered?

“That which did serve thy purposes of need  
Behold, before thy cruel hand with anguish bleed;  
That faithful animal, kind nature’s gift,  
Form’d for thy use in toil, hast thou not left  
To nature’s law; but has of life bereft. }  
Behold the quivering limbs of victims slain  
For thy delight, yet agonized with pain;  
Behold, and eat if such thy nature be,  
These, said Pythagoras, are not meat for me.

“This is what he must have imagined and felt the first time that he overcame nature so far as to make these horrible repasts; the first time that he felt a longing for a living creature, and that he wished to eat of the animal that was still browsing; and that he gave directions how the sheep which licked his hand, should be slaughtered, cut up, and cooked. We should be astonished at those who commenced those cruel feasts, and not at those who have declined their use; the former might, however, justify their barbarity by excuses we have not, and the want of which renders us an hundred times more barbarous than they were.

“Mortals well beloved by the gods, those primogenitors would say to us, compare the times, see how happy you are, and how miserable we were! The earth newly formed, and the air loaded with vapors, were still untractable to the order of the seasons, the uncertain course of rivers wasted their shores on all parts, ponds, lakes, and great marshes covered three-fourths of the surface of the earth, the other fourth

was covered with wood and thick forests. No good fruits grew in those days, we had no implements of husbandry, and were ignorant of the art of using them, and to him who did not sow there was no harvest; hence, hunger never quit us. In winter the moss and bark of trees were our ordinary food, some green roots of dog grass and heath were, to us, a feast, and when the inhabitants were able to find beach mast, nuts and fruit, they danced for joy round an oak or beech tree, to the sound of some rustic song, calling the earth their nurse and their mother; this was their only feast—it was their only game; all the rest of human life was but grief, pain and misery.

“Finally, when the earth, stripped and naked, no longer afforded us any thing, we were forced to commit outrages against nature, to preserve ourselves, and we eat the companions of our misery rather than perish with them. But you, cruel men, what compels you to shed their blood? See what a great number of blessings surround you, how many fruits the earth produces you! How the animals furnish you with their milk, to nourish you, and their fleece to clothe you! What more can you ask of them, and what rage induces you to commit so many slaughters, satiated with blessings and gorged with provisions? Why do you belie our mother in accusing her with not being able to nourish you? Why do you sin against Ceres, the inventor of sound laws, and against the bountiful Bacchus, comforter of men, as if their multiplied gifts were not sufficient for the preservation of the human species? How have you the heart to mix bones with their sweet fruits, and to drink with milk the blood of the beasts that give it you? Panthers and

lions, which you call ferocious beasts, follow their instinct by force, and kill animals to live upon; but you, an hundred times more ferocious, you combat instinct without necessity, to give yourselves up to your cruel enjoyments. The animals which you devour are not those that devour others; you do not eat these carnivorous animals, but imitate them. You hunger for innocent and mild beasts, which injure no person, but which attach themselves to you, which serve you, and which you devour for the price of their services.

“Oh! Slaughterer against nature! If thou contendest that thy common mother hast formed thee to devour thy fellow creatures, beings of flesh and bone, sensible and animate like thyself, stifle then the horror with which she inspires thee for this shocking repast, kill the animals thyself, I say, kill them with thine own hands, without weapons, without knives, tear them with thy nails, as do the lions and bears, gnaw this ox and tear it in pieces, thrust thy talons into its skin, eat this lamb still alive, devour its flesh quite warm, drink its life with its blood! Thou startest, thou darest not feel living flesh palpitating between thy teeth! Commiserating man, thou beginnest by killing the animal, and then thou eatest it, as if to make it suffer the second death. This is not sufficient! the dead flesh still disgusts thee—thy entrails cannot bear it, it must be transformed by fire, it must be boiled, roasted and seasoned with condiments which disguise it; thou must have butchers, cooks, and people to keep thee from the horror of slaughter, and to dress the animals, in order that the sense of taste, deceived by these alterations, may not reject what is foreign to it, and may

relish, with pleasure, carcasses of which even the eye could not endure the sight.”

How ingenious soever this discourse, which is more eloquent than true, may be, Plutarch, and all the Pythagorean philosophers cannot, with all their reasoning, triumph over instinct, which induces man in every country of the world, to use the flesh of animals, and the diet of Pythagoras is not indicated by nature; although there have been persons and even nations, who have lived upon milk and vegetables,\* it does not prove any thing in favor of that regimen.

Man is omnivorous, that is to say, he is destined by nature to live upon vegetables and animal substances, and not entirely upon the former. The natural appetite which all persons have for meat, would, alone, be sufficient to establish the truth of this assertion; but it is also proved by the structure of the digestive organs, and by the real inconveniences that arise from the entire use of either vegetables or viands.

The stomach of man resembles that of the carnivorous animals, in its structure and its membranaceous-muscular tissue; man has also canine teeth, and a small and short intestinum cecum. Besides, the use of meat is absolutely necessary to repair the energies exhausted by labor. Now if we attend to the fact, that man as well as phytivorous animals, is provided with incisive (cutting) and grinding or molar teeth; that he has, as well as them, a very long and large intestinal

\* The inhabitants of the isle of Pagues, those of New Spain, and the Dalecarlians, according to Sparrman, live solely upon vegetables. The poor inhabitants of our country (France) very rarely eat meat; in fact, but few of them enjoy good health and reach the ordinary term of life. It is true that the wretched and filthy manner in which they live, contributes much to produce that state of cachexy in which they almost always languish.

canal, which is highly distensible, which has anfractuosités, and is furnished with a multitude of rugæ. We shall see by this mixed conformation, that nature has designed him the use of vegetable and animal food.

Besides, the entire use of aliments of one kind would soon disgust the appetite, and give rise to divers inconveniences. Vegetables do not support the system and repair its losses sufficiently; their use alone is always accompanied with, or succeeded by debility, and especially of the *primæ viæ*, with flatulency, crudity, griping pains, and diarrhea. This regimen is, however, very salutary in cases of sanguine plethory, and in diseases of a bilious nature, also to persons disposed to putrid affections. It seems that nature, in furnishing man with a very small number of cutting teeth, intended it as an indication of the necessity of making great use of animal flesh as diet; and, in fact, in addition to animal diet rendering him cruel and ferocious, it also considerably augments the quantity of blood and bile, and disposes to inflammation and to putrid bilious diseases.

In the nutrition, it is necessary to distinguish *animalization* and *assimilation*. Animalization consists in converting the vegetable substances into animal; and assimilation is the conversion of the alimentary, animal, or animalized substances into that state which renders them similar to our parts.\* Nutrition supposes, in vegetable substances, animalization, and in all alimentary substances assimilation. Both also

\* An essay of a theory upon the animalization and assimilation of aliments by citizen Hallé, given in a journal conducted by citizen Fourcroy. Tom. ii. p. 295.

suppose analogies which render them susceptible of undergoing these changes, and differences, which render this necessary.

The analogy between aliments and our parts is demonstrated. 1. The solids have been fluids in the primordial state, and have circulated in this state, through the vessels with the blood which contained them. The substances of which the humors and solids are composed, are found in the aliments; they are all formed into the flesh of animals, and all these analogies are found in the vegetable productions.

The gelatin or animal jelly has for analogies the mucilages and fecula. These substances are very abundantly diffused in the numerous families of vegetables, and constitute the almost universal basis of alimentary substances. The vegetable gluten or vegeto-animal substance of Beccaria, which is abundant in wheat flour, exists in almost all herbs, and with some little difference of proportion, is of the same nature as the fibrous parts of the blood and of the gluten of the muscular fibre. We also find in the vegetable kingdom, a substance which has much analogy with the albumen of animals, and which possesses nearly all its properties. All these substances possess, not only the nutritive quality, but they also resemble one another in this, that they have a common base, the *hydro-carbonous oxyd*. In animal substances, this oxyd is combined with a certain quantity of azote, and sometimes phosphorous. We also find azote in vegetables; but in them the carbon is in a greater proportion; thence they are acescent whilst animal substances are alkalescent. Hence, vegetables differ from animal substances, in respect to those two

substances, the carbon being more considerable in the former, and the azote combined in a greater quantity in the latter.

Animalization appears only to consist in the fixation of a greater quantity of azote relative to the other principles; it commences in the stomach, and is continued in the intestines. In these the alimentary pulp, acted on by the digestive juices, contracts a kind of fermentation, by means of which its principles enter into new combinations; at the same time, different gases are disengaged, especially the carbonic acid, hydrogen, &c. and the proportion of azote also becomes greater. But there is no organ in which the *azotization* is greater and better marked than in the lungs.

The phenomena of the respiration show that the oxygen of the atmospheric air carries from the lungs a great quantity of hydrogen and carbon, with which it unites, and that thus diminishing these two gases, it augments the azote.\* Animalization may then be considered as a real decarbonization performed by the animal forces; vegetation, on the contrary, as the fixation of the greater quantity of carbon in the vegetables. The effects are performed in the one, by the intermedium of oxygen; in the other by the disoxygenation of the carbonic acid, which is the effect of the solar light.

Aliments are more or less easily digested, in proportion to their solubility, to the activity of the gastric juice, and to the specific action of the stomach.

\* Perhaps the azote of the atmosphere unites also to a certain degree with the blood of the pulmonary veins; but this opinion has not been proved by any experiment.

We are not yet well acquainted with the kind of power that the gastric juice exercises upon the divers alimentary substances. We only know that its nature differs in different animals, that in the greater part of the carnivorous animals, it has a very feeble action on vegetables, and that that of phytivorous animals acts feebly on animal substances; but in man, and animals whose stomachs are membranaceo-muscular, it perfectly dissolves both classes of aliments. We also know that its dissolvent power, varies in many circumstances, and that at certain periods it is more active in its operation on certain aliments, than it is on others. As to the principles of which this menstruum is composed, there are none of them which are positive or constant; sometimes we find it acid, and at others of an insipid sweet. In the gastric juice of carnivorous birds, and even in that of some others, Brugnatelli found an uncombined acid, resin and animal matter united to a small quantity of muriat of soda. Other chemists have discovered in it some phosphoric salts. From the experiments of Spallanzani and of Gosse, it appears that this juice is constantly acid, in animals that live upon vegetables; and Spallanzani is certain that he never found it acid in birds of prey, serpents, fishes, and frogs.

Aliments are more or less soluble in proportion to their softness or their compactness; the most dense and compact digest less easily, but are also more nourishing when digested, as Celsus has said: "The stronger the aliment is, the less easy it is of digestion, but when digested, the more nutritive."

Hippocrates called aliments which dissolve easily, light aliments; to others he gave the name of hard or

heavy aliments. An aliment is light, says he, which causes neither fullness, gripings, nor flatulency, but digests without producing any inconvenience, even when taken to excess. We know that an aliment is heavy, when, although used moderately, it produces a sense of fullness, weight, and anxiety.\*

The more an aliment approaches the character of the animal fluids, the more soluble it is, and the less excrement it leaves, when the digestion is properly performed. On the contrary, aliments remote from the animal character, which are hard and compact, escape in a great measure, the action of the digestive powers, and furnish much excrement. Hence, she is the best cook, who, in the preparing of aliments, softens their tissue, so that all the nutritive matter may be dissolved by the gastric juice.

The specific sense of the stomach contributes not a little to digestion, and it is an indubitable fact, that the actual state of this viscus has a considerable influence on the digestion of aliments. When its sense is blunted, as in cases of debility or relaxation, there is not only a want of appetite and frequent nausea, but the aliments, although taken in a small quantity, do not dissolve or but very imperfectly; the gastric juice being too inactive, the alimentary substances are too long retained in the stomach, and there ferment and contract vicious qualities. There are even some substances for which this organ indicates an aversion; in fact, they are most frequently ejected by vomiting, when this is not the case, they occasion the most serious accidents, for they act as real poisons. When the gastric juice is too active, the aliments pass

\* Lib de affection.

too soon into the intestines, (if they do not always produce anti-peristaltic motions,) and in a crude state. The consequence of this imperfect digestion is violent cholics, diarrhea, and frequently other more dangerous diseases. When the stomach possesses only a moderate degree of sensibility, when it does not retain too great a sum of the energies, nor is not deprived of its just proportion of them, it fulfils its functions in a proper manner; in this case, the gastric juice has the necessary degree of activity, the aliments so far from causing a sense of weight or irritation in this organ, impart agreeable sensations to it, which are propagated throughout the system, and digestion is performed according to the views of nature, which implies a just division of the energies, and a perfect harmony in the exercise of the functions which indicates health.

It is impossible to account for the antipathies which some nations entertain for certain meats, for which other nations give a preference; they appear to me nearly if not entirely to be founded on false prejudices peculiar to the different nations. In this case, the gastric sense possesses only a secondary principle, and the stomach contracts a habit of aversion, which is but the effect of example. The Persians abhor a sturgeon, and the Russians craw fish. The Icelanders have a pretty strong and not less singular aversion to eels. In many of the departments of France, they will not eat snails, which the Germans esteem as an excellent meat; whereas these have an horror for frogs, which the French eat. The repugnance of most people for the flesh of the horse and the milk of the mare, is not more reasonable. We have an insurmountable

aversion for the flesh of the dog, which serves different nations for nourishment, and especially those who inhabit the islands of the Pacific ocean; the negroes prefer the meat of the dog to that of all other animals; to them the most delicious meat is a roasted dog. This taste might be supposed to be owing to a change of the quality of the flesh of this animal, which, bad in temperate climates, becomes good in these warm countries; but this is proved not to be the fact, for the savages of Canada, who inhabit a cold country, have the same taste for the flesh of the dog; and the Missioners have sometimes eat it without disgust.

The stomach is the viscus of the human body, over which habit has the greatest power. This is the reason why—"the aliments which please the taste, and to which one is accustomed," as Hippocrates says, (Aph. xxxviii. sect. 11.) "though they be naturally bad, are more healthy than more agreeable aliments, to which we are not habituated, although they are naturally better." Aliments most agreeable to the palate, and taken with the greatest degree of sensibility, are more intimately mixed with the saliva, received into the stomach with greater pleasure, and are more easily and more completely dissolved by the gastric juice. If they possess some bad qualities, the agreeable sensations which they produce in eating them, compensate for, and corrects the pernicious qualities that they may possess; whereas the best aliments, and those the most easy to digest, but which are disagreeable, elude the action of the stomach and of the digestive juices. We are affected with pleasant sensations in taking aliments, only in consequence of certain dispositions of the system, and these agreeable

sensations designate an affinity between the aliment and the actual state of the system. We frequently see delicate persons digest hard and compact substances of which they are fond, and are injured by those more tender and more succulent, but for which they have a repugnancy.

Daily experience teaches us that persons accustomed to use indigestible and pernicious aliments, do not experience any injury, but that they run a risk of being injured by taking healthy and salutary aliments to which they are not accustomed. We know that Mithridates, king of Pontus, was so habituated to poison, that he never experienced any injury from it. We pretty frequently see persons swallow enormous doses of opium, whilst five or six grains would be sufficient to destroy those who are not accustomed to it.\*

For the same reason, if we take a purge, of manna for example, several days successively, the active impression which it at first makes upon the stomach decreases; as Deseze has well observed, it becomes an aliment and no longer purges.

From what has just been explained, there results an important corollary as respects the physical part of man; it is, that the stomach does not act mechanically, but vitally: in mechanics, the levers, wedges, &c. do not know the power of habit. We can no longer say that the sensibility of the stomach is weakened, for if we change the substances, we shall see that this will be manifested with its wonted vigor. What has just been said respecting the influence of habit upon the

\* In this country one grain is a common dose, two is a large one; and although there are those who, from habit, use large quantities of it with impunity, yet I have seen half a grain produce melancholy effects. In Turkey they chew it as we do tobacco.—*Tr.*

stomach, extends to all other organs; as is proved by observation.

We know that the odour of assafœtida, so unpleasant to us, was a luxury to the ancients, and is still much esteemed amongst the Persians. On the contrary, to the Persians, the odour of citron is very disagreeable. Finally, do we not see the most delicate women expose, with impunity, their breast to the coldest air, being habituated to it; whilst the most robust men would pay severely for a like exposure, by a cold, or a more serious complaint. All these truths were so well known to the father of medicine, as to induce him, in the most of his writings, to recommend strict attention to be paid to the habit and ordinary regimen of persons in the treatment of patients. "There is less evil to fear," says he, (Aph. l. sect. 11.) "from substances to which the person has been long habituated, and which may be considered, under ordinary circumstances, bad, than from those to which he is not habituated, although naturally better. It is proper then, to vary the regimen from time to time, and to accustom ourselves to all kinds of diet, (*oportet autem ad insolita mutare.*)" Such is the doctrine of Hippocrates, followed by Erasistratus; who adds, that the physician who neglects these principles, runs the risk of committing the greatest faults, and of killing his patients; as happened to Arius, the peripatetician.\* This philosopher feared cold water, because it produced a hiccough so soon as he drank it; one day when he had a fever, the physicians, notwithstanding this fact, insisted on his drinking cold water; he drank it, and perished immediately.

\* Galenus, lib. de consuetudine.

## APPENDIX.

### ARTICLE I.

*Advice to persons who live in situations rendered sickly by marshes, swamps, ponds, &c.*

HAVING been raised in a situation of this kind, I possess, at least, a knowledge of the effects of such a residence, and have a thousand times commiserated those thus situated, and have also suggested to many of them the means which I suppose the most conducive to their health; but either blinded to their own interest and happiness, or so familiarised with disease as to be regardless of it, too many of them turn a deaf ear to all suggested improvements. They enjoy health when they have it, but, at the same time, anticipate sicknesses as regularly as they do harvest.

There are two principal causes that concur to render the inhabitants of those situations sickly; first, the country in which they reside; secondly, their manner of living. We will notice each of these causes, and propose our remedies.

First, countries interspersed with marshes, swamps, ponds, &c. are unwholesome in consequence of the

marsh miasma and putrid effluvia which are exhaled from these sources; and whether the Mitchillean doctrine be correct or not, we know that these situations are much more sickly in the autumn, during the progress of vegetable putrefaction, than at any other period; and that this is more obviously the case in years productive of an abundant vegetation, than when it is but small.

These countries are very fertile, the vegetation is abundant, and the autumnal putrefaction of vegetable substances, must necessarily be great. If a small degree of putrefaction renders the atmosphere unwholesome, by contaminating it with its noxious particles, this effect must be increased in proportion to the more luxuriant vegetation, and the greater decomposition of vegetable matter. This was proved by melancholy experience, in the autumn of 1804; the spring and summer of that year were, in common language, very seasonable, and the vegetation very great, but never, perhaps, was the country more severely scourged with disease than in the succeeding autumn.

The remedies which very naturally suggest themselves to a man of reflection, in these cases are, 1st. To drain, if possible, all still ponds, and to give a free circulation to currents. 2d. To convert the low grounds into productive meadows. The first of these remedies is too often entirely neglected; indeed, so far from apprehending any danger from ponds, artificial ones are not unfrequently made in the vicinity of their dwellings, for the accommodation of the aquatic fowls.

The second of these remedies is objected to, from the situations to which I principally allude, being very remote from a market for hay; in consequence of this,

the inhabitants of those countries suppose, to cultivate their low grounds, would be an entire sacrifice of time and of interest; this is a mistake, which arises from the want of a due and rational consideration of the subject; for, although their remote situation from market would not render the cultivation of hay an immediate object of wealth, there are, nevertheless, other considerations which should be taken into view. If nothing but the health of persons thus situated was taken into view, and this merely as regards their pecuniary circumstances, I am of the opinion that it should be sufficient to induce them to cultivate their meadow ground; for it is well known that there is a considerable time of each year lost by the autumnal sickness, and there is no period of the year in which time is more precious, in consequence of the abundant labor peculiar to this; and in those countries where the cultivation of hay would not be an object, it would not be necessary to let the grass arrive at that degree of maturity before it is cut, nor to pay that attention to the curing of it, as in those where it is cultivated for market; and although it would require some time for the cultivation of the hay, yet, I believe, not so much as is lost by sickness, which might be prevented by this means. If the view of the subject just taken would be sufficient to parallel with the general objections, there are others which must give it a decided predominancy, and these, also, of a pecuniary nature. The inhabitants of countries thus situated, say, what shall we do with our hay? we have no market for it, to cultivate it merely to let it rot would not do; we have sufficient provender for our cattle, &c. without it: at a superficial view these are specious reasons, but

they will not bear an examination. If they have no market for their hay, they have upland which should be manured, and which, if well manured, would produce them, at a moderate estimate, four times as much as it now does; here is a very powerful inducement, and not mere matter of opinion, it has been realised a thousand times, The next question is, what is the best means of converting this hay into manure? This I consider as about the most important part of the subject, and, therefore, wish it to be strictly attended to. I believe many of these irregular bilious and intermittent fevers which occur in the winter and spring after a few warm days, are most frequently owing to heaps of manure which are suffered to rot in the vicinity of the dwellings of those thus affected. During this warm weather, the putrid fermentation becomes very rapid, and the noxious effluvia which contaminates the air, and frequently spreads desolation, is much augmented; the practice, which is very common, of having pits dug for the purpose of rotting vegetable substances in the vicinity of dwellings, cannot be too much censured. The most judicious method, therefore, of converting hay into manure, is by keeping a sufficient number of cattle to eat it. If there were no demand for them, if it were even necessary to give them to the poor, the farmer would be more than compensated for his trouble and expense; but this is not necessary; there is no place that I know of, which comes within the limits of these observations, from whence butter and cheese may not be easily conveyed to market, and if the beeves cannot be sent alive, let them salt the meat and send it in this state. If any situation should render these means

impracticable, it were better to cut the grass, and spread it thinly on the uplands, where it might gradually decay, or be wafted away by the winds, than to suffer it to undergo the usual method of fermentation or decomposition. The vegetable substances which grow around ponds, &c. and which cannot be converted into hay, should be treated in this manner, and not be suffered to remain in those places, to undergo the usual order of decomposition; for a small pond of this nature may render a whole neighborhood sickly. Much might be said on the pernicious effects of mill ponds, but as these are, in some measure, a necessary evil, we will, for the present, merely recommend those immediately contiguous to them, to the advice in the last sentences.

Secondly. *The manner of living.* To treat a subject of this nature, much perseverance and patience is requisite. Habit is second nature, and man may very justly be considered, "a bundle of habits;" old prejudices are powerful and not easily eradicated; he who undertakes to reform the manners of a people, rarely receives any other reward than a consciousness of having done his duty.

This subject naturally divides itself into two heads; 1st. The manner in which citizens of those countries do live; 2d. That in which they should live.

First. They live too generously, they eat too much meat, make use of too many seasonings, and drink too much spirituous liquors; they do this, as they say, to live above disease, but this is a mistake which should be rectified. In living thus they increase the animal heat, and, as it were, burn out the powers of life; hence, they either subject themselves to disease,

or bring on premature old age. The very means which nature gives them for their security, they convert into potions of destruction. Instead of living frugally, of using meat sparingly, and making a vegetable diet predominate, they adopt the contrary method; the fruits which are given them to reduce the animal heat, and thus to preserve their health and existence, are distilled into spirits, and to say the least of these, they are slow poisons. When strong liquors are drank to excess, they soon exhaust the vital powers; the person who thus uses them, must always keep himself well charged, otherwise, indirect debility is the consequence; and when in this state, which can only be considered as that of a disease, if he exposes himself in the smallest degree, he subjects himself to the most fatal diseases of his country. The excessive use of strong drink, destroys the tone of the stomach, causes indigestion and all its dreadful train of diseases; one of which is habitual diarrhea. Habitual diarrhea has become very prevalent in the middle and southern states of this country, and this disease is as fatal in its nature as that of the consumption. Spirituous liquors, when drank to excess, occasion obstructions in the abdominal viscera, and the most obstinate liver complaints; which have also become very prevalent in the middle and southern states of this country. This catalogue of the physical evils attending the use of spirituous liquors, might be extended to a great length, and the moral evils occasioned by them are not less numerous; but what we have said must, for the present, suffice.

We will now say something relative to labor. We are aware that under this head our observations will

be chiefly applicable to servants, and that these are too generally considered merely as beasts of burden; but the friend of humanity who regards all men as brethren, created by the same power and for the same purposes, feels for the bond as well as free, and considers it his duty to plead their cause. And the master who considers his own interest, knows that the better he treats his people, the better servants they are, and also the more profitable. The first thing that claims our attention in this respect, is the impropriety of working them too hard, especially in hot summer weather; the second is the impropriety of exposing them to night air during autumn, and to the heavy dews of this season. 1. The expenditure of animal heat and the vital powers is naturally very great in the summer season, and immoderate exercise increases this expenditure; a consequence of which is debility, and a predisposition to autumnal diseases. Some kind masters, whose tender mercies are cruel, but perhaps unknowingly, feed their servants generously, and give them a plenty of whiskey to drink, to enable them the better to perform the tasks assigned; this cheers up the servant, he goes through his work with alacrity, and the master's immediate object is answered; but in the end this practice proves to be very pernicious. 2. An exposure to the night air and heavy dews of autumn is frequently the immediate cause of the diseases of this season.

We now come to the second part of our subject, which is the manner those who reside in the unhealthy situations alluded to, should live.

Some of the information on this score is necessarily included in the manner in which they do live.

We have there said by living too generously, they increase the animal heat, and, as it were, burn out the powers of life; by doing this, they bring on indirect debility, which subjects them to the pernicious effects of the atmosphere, contaminated by the marsh miasma, and the exhalations of vegetable and other putrid substances. The better means, therefore, is to keep the animal heat at a healthy point, and to husband the vital powers with care. The animal heat is naturally too great in the summer season, in warm climates, and it should be reduced; this is nature's view, and it ought not be frustrated but seconded. This can be accomplished, 1. by eating less meat and more vegetables, by almost entirely abandoning the use of acrid and heating seasonings, by refraining from strong drinks, and by using little or no coffee or tea; 2. by eating freely of ripe fruits, and such as grow abundantly in those situations; by drinking water alone, or molasses, water and vinegar, which is a very pleasant and very salutary beverage; the molasses keeps the bowels from becoming constipated, which is very frequently the case in warm climates, if not prevented by ripe fruit or some other means, and a constipation of the bowels is always pernicious, but more so in warm weather than at other periods; it produces fever, and frequently gives rise to bilious complaints. Vinegar has a tendency to check and restrain the generation of heat. I will here take the liberty of presenting the reader with extracts from my essay on the effects of cold.

“That the temperature of the system can be augmented and supported by artificial means, is an unquestionable truth, and that an expenditure of it may

also be increased, is no less true. Thus, when heat is accumulated in the system, either by fever, by strong exercise, or by the scorching heat of the sun, nature constantly cries aloud for acids, and a cooling diet. Acids, when taken in the stomach, always check and restrain the generation of heat, or, in other words, when the system is saturated with oxygen only, less oxygen air (oxygen and caloric) is imbibed by the blood in the lungs, and consequently less heat will be evolved in the body. 'It is upon these principles,' says the Rev. Mr. Townsend, 'that the reapers in the south of Spain covet their *guz pacho*, composed of bread, oil, and vinegar; the two first articles for nutriment, and the latter to moderate the vital heat. On the same principle, obedient to the voice of nature, during the sultry heats of summer, we equally desire our lettuce, oil, and vinegar.'"\*

The water in those unhealthy situations, is generally very impure, and should be distilled or boiled before it is used, especially when drank alone.

The general use of sweet oil would also be very salutary to the inhabitants of those warm and unhealthy climates.

"Oil not only serves for nourishment, but has also a tendency to relax the solids, as is experienced by those who make much use of it; this is very obvious in parturition. On this principle it may promote perspiration, and thus reduce the temperature of the system."†

\* See Medical Museum, vol. vi. No. 2. of Philadelphia.

† "On conversing with an intelligent gentleman on this occasion, he told me he believed I was correct, although the idea was new to him; he observed that last summer (1808) he had eaten much oil, but never before, and that he experienced less inconvenience from heat than formerly." Med. Mus. vol. 2.

The olive does not grow in many of these sickly countries, nor are many of their inhabitants able to obtain its oil; but no doubt providence, who guards man with the most parental care, has furnished a substitute for it, were it discovered; indeed, it has been said, that the ground-nut furnishes a very good substitute.

*On exercise.* We have given it as our opinion, that immoderate exercise during the heat of summer, produces debility, and thus disposes the system the more easily to be affected by morbid causes of autumnal diseases; if this should be the case, the remedy is obvious. We have also spoken of the pernicious effects of night air, &c. the deleterious effects of the evening dew on the human system, have been frequently commented on. I have long been of the opinion, that the morning exhalations are equally pernicious, and that persons, at least those who are much disposed to autumnal diseases, should avoid the latter as carefully as they do the former. Professor Mitchill says, "facts from all quarters prove, that the septic acid, generated by putrefaction, is always on the earth's surface, and its vapors never rise to a great height above it; from these exhalations, the water of dews, mists, and fogs, precipitated when the atmosphere is cooled, particularly during the night, receives a portion of the same acid, which thus united, attach themselves to animal and vegetable bodies. Exposure to water, so impregnated, causes the most violent distempers in the southern latitudes, and is followed by an almost certain destruction of human life in many places."\*

\* Medical Repository. Hex. i. vol. 1. p. 41.

Now, it is very reasonable to suppose, that this destructive acid, which is precipitated with the dews, &c. during the night, is at least in part exhaled with them in the morning, and that persons exposed to these noxious exhalations, must at the same time, be exposed to the diseases which they cause. But if the reader should be disposed to call in question the ingenious doctrine of doctor Mitchill, or my inference, the general principles of vegetation will be sufficient to prove the correctness of the opinion I here advance.

From many experiments by Ingenhouz, and other celebrated philosophers, it has been proved, that vegetables exhale oxygen during the day, and carbonic acid gas during the night.\* Oxygen gas, from its promoting health and life, has been called vital air; carbonic acid gas, from its being destructive to animation, has been included among the noxious airs. If no carbonic acid gas was exhaled by the vegetables during the night, the night air would not be so pure as that of the day, in consequence of the diminution of oxygen, and the impurity must necessarily be increased by the carbonic acid. The dew that falls in the evening, continues on the surface of the earth and on the vegetables until morning, and unites with the water they give out by transpiration, which renders the quantity of water greater in the morning than in the evening; it is true in dry seasons this is not always the case; then a part of the water may be absorbed by the earth, and also by the vegetable pro-

\* Ingenhouz and Priestly experimented on vegetables about the same time, and their results were similar; they both say plants give out oxygen to the sun's rays, and a very noxious gas in the shade and during the night.

ductions; but in general, my position will be found to be correct. Although, a portion of the carbonic acid gas, exhaled by the vegetables during the night, mixes in the common atmosphere, yet from its being heavier than the atmospheric air, it necessarily descends towards the earth's surface, and is absorbed in considerable quantities by the dew, &c. for water will, when agitated, absorb nearly its own volume of this gas. On the succeeding morning, when the solar rays begin to warm the surface of the earth, the dew begins to evaporate or exhale; and while this water is passing into the gaseous state, the noxious gases are set free in the ocean of air, and consequently contaminate it; or if the carbonic gas absorbed by the dews, is completely assimilated with it, this must be contaminated by the gas, and when exhaled in the morning, must of course communicate its noxious qualities to the atmosphere; or, if it should be contended, that all the deleterious qualities of the noxious gases, exhaled by vegetables during the night, is corrected by the water that falls during this period, the mere exhalation of the water in the morning must render the air insalubrious, for air supersaturated with water is not so conducive to health, as that which is not, and should be avoided, especially by those of delicate health. But I presume the first of these propositions, will be acknowledged, by the philosophical reader, to be correct.

In endeavoring to prove the morning air not so salubrious as generally supposed, I should be very sorry to be the advocate of indolence; and I have no doubt, but that the pernicious practice of lying sweltering in a warm feather bed in the morning, a practice which

is very common, especially in our cities, is far more injurious to the human system, than an exposure to either the evening or morning air. My object is only to caution those of delicate health against an improper exposure to morbid causes; and I am persuaded there is nothing more conducive to the health of both the body and the mind, than judicious exercise properly conducted.

When a writer undertakes to correct a popular error, or advances a new opinion, he has two classes of readers to contend with; the one reasons on the subject, the other substitutes assertions for reason, and endeavors to enforce these assertions by supposed experience. At present, I have nothing farther to say to the first class; and as I am not a friend to empiricism in its ordinary form, I generally avoid noticing the second class. But as the present is a subject of more than ordinary importance, and as I do not wish to impose my opinion on any person, I shall deviate from my general rule.

I have been led into these few remarks in anticipating the second class of readers, who may assert that the morning air is healthy, because they feel better then, than during the other periods of the day. This assertion is generally received as a fact; and the circumstance of our being exhilarated in the morning, has imposed on men of science in general, and induced them to adopt the vulgar opinion respecting the salubrity of the morning air. I conceive that the exhilaration that we experience in the morning, is owing more to the increased energy of the system, from a cessation of mental and bodily exercise, than to the supposed salubrity of the morning.

I am aware that the doctrine I here advance respecting the insalubrity of the morning air, and more especially the arguments that I use in favor of it, seem to be refuted by some recent experiments.

If a person was barely to assert, that the component parts of the atmospheric air are the same in every country and in all situations, that it does not contain more oxygen on high hills or mountains, on which the vegetation is very small, and where animals cannot live for the want of this kind of sustenance, than in rich valleys, where vegetation is abundant, and there are many animals which also contaminate the air by respiration, or that the sea air contains no more oxygen than the land, &c. we should certainly doubt the assertion; but when he tells us he has proved what he asserts by actual experiments, we are compelled to suspend our opinion until we have repeated the experiments.

I very strongly suspect the correctness of the experiments which are said to prove that the component parts of the atmosphere are the same in every country, and under all circumstances. If such be the case, to what are we to attribute the various effects of the atmosphere in different situations and climates?

If the evening and morning air are pernicious in the autumn from those causes, what must their effect be when the noxious gases of putrifying vegetables are added? which is always the case in the autumnal months, when vegetation has been luxuriant in the preceding spring and summer, and how much more necessary does it become, to guard against these offensive causes.

If these noxious gases do not become a part of the

atmosphere, they float in the ocean of air, as do other foreign substances. Their existence cannot be questionable, nor can there be a doubt as to their pernicious effects.

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## ARTICLE II.

### *On Cleanliness, &c.*

WITHIN the last twenty years many ingenious essays have been written by our own countrymen, of a popular nature, on correctives of poisonous effluvia and on cleanliness.

At various periods since the settling of this country, benevolent authors have manifested a solicitude for the health and prosperity of their countrymen, by giving them much salutary advice relative to the clearing of lands, draining of swamps, meadows, &c.; but in 1793, our most populous city, Philadelphia, was visited by a malignant bilious fever, which in a short time ravaged it of many of its inhabitants. Since that period, it, as well as almost all the principal cities and towns in this country, have been scourged by this destructive malady; this melancholy occasion excited the guardians of our health to an active investigation of the origin, causes, nature, cure, and prevention of a disease so depopulating.

Under these different heads much instructive information has been given, the question of domestic and foreign origin has been ably handled, the utility of

lazarettos, ingeniously discussed, the probability of preventing the disease by cleanliness, masterly treated, &c.

Amongst the number of writers who have been engaged in these important investigations, professor Rush of Philadelphia, and professor Mitchill of New-York, have a just claim to the gratitude and veneration of the citizens of the United States. The latter of these gentlemen has been the able advocate of a theory that every person may reduce to practice, and which is as salutary as simple, I allude to the use of alkalies. Every old matron or domestic in our country, knows the advantages of soap, (one of the active ingredients of which is alkali,) in producing and preserving cleanliness; and every person of reflection knows how conducive cleanliness is to health. But although these facts were so obvious as to be granted by even the greatest sceptics, yet alkalies were not reduced into general practice until the philosopher of New-York convinced us by his eloquence and by his reasoning, of its indispensable utility, and that nothing could supersede its use.

We are not disposed to discuss any theoretical question, we are not disposed to contend for any favorite system, but to recommend a salutary practice, which is in the power of our most indigent citizens. This is the place to adduce matter of fact, and not controverted theories; and whether this disease to which we have alluded, with many others, is, or is not, owing to an acid cause, is of but little importance, provided the use of alkali is salutary in preventing them. To reason from analogy, we should suppose that the noxious principle which produces many diseases, is of an

acid nature, and to reason from experience, we are inclined to draw the same inference. The stomach of man when debilitated by any cause whatsoever, does not execute its principal function in a healthy manner, the decomposition of the substances received into it, is generally attended with some morbid effect; if these substances stimulate the organ too actively, a spasm is the consequence; when this is not the case, the decomposition, fermentation, or digestion, is accompanied by a predominant portion of acid, which gives rise to disagreeable eructations: this affection may, generally, be relieved by taking some pleasant absorbent, such as magnesia, or a little alkali. When these fail, the better means is to evacuate the stomach by a puke; when this is done, its tone should be reestablished by some gentle bitter or tonic: a cold infusion of chamomile is, in this case, very salutary. Whether the atmosphere or earth may, either of them, be considered in the same view as the stomach, shall be deferred for another occasion, but that inanimate substances are sometimes decomposed in these without any pernicious effects, and at others attended by the most fatal, is a fact too obvious to be doubted; and the causes which give rise to these effects may, generally, be corrected by alkalies.

The practice of giving alkalies, or absorbents, in cases of poisons, &c. is not confined to the Christian world, where the science of medicine is cultivated with honor to its professors, and with indescribable advantages to the citizens in general; the Chinese consider petrified crabs a salutary and powerful antidote against all kinds of poison.\* I shall conclude these

\* See Grosier's China.

remarks, with some detached extracts from professor Mitchill's papers on this subject. "It will appear from the perusal of a great number of books, that an opinion, grounded on fact and long observation, has, from early ages, prevailed among writers, that there was something of an acid nature produced in the atmosphere; the names they have given to this acid shew, that the principal and most respectable notices about it, were tinged with conjecture and uncertainty. Sometimes it was called *acidum primogenium*, because it was imagined to be the first formed acid, and that other acids derived their qualities, in some measure, from it; then it was called *acidum universale*, on account of its existence so generally where the business of man was carried on; again it was termed *acidum vagum*, as it seemed to stray and wander about through the air and water, attaching itself now to one thing, and then to another. It was by some denominated *acidum atmosphericum*, from its presence and universality in the atmosphere, and by others, *acidum aerium*, by reason of the gaseous or volatile form it assumed whilst flying about, or floating along with the winds; and when artificially prepared, by disuniting it with potash, with which it loved dearly to associate, it has since received the more specific names of the *nitrous and nitric acid*.

"Now the belief of mankind, from a very early period of ancient history, has favored the opinion of a primitive and universal acid, existing at all times and places, and performing great things in the economy of this world. The experiments of the moderns have established the truth of this opinion, by ascertaining that, by a law of nature, the septon of those plants

and animals which contain it, does, during the putrefactive decay of such organised substances, very commonly unite with oxygen, and form the acid of putrefaction, or the nitric acid; and as all living systems, whether of plants or animals, must die and undergo dissolution, such a mass of putrefying materials, corrupting at all times and in all places, will generate enough of septic (nitric) acid to countenance the ancient idea of the universality of its existence; it is, therefore, the most abundant and most active of all acids, at least as respects man, and the various objects with which he is conversant on, or near, the surface of the earth.

“Among other effects which oxyds and acids of this sort seem to produce, when volatized by heat they float about the atmosphere, endemic and epidemic distempers deserve to be particularly mentioned. Accordingly, sickness of one or other of these denominations, has been always remarked to prevail where putrefaction and corruption abounded, where septic vapors contaminated the atmosphere, and where the bodies of living animals inhaled them in a sufficient quantity.

“In a situation where a soil, over rich with moist and putrid materials, exhales its septic and unwholesome steams, and excites agues, fevers, and plagues, there it often happens that vegetation goes on vigorously, and in proportion to its luxuriance, lessens, by converting to its own use, the quantity of pestilential matter in the soil and air; while on sandy, mountainous and rocky places, where only a small quantity of putrid substances can collect, where the atmosphere is little

or not at all poisoned with their exhalations, but the respirable portion of it is unusually large; in such circumstances plants thrive but poorly.

“Supposing then that septic acid vapors contaminate the atmosphere, and destroy men and other animals, these must undergo decomposition after death, and enlarge the mass of putrefying materials. Every carcase added to the heap, increases with regard to plants, the quantity of aliment, and, with respect to mankind, augments the bulk of poison.”

These extracts are intended merely to give the reader an idea of professor Mitchill's opinion of the causes of many diseases. I shall not presume to say whether this theory is correct; be this as it may, I have full faith in the utility of alkalies.

Some of the opinions inculcated in these extracts are more immediately applicable to the subject of the preceding article than they are to this; they here, however, serve to show the pernicious effects of a poisonous effluvia, presumed to be an acid, and the necessity of correcting this noxious principle as far as practicable, by the judicious use of alkalies.

Some of the European authors have recommended the use of the fumes of muriatic acid, &c. to purify ships, &c. If the noxious effluvia which infests ships, prisons, &c. is of an acid nature, and we doubt not but that such is the fact, the use of lime and alkalies are, at least, the most rational remedies. From this view of the subject, the necessity of cleanliness, by the free use of soap and water, is strikingly obvious.

The free use of lime in washing the walls of houses, and in privies, &c. should not be neglected;

more especially in prisons, and all other places where many persons are crowded in a small space.

The benefit derived from the inhibition of vegetable acids in many diseases produced by putrid effluvia, does not tend in the least to derogate from the doctrine here inculcated; for whilst the oxygen gas is a principle necessary to life, and emphatically called vital air, the most of the other gases are deleterious, and in an uncombined state fatal to life. Wherever the septic acid, or any of the deleterious gases predominate, there is a deficiency of oxygen; which is, in some measure, compensated for by the internal use of vinegar, or the vegetable acids.

There is no part of medical science so interesting to the philanthropist as that under consideration; of all earthly objects, health is the most desirable, and most precious; and a vast number of diseases which afflict human nature, are the fruit of neglect or ignorance. A neglect of as trivial a nature as cleanliness appears to be to the commonality, has been the source of the most fatal diseases; a stagnant pond of putrescent matter, a cellar of filthy water, has frequently spread dismay through a whole neighborhood. These melancholy instances of neglect are more fatal in towns and cities than in the country—more among the ignorant poor than the wealthy and intelligent; it is for the health and happiness of those, that humanity raises her voice.

## ARTICLE III.

*On Mineral Waters.*

As the subject of mineral waters has been very slightly noticed by Tourtelle, and as it is closely connected with hygiene, I must be permitted to make some remarks on it.

It is to be regretted that the practice of medicine, like every other thing in this versatile world, is subject to the caprices of fashion. It is true there are many changes in this globe we inhabit, in the bowels of the earth and its productions, in the climates and seasons, in the manners of the people, and in the diseases to which they are subject, that frequently render a different treatment necessary; it is, however, to be greatly feared, that *fashion*, that fickle jade, has more influence than *necessity*.

In no respect is this more remarkably the case than in the use of mineral waters. At one season, one spring is all the vogue, at the next, another; and whatever our diseases, our constitutions, or our habits may be, we must all go where fashion directs or invites.

The utility of mineral waters has long been a subject of controversy among medical men; while some have past the highest encomiums on them, others have decried them as possessing no virtues; and a third class has been willing to allow that they are, in some cases, of real utility, but that the dissipation and improper conduct of valetudinarians at the springs, do more injury, than it is possible to receive benefit

from the waters. What! do valetudinarians who go in the pursuit of health, act indiscreetly? Oh no! they only take a little innocent amusement now and then, to recreate themselves. You have frequently discovered how difficult it is to regulate your patients when under your immediate care, and even that this is sometimes utterly impossible; if such be the case then, how do you suppose they will act when free from restraint? At these springs a great number meet, they intermix from different parts of the continent, they form acquaintances, invite each other to dine; those invited must be polite enough to attend, and when there polite enough to eat and drink what is set before them; the richest dishes, which are perhaps indebted to every country of the world, must be eaten *sans ceremonie*, and wines must be drunk even to cheerfulness, or in other words, to inebriety. It is, therefore, easily to be conjectured what must be the fate of the poor valetudinarian, for none but a churlish philosopher, a clown, or a person very sick indeed, could have the impoliteness to refuse a pressing invitation to dine, to game at some amusing play, or to take a little excursion with a friend. As to gaming, it is also very pernicious, not only on account of its confining invalids too much in the day time, but also, (but with confusion let it be told,) from their spending a considerable part of the night at this fascinating abyss of destruction. In addition to this, the malicious passions are too frequently awakened at the gaming-table, and when these are excited into action, take care health! an insidious enemy is undermining, perhaps, thy only remaining bulwark.

The games that are most frequently played, such as

backgammon and cards, are not only too confining, but also confine one too much to the same position. Excursions, when moderate, are certainly of service; but moderation, unhappily, is too little attended to by valetudinarians, and their excursions, instead of being moderate, are frequently carried to excess, consequently do more harm than good. I would recommend as a general practice, that valetudinarians eat alone and be pretty much alone, unless they can govern themselves when in company, at the table, or elsewhere; not that I would wish to restrain them from the company of a cheerful friend or two, but that they should shun company, unless they could govern themselves in every respect; in their eating, drink, exercise, and also have full command over their passions. If they once venture into company, let them be guarded whilst there, and when gone, reflect what they have done; if they have transgressed, and not gone so far as to have committed an irreparable transgression, or even if this be the case, let them for the future shun such temptations. Certainly, it is not pleasant to be thought impolite, and when in Rome we must too frequently do as they do in Rome. There is more wisdom in shunning temptations, than in subjecting ourselves to them; for although we may possess resolution enough to overcome them, yet the commotion excited in the system, to enable us to gain this victory, is generally very pernicious. I am aware that many impassionate philosophers contend that to shun temptations is a mark of pusillanimity. Be this as it may, and granting it to be correct, I do not conceive it to derogate in the least from our position. I had sooner incur the name of a coward, than to injure my health at the expense

of apparent magnanimity. I, for my part, consider health above all estimate, and think that when a man is in health, he should endeavor to keep so; and that when in a state of disease, he should endeavor to regain his health; and that all formality, all etiquette should be sacrificed at the shrine of health. The man regardless of his health, is worse than the beasts of the field; they neither gormandise nor swill when sick. It is a much more difficult task to govern ourselves, than the most of us are aware of; we are imitative animals, and fond of doing what we see others do, provided it be not disgusting. We are the children of habit, and find it difficult when in health, to break ourselves of old customs, even when we know them to be pernicious. When the body and mind are under the empire of disease, this is more obviously the case. We are also the children of taste, and like to indulge in whatever pleases our fancy, either in eating or otherwise; hence the necessity of shunning all improper things. I am not disposed to make these censures general, although it is to be feared there are more to whom they are applicable, than to whom they are not. Some persons who go to the springs, come home in, perhaps, a better state of health than they were in when they went to them; when this is the case, I suspect it to be more owing to a change of climate, regimen, exercise, &c. than to the use of the mineral waters. Mineral waters are now prepared in our large cities, and it may therefore be argued, that these objections are not applicable to them. But I presume there cannot be much certainty in the purity of these waters, and the advantages of exercise, change of residence, &c. are here lost. Whether these waters

have any decidedly medicinal effect, is to me questionable; but of one fact I am well persuaded, which is, that their introduction has materially diminished the use of spirituous liquors. If they promote temperance, it is an invaluable blessing; for drunkenness is the most inveterate and most destructive disease to which the inhabitants of the civilized world are subject. They are exhilarating and refreshing, and the carbonic acid gas, with which the water is impregnated, often has a salutary effect on the stomach.

Let us see if there are not other objections to the use of mineral waters equally specious. 1. By a continued use of any article, its medicinal effects are destroyed; this is obviously the case with mineral waters. 2. Bitters are very valuable in many diseases, but by a long continued use of them, they lose these salutary effects, and lay the foundation for new diseases; this is no doubt the case with mineral waters.

Let us now see in what diseases they are recommended. But this is too great a task to fulfil in this place; for there are but few diseases to which the human system is subject, that are not said to be relieved by mineral waters. We will, however, notice a few of the most prominent. 1. Consumption. But what effect can they have in this disease? It is not probable that they possess any specific properties; and that if salutary, it must be owing to the effect they have on the general system. 2. Dyspepsia. In most cases where mineral waters are recommended, and where they promise any advantage, there is a general debility, with atony of the stomach. Dyspepsia or indigestion lays the foundation for many chronic diseases, and it is in these that mineral waters are the most

highly recommended; but a diseased stomach, like an enfeebled man, is able to bear but a small burden, and by drinking too much water, it is too much distended, and its tone is thereby still more impaired. The proper means of giving tone to it, is by the administering of tonic medicines, and in this case liquids are generally pernicious. The principal advantages to be derived from these waters, must be owing to the minerals with which they are impregnated. If any of the minerals are supposed salutary in such and such diseases, it were better to give them in some other menstruum, which would not morbidly distend the muscles of the stomach, and thereby increase the disease. Lamb has endeavored to prove, that all constitutional diseases are owing to impure waters; and although he has certainly extended his principles even beyond the limits of probability, yet I think his observations worthy of attention, and have no doubt that impure waters are very unhealthy, and that if distilled waters were generally used, they would be salutary. We know the advantage of them in bowel complaints.

Mineral waters are also recommended in chronic rheumatism, eruptions of the skin, calcareous complaints or gravel, chlorosis or green-sickness, &c. &c.; and it is probable that they may be salutary in these diseases; I have no doubt but mineral preparations are salutary in many diseases. My principal objection on this score, is the menstruum, and the only objection I have to this, is the great quantity that must be taken, to introduce a small quantity of the substances that impregnate it, into the system. When the friends of these waters endeavor to dissipate this

objection, by saying it is mere ideal, I am not a little amazed to see how pliant the mind is, and how soon prejudice lulls reason to sleep. If we had no knowledge of the size of the stomach, we could then believe all they say on this score, but since we have a knowledge of its size, and know that the most of the persons who visit the springs, drink more at one draught, than that viscus is calculated to hold, without injury, we cannot adopt their opinion. But they say the waters communicate no unpleasant sensations to the stomach, and that this organ, when unpleasantly affected, communicates these impressions to the brain, &c. In reply to this objection, I must be permitted to say, that on first using these waters, they do very frequently, when taken in large quantities, cause an unpleasant sensation in the stomach, but that after they have been used some time, this effect ceases, not that they become the less pernicious, but because the stomach has become habituated to the morbid distension, and also because its sensibility has become in part impaired. The system may become so habituated to any poison, even the most noxious, as not only to receive it without injury, but even to require it. The friends to the use of mineral waters, argue further: but these waters soon pass off as diuretics or cathartics; this is frequently the case, and these very effects induce me to distrust their wonderful effects in diseases of atony; for to contend that active purges and diuretics are medicines, which powerfully strengthen the system, is to me paradoxical.

But there is one other objection that I have to the use of mineral waters, which is that we know but very little in general of their component parts, and I

never could consent to recommend any thing to a patient, unless I knew what it was, and what its effects were. No invalid should go to a mineral spring without consulting his physician; and no physician should recommend a spring without knowing of what minerals it is composed, and also what is the climate, &c. in which it is situated. And although our country so much abounds in mineral springs, yet there are but few of them that have been properly analyzed. The Ballstown and Saratoga springs, in the state of New York, have been analyzed by V. Seamen, M. D. and we recommend his little treatise on this subject to the attention of the reader, as containing such information as he should possess. This last objection does not hold good with relation to the artificial mineral waters, when they are properly prepared, and as a substitute for ardent spirits, I should like to see them in general use; for although I have given it as my opinion, that mineral waters may on some occasions be injurious to the animal system, yet I should view it as a most fortunate occurrence for our country, were they substituted for that of the hydraardent spirits. The wise and benevolent of every country in which spirituous liquors are used, have endeavored to convince their fellow-citizens of their destructive properties. They have represented to them their pernicious effects on the animal system, of their demoralising tendency, and of the injury frequently inflicted on a whole family, from one of its members partaking too freely in their use. View that poor decrepid man, whom you see walking the street; he was once an industrious mechanic, or a respectable merchant, he enjoyed the comforts of life, and provided like a christian for his

wife and children; but, unfortunately for himself and for them, he became introduced to some idle companions, who were in the habit of visiting the tippling shops, he was prevailed on to go to these haunts of destruction; at first he went reluctantly, and it was with difficulty that he could be persuaded to partake in their orgies; but he finally contracted the vicious habits of his companions, and neglected every thing for the poisonous potion; he now became callous to the endearing caresses of his prattling babes and affectionate wife, who were formerly his greatest pride, and afforded him the most felicitious moments he enjoyed in life; he has gone on from one degree of excess to another, until the present period. A few years since he enjoyed perfect health, but now behold him reduced below the grade of a brute. Poor unhappy being, his mind is almost destroyed, and his body is scarcely animated by the breath of life. Happy would it be did the attendant evils end here; but alas! they do not; his wife and innocent babes are deprived of even their very subsistence by the monster whom she calls husband, and they father.

## GLOSSARY.

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### A.

- Animalization.* Conversion of nutriment into animal matter.
- Asphyxia.* Cessation of animal motion.
- Anastomosis.* An union of vessels, especially arteries and veins.
- Asthenia.* Debility.
- Aorta.* A large artery going from the heart.
- Acidulous tart. potash.* Cremor tartar.
- Azotized hydrogen gas.* Azote and hydrogen combined.
- Auricle.* A cavity of the heart.
- Antimony.* A semi-metal.
- Alkalescent.* Having a predominance of alkali.
- Azote.* Noxious air.
- Antiseptic.* That which resists putrefaction.
- Acidulous oxylat of potash.* A salt.
- Antiscorbutic.* Medicines which prevent and cure the scurvy.
- Azotization.* Conversion into azote.

*Aphrodisiacum.* Medicines that excite venereal diseases.

*Acetate of lead.* Sugar of lead.

*Anthrax.* A hot or burning eruption.

*Acetous acid.* Vinegar.

*Aperitive.* Gentle laxative.

*Acescent.* What has a tendency to sourness.

*Antiphthisic.* A remedy in the consumption.

*Ammonia.* Volatile alkali.

*Antiphlogistic.* Debilitating or cooling remedies.

*Antispasmodic.* Preventives or remedies for spasm.

### B.

*Bilification.* Formation of bile.

*Borborygma.* Rumbling noise of the bowels.

### C.

*Carbonat of lime.* Lime.

*Catarrhs.* Colds or coughs, &c.

*Cataract.* A disease of the eye.

*Chyle.* A juice of the alimentary substances after passing from the stomach.

*Chyme.* The finest part of the chyle.

*Cornea.* A coat of the eye.

*Clavicle.* Collar bone.

*Coccyx.* Termination of the back bone.

*Carbonic acid gas.* Fixed air.

*Cerebral.* Relative to the brain.

*Corpora cavernosa.* Parts of the penis.

*Cutaneous organ.* Skin.

*Carbon.* Coal.

*Cachexia.* Bad habit of body.

*Cardialgia.* Heart-burn.

- Carotid artery.* Artery of the neck.  
*Carnivorous.* Animals that live on flesh.  
*Calculi.* Gravel.  
*Carbonat of amonia.* Volatile salts.  
*Caloric.* Principle of heat.  
*Colliquative.* A profuse discharge.  
*Chlorosis.* Green-sickness.  
*Carminative.* Warming medicines.

## D.

- Diaphragm.* Midriff.  
*Duodenum.* Intestine next to the stomach.  
*Dura-mater.* A membrane of the brain.  
*Deglutition.* Swallowing.  
*Dentition* Teething.  
*Diathesis.* A disposition of the body.  
*Dyspepsia.* Indigestion.  
*Diuretics.* Medicines that increase the secretion of urine.  
*Deliquescent.* Substances that dissolve.  
*Diaphoretics.* Medicines that promote sweat.  
*Defluxions.* Discharges of humors.  
*Decarbonization.* Depriving of carbon.  
*Disoxygenation.* Depriving of oxygen.

## E.

- Emunctories.* Parts of the body where excrementious matter is separated, collected, and discharged.  
*Endemic.* Diseases prevalent in a particular part of the country.  
*Epigastrium or Epigastric region.* Region where the stomach is situated.

*Elephantiasis.* Species of leprosy.

*Entomaphagus.* Animals that live on insects.

## F.

*Fistula.* Sinusses—deep-seated ulcers.

*Ferruginous.* Belonging to iron.

*Frugivorous.* Animals that live on fruit.

## G.

*Granivorous animals.* Animals that live on grain.

*Gastric.* Relative to the stomach.

*Goitre.* Swelling of the throat.

## H.

*Hypomochilion.* Point of support.

*Hemiplegia.* Partial palsy.

*Hydrogen.* Inflammable air.

*Hernia.* Rupture.

*Hydrocele.* Collection of water in the scrotum.

*Hydrocephalus.* Dropsy of the brain.

*Hæmorrhoides.* Piles.

*Herpes.* An eruption of the skin.

*Hæmoptosis.* A spitting of blood from the lungs.

*Herbivorous.* Animals that live on herbs.

*Hydro-carbonas oxyd.* An oxyd produced by hydrogen and carbon.

## I.

*Iris.* Part of the eye.

*Innominata.* Bones of the pelvis or basin.

*Intestinum cæcum.* One of the intestines.

*Jejunum.* One of the intestines.

*Idiosyncrassy.* Peculiarity of constitution.

*Ichthyophagus.* Nations that live on fish.

## L.

- Lymph.* A transparent watery fluid of the system.  
*Lesion.* An injury of any part.  
*Lactic acid.* Acid of milk.  
*Lacteal vessels.* Vessels that convey a milk-like fluid from the intestines.

## M.

- Meconium.* The substance in children's bowels at birth.  
*Mesentery.* A membrane to which the bowels adhere.  
*Molybdenic acid.* Acid of Molybdena.  
*Maxillary.* Jaw.  
*Masticatory.* Articles that excite a flow of saliva.  
*Malic acid.* Acid of apples.  
*Martial.* Relative to steel.  
*Magma.* Gross substance in the bowels.  
*Menses.* Monthly evacuation of women.  
*Muriat of Soda.* Table salt.

## N.

- Nosology.* The doctrine of diseases.  
*Nitrat of silver.* Lunar caustic.  
*Nasal.* Relative to the nose.  
*Nitric acid.* Aqua fortis.  
*Narcotics.* Medicines that produce stupefaction and sleep.

## O.

- Oesophagus.* Gullet.  
*Oxygen.* Vital air.  
*Osified.* Converted into bone.  
*Oxydated.* Converted into oxyds.

- Ophthalmia.* Inflammation of the eyes.  
*Oxygenated muriat of mercury.* Corrosive sublimate.  
*Oxyds.* Calx of metals.

## P.

- Pathology.* Theory of disease.  
*Parturition.* Child birth.  
*Pharmacy.* The art of compounding medicines.  
*Phosphats.* Alkaline salts.  
*Parietis.* Walls.  
*Peristaltic.* Natural motion of the bowels.  
*Phthisis Pulmonales.* Consumption.  
*Pubes.* Front of the pelvis or basin.  
*Palmated.* Hand-like.  
*Paroxysm.* Fever fit.  
*Pulmonary.* Relative to the lungs.  
*Primæ viæ.* First passage, or stomach and intestines.  
*Peripneumonia.* Inflammation of the membrane covering the lungs.  
*Phrenzy.* Madness.  
*Phalanx.* Small bones of the fingers.  
*Parotides.* Glands behind the ears.  
*Pancreas.* Sweet bread.  
*Parenchyma.* Spongy-like substance.  
*Prussiac acid.* An ingredient of Prussian blue.  
*Prophylactic.* Preventive.  
*Pituesency.* Relative to phlegm.  
*Piscivorous.* Animals that live on fish.  
*Phytivorous.* Animals that live on grass or vegetables.  
*Phosphorous.* An alkaline salt.

## Q.

- Quartan fever.* A fever that occurs once in seventy-two hours.

## R.

- Retina.* A membrane of the eye.  
*Rheums.* An acrid discharge from the nose.  
*Rectum.* The lowest intestine.  
*Refrigerants.* Cooling medicines.  
*Rubefacients.* External applications that excite heat.  
*Receptaculum chyli.* The receiver of the chyle.

## S.

- Sensorium commune.* Common sensory, or organ of sensation.  
*Subclavian.* Under the collar bone.  
*Sthenic.* Inflammatory, or heating.  
*Sinus.* Cavity.  
*Sacrum.* A bone of the back.  
*Scrophula.* King's evil.  
*Sanguification.* Formation of blood.  
*Sui generis.* Of its own kind.  
*Saburra.* Excrementitious matter of the intestines.  
*Sacho-lactic.* Sugar of milk.  
*Soporiferous.* Articles that produce sleep.  
*Subclavian vein.* A vein under the clavicle.  
*Septicity.* A state of putrefaction.  
*Syncope.* Fainting.  
*Spirits of amonia.* Volatile spirits.  
*Semi-tertian.* A species of intermittent fever.

## T.

- Thoracic duct.* Reservoir of the chyle previously to its mixing with the blood.  
*Thymus.* A gland of the thorax or chest.  
*Tetanus.* Locked jaw.  
*Tenia.* Tape worm.

*Tartarised antimony.* Tartar emetic.

*Tartarous acid.* Acid of tartar.

## V.

*Uterus.* Womb.

*Vena cava.* A large vein entering the heart.

*Vena porta.* Vein of the liver.

*Ventricle.* A cavity of the heart.

*Vertigo.* Giddiness.

*Vis medicatrix naturæ.* The curative power of nature.

*Vis vitæ.* Power of life.

*Varicose.* A morbid enlargement of veins, &c.

*Vulneraries.* Remedies in wounds.

*Vermifuges.* Worm medicines.

END OF VOLUME I.

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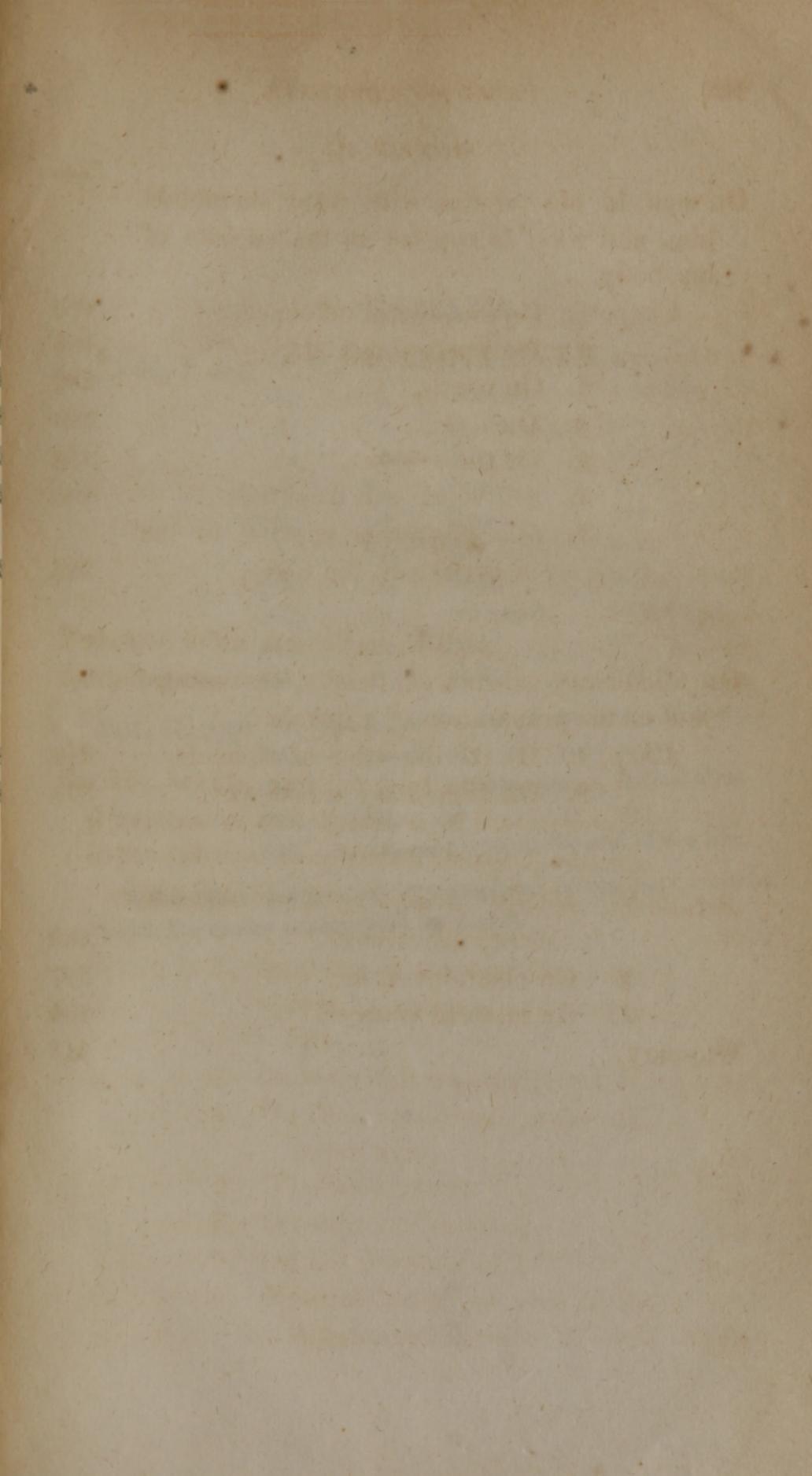
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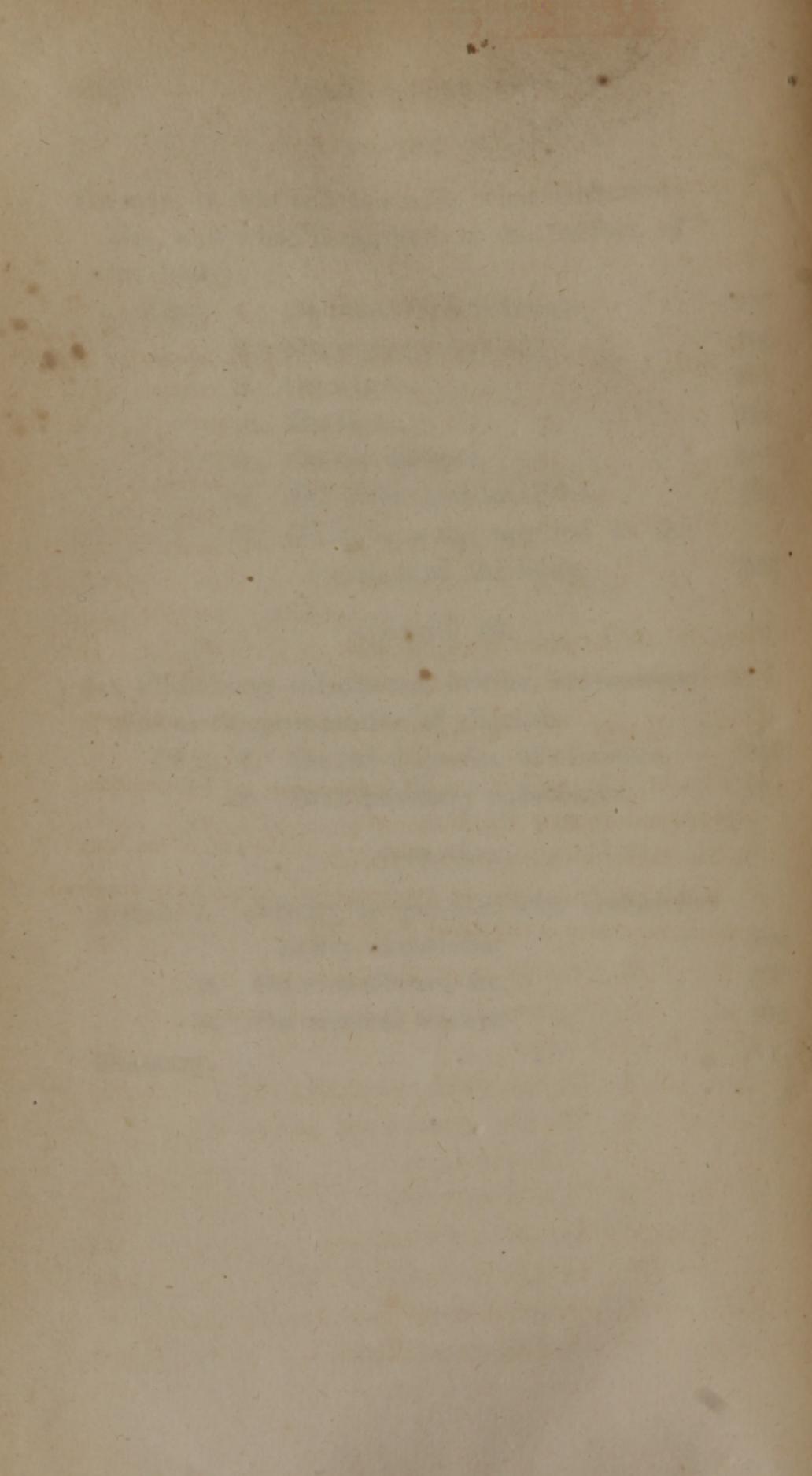
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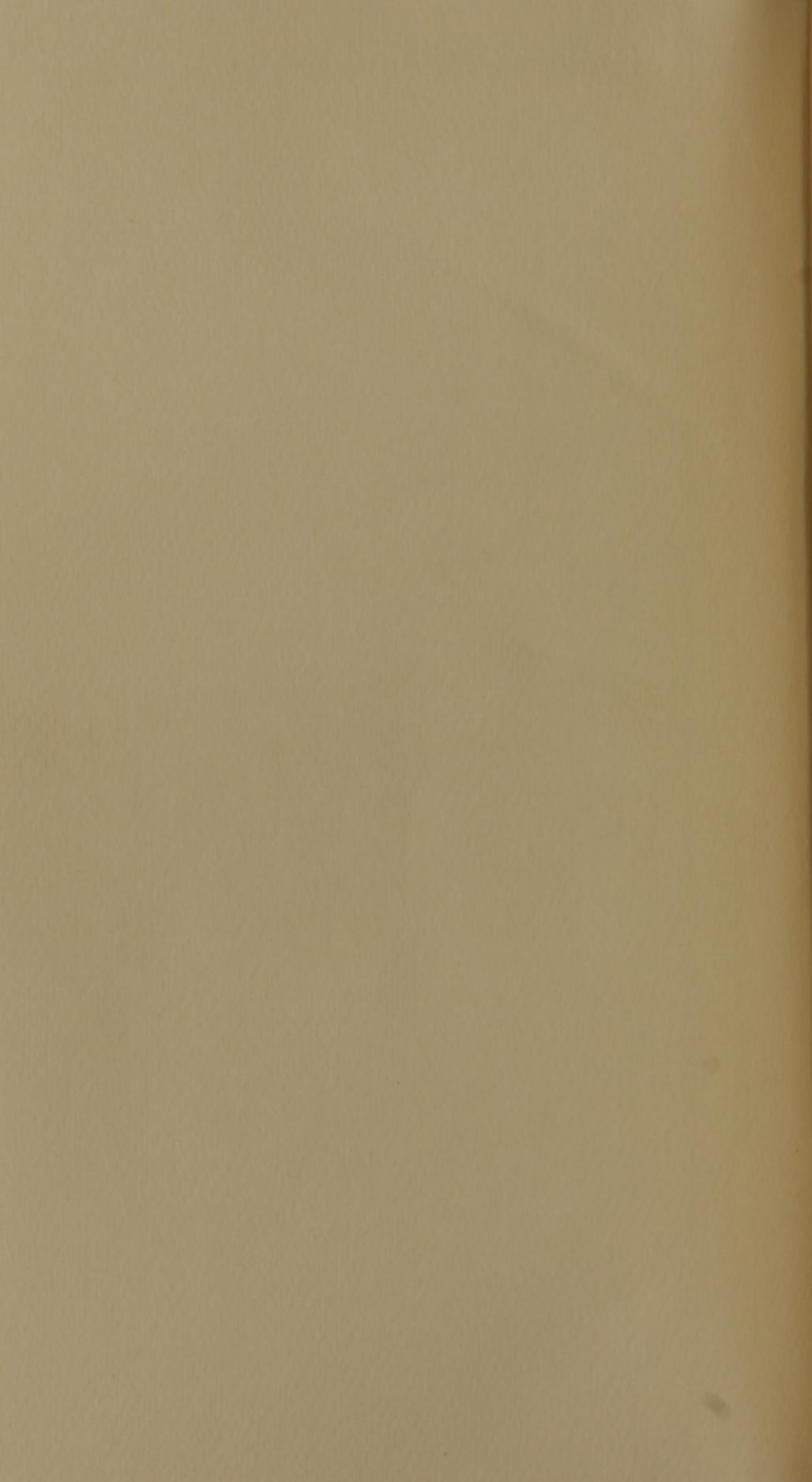


## ERRATA.

VOL. I.	page 34,	line 30,	for lances	read launches.
	40,	6,	arterical	arterial.
	59,	5,	passes	pass.
	79,	5,	interior	inferior.
	95,	17,	sensual	sexual.
	112,	14,	hour	day.
		15,	day	hour.
	179,	9,	them	it.
	192,	16,	reservoir	receiver.
	220,	22,	acid	air.
	361,	17,	while	which.

VOL. II.	page 99,	line 23,	at the end of the line, add they.	
	120,	18,	for sus	read suis.
	213,	3,	halicaacobn	halicacabon.
	303,	23,	of	or.
	329,	13,	omit who, at the end of the line.	

A few other unimportant typographical errors have occurred, which the reader is requested to correct.



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