Abstract

On July 1, 1751, the royal Parisian printer Le Breton published the first volume of the Encyclopédie of Diderot and d’Alembert, a rational dictionary, in folio and in alphabetical order, sold by subscription. The whole work was completed in 1780 (a total of 35 volumes, of which 12 were of illustrations, 4 of supplements and 2 of indices). In 1782 it was followed by the Encyclopédie méthodique, printed by Panckoucke, which ended in 1832 with volume number 166.

The frontispiece of the first volume, designed by Charles-Nicolas Cochin Jr. and engraved by Benoît-Louis Prévost showed the columns of an Ionic temple where the Truth appears between Reason and Philosophy. Reason is shown trying to break the veil of Truth, and Philosophy trying to embellish it. Below are the philosophers, their eyes fixed on Truth. Theology is on his knees with his back facing Truth, and seems to receive light from the top. The subsequent chain of figures depicts Memory, Ancient History, Modern History, Geometry, Astronomy and Physics. Below are Optics, Botany, Chemistry and Agriculture. On the bottom line one finds the representatives of arts and professions derived from science.

In a 42-page preface (“Discours préliminaire”) d’Alembert discussed the path to new knowledge as one “based on what we receive through senses. Ideas depend on senses.”

The medical collaborators were, or became, famous. Medicine was considered to be rooted in experiment, in patients and in measurements. Functions started to be described with numbers. It was the birth of determinism which was later reinforced by Magendie and Claude Bernard. Albrecht Haller, president of the Academy of Science at Göttingen, as well as a member of all European academies, wrote seminal entries. New accurate definitions appeared for life, disease, death, infections, plague, epidemics, hygiene, fevers and edema. Semiology, the study of signs, became the visible explanation of deranged function, diagnosis and prognosis.

Key words: d’Alembert, Diderot, Encyclopédie, Enlightenment, Life

The birth of the Encyclopédie

On July 1, 1751, the royal Parisian printer André-François Le Breton and his associates, published, in folio, in Paris the first volume of the Encyclopédie, ou Diction-
For Coleman, the Encyclopédie “was the most important publishing event of eighteenth century France. Although bulky, tendentious, and enormously expensive, 4,000 out of the 4,250 of the original edition were sold by subscription and were soon followed by supplementary material, re-impression, a rival edition, and various epitomes” (2). They “went in the hands of educated and ambitious members of the nobility and of the bourgeoisie. Lawyers, military officers, congressmen, physicians, merchants, ecclesiastics, royal officials and educators – all purchased the Encyclopédie in one or another of its variously priced editions. Many of these subscribers doubtless held conservative views.” However, “they shared and perpetuated the new faith of the Enlightenment that one must change man’s way of thinking in order to change how he lives and acts” (2).

The Encyclopédie opened with an extraordinary introduction (“Discours préliminaire”) written by d’Alembert, who in 1754 became secretary for life of the Royal Academy of Sciences in Paris. In it the mechanism of knowledge based on the senses was illustrated.
lished in London by Ephraim Chambers in 1728. This was a dictionary in alphabetical order that had met with great public interest. Le Breton obtained royal permission and recruited for the enterprise 3 publishers: Antoine-Claude Briasson, Laurent Durand and David l’Aîné. A contract was made with Sellius and John Mills, a bank employee. The idea was to publish 4 volumes plus 1 volume of illustrations. A subscription was launched through the Journal de trévoux. However, a controversy emerged between Mills and Le Breton which ended before the court of justice. Therefore the Abbot Jean-Paul de Guà de Malves took responsibility for the encyclopedia. He received 18,000 livres, and Diderot and d’Alembert 1,200 livres. At that time, a laborer was paid 15 livres a month. A member of the Academy of Sciences, an investigator in science and philosophy, but unable to work as a team member, de Malves was donnish and stubborn, and did not succeed in making the enterprise progress. On October 16, 1747, the direction was given to Diderot and d’Alembert who transformed the commercial enterprise of Le Breton into a scientific undertaking. They broadened the task, changed the nature of the publication and turned it into an important, radical and evolutionary organ of opinion.

**THE ENCYCLOPÉDIE**

The process of writing the *Encyclopédie* has been described thus:

“Diderot and d’Alembert gathered around them a team of dedicated litterateurs, scientists and even priests many of whom, as yet unknown, were to make their mark later in life. All were stimulated with a common purpose to further knowledge and by so doing striking a resounding blow against reactionary forces in church and state. As a *Dictionnaire raisonné* (rational dictionary) the *Encyclopédie* was to bring out the essential principles and application of every art and science. The underlying philosophy was rationalism and a qualified faith in the progress of human mind. [D’Alembert,] the chancellor Baron is one who had contributed the most to the advancements of sciences. He did not know nature, but he indicated the roads driving to her. He spoke of *experientia quesita*, that is experimental research, a series of experiments methodologically ordinate which allow the advancement of nature” (4).

**DIDEROT**

The *Encyclopédie* is not only an intellectual monument, but according to Lepape, it represents the logo of Diderot who planned a dictionary based on reason, wrote the outline, directed the coworkers, decided the articles, selected the authors, transferred the orders, corrected the manuscripts, checked the galley proofs, discussed the modifications, wrote articles, controlled the notices within the articles and directed the printers. At the same time, he learned about the habits of artisans and artists and prepared notes for those in charge of the illustrations. As investigator, journalist, writer and chief of the enterprise, he put considerable energy into the job (5).

It is not irrelevant to mention that the Royal Society in London refused membership to Diderot. Generally speaking, with the exception of the Royal Academy of Prussia, he was denied admission by all of the academies in Europe. In London his applications were rejected on 3 occasions, the last in 1759, and to further demean him, de Jaucourt, Diderot’s collaborator, was nominated member of the Academy following the first application.

**ÉLÉMENTS DE PHYSIOLOGIE**

The present paper, written to discuss the role of the *Encyclopédie* and the status of medicine in those times, obviously lacks an analysis of Diderot’s works. An exception is made for the *Éléments de physiologie*, a book published in 1778 to make a point regarding the scientific achievements of his time in relation to the organization of the human body. This work, which occupied much of his attention until his last days, is made of fragments for which Diderot received input from many scientists, including Tronchin, Marat, Bonnet, Buffon, Maupertuis and Haller. We are inclined to think that Baron Haller, who extensively wrote for the *Encyclopédie*, was the most inspiring. The *Éléments de physiologie* should be considered as “the non experimental reflection of a non-physiologist, on the elements which constitute human body, as a vision of a bridge to the science of the future. Towards a science of life, towards biology, neurobiology and psycho-pathology, towards the exploration of the unconscious” (5).

**DIDEROT’S LAST DAYS**

At the end of his life, Diderot was ill, weak and poor. A dropsy affected his heart, respiration, liver and stomach for which he even underwent blood letting on 3 occasions within 1 day, a cure which, we know now, was a added disaster. Catherine II of Russia – who had not forgotten their intellectual exchange with Diderot during his stay in St. Petersburg – came to his rescue and made money available to cover the needs of her former advisor. Probably it was a political act to show the inadequacy of France to take care even of an extraordinary man. A comfortable apartment in the center of the city was
rented in Rue de Richelieu, where Diderot spent his last days. It is reasonable to think that part of the Tsarina’s money was also used to obtain the condescendence to bury Diderot in a church, as occurred for d’Alembert who died without receiving the Sacraments but had royal support for a Christian burial. For Diderot a religious burial was not taken for granted due to his antireligious positions, which no priest and no abbot was able to remove, even in his last days. He died on July 31, 1784, and on the following day was buried in the Chapel of the Virgin in the Saint Roches parish. With the revolution, the tombs were violated, and Diderot’s remains vanished forever.

**ENLIGHTENMENT**

The Enlightenment, Age des lumières, Aufklärung, illuminismo and illustración are different names to indicate that process starting with the English Revolution (1688) and ending with the French Revolution (1789). As Pope said, “Nature and its law were immersed in the night. God said, let Newton be and there was light.” That spiritual movement developed in France, England and the Lower Countries, Italy and Spain. Its summa is the *Encyclopédie*. It marks a defined period of European civilization, which had a different physiognomy from the preceding and subsequent periods. Its foundation was the faith in human reason. It recognizes its birth in the philosophy of Descartes but, at variance with Descartes, the Enlightenment bases everything on the senses, on experience perceived by the senses, on nature. It is the triumph of *l’esprit de géometrie* (the spirit of geometry). The model is no longer philosophy, but mathematics and physics (*Piccola Enciclopedia Treccani*).

**THE STRUCTURE OF THE ENCYCLOPÉDIE**

The *Encyclopédie* consists of 35 volumes: of which 4 are supplements, 12 are dedicated to illustrations and 2 contain the indices. In 1782, Panckoucke, who had bought the printing house of Le Breton, started the *Encyclopédie méthodique* which went on for 50 years until 1832, and published a total of 166 additional volumes.

**ENTRIES ON MEDICINE IN THE ENCYCLOPÉDIE**

There is no doubt that medicine represented a special field where Diderot wanted to renovate the most by changing the philosophical spirit of that art. Diderot was very concerned about this and very precise. In fact he underlined the fact that the *Encyclopédie* was a work where words were defined “by competent people,” by special men linked by a unique interest in humans and by a specific sentiment of benevolence indispensable to a work and a goal of those dimensions. One could even stick to some key ideas, those applied to clinics where the matter is developed in general and in specialized terms, – however, always “in freedom of spirit” by following a method, as Claude Bernard will reinforce years later.

The Encyclopédie contributed to the development of medicine by giving value to its accessibility to logic, reinforcing the role of logic, toward a medicine which finds its final and definite role, where all is measured, as in the other sciences. For this reason, Diderot personally wrote many entries – those related to the methods used in this field, a field where science reigned. He was aware that medicine was living through a stagnant phase although William Harvey had shown concretely the potential pitfalls of the use of reason when it was applied (1628) to blood circulation. Diderot aimed, as we will see later, to transform medicine into a complete and mature work of the human intellect, capable of transferring to the new generation the ideas in progress. What follows are our translations of selected entries.

**Life, death and disease**

“Life consists in the continuous use of specific functions without which the animal would be dead…. Life is precisely the particular state of the animal economy where are present the movements of the organs necessary to the circulation of blood and for respiration, or just the movement of the heart even in imperfect state.” These definitions announce, in 1778, the advent of reanimation (G. Richet, unpublished).

“Death is the ultimate cessation of this movement, and therefore of all functions of the animal body.” “Health and healthy life are just the opposite state which consists in the function of all parts, in relation to age, sex, temperament, that are exercised to meet the needs of the animal economy.”

While *Disease* was defined as: “the state of the living animal who cannot be delighted by health, it is a physical life in a state of imperfection...” “Disease may be also considered as an intermediate state between life and death, in this state some function is still switched on. Disease is therefore a defective disposition which causes a lesion more or less evident in the exercise of one or more functions of healthy life, and/ or also capable to halt some functions, even all at the same time, at the exception of the movement of heart.”

The definition by Sydenham (1624-1689) is also not without defects. In fact, disease becomes “a salutary effort...”
of nature, an extraordinary movement operated by nature to overcome the obstacle(s) which impede the exercise of functions, in order to separate and to drive it out of the body where it affects animal economy.” However, this definition is appropriate only to some circumstances observed during diseases, like acute disease, congestion and crisis.

For Hoffman,

“Disease is to be regarded as an important change, a considerable trouble in the proportion and order of the movements which occurs in the fluid and solid parts of human body, when they are very much accelerated or delayed in some parts or in all parts. It is followed by an important lesion in animal secretion and excretion and in all other functions of which animal economy consists, which heals or gives death or causes a predisposition to another disease, often more pernicious to animal economy.

Man does not possess a perfect health, this because of the many things he must utilize, which inevitably affect him, like foods and air … which can break the equilibrium necessary between fluids and solids in the human body, in order to increase or reduce the irritability and the sensibility, which in appropriate proportion, determine and regulate the action and the interplay between organs, since there are people who spend their life without a disease properly defined.

Understanding the nature of a disease, means that one knows that there is a defect in the exercise of some functions, which constitutes the present dysfunction, and which are the lacking conditions. From this one derives that this or another function cannot be adequately completed."

“The knowledge of a disease depends on the knowledge of those defective actions which give origin to the disease. It is not enough to know the name, one needs to know the proximate cause. It is easy to catch that a person is blind without a disease properly defined.

Understanding the nature of a disease, means that one knows that there is a defect in the exercise of some functions, which constitutes the present dysfunction, and which are the lacking conditions. From this one derives that this or another function cannot be adequately completed."

“Aristotle was thought to be inherent in 6 natural things: elements, humors, body parts, their properties, the spirits and the temperaments, and therefore Fernel (1506-1558) could write: “The first part of medicine is physiology which explores the nature of healthy man, all his forces and functions” (7-9). For Claude Bernard, there were 2 ages in physiology: 1 from the antiquity to Haller, the second began with Haller, Lavoisier and Bichat (5, 6).

As stated at the beginning of this section, Haller was one of the major and more illustrious contributors to the Encyclopédie. To understand the vastness of his interest and his capability of writing for nonspecialists, one should have a look at the many entries he wrote in volumes 1-4 of the “Supplement.” As Rudolph pointed out, what is relevant in Haller is the faith in measurements, “omnia in numero et pondere,” as in the Ecclesiastes (6). Haller wrote many contributions to the Encyclopédie, thus extensively and qualitatively contributing to the battle of the illuminists. Attention should be given to the advertisements to readers in the “Introduction” of the first volume of the supplements:

“Anatomy and physiology have been written by Haller, a member of nearly all academies of Europe and president for life of that of Göttingen. Albrecht Haller whose writings are enough to make the reputation of many persons, did not only contribute anatomical and physiological data which were previously unknown, but of no less importance, he identified, demonstrated and described the dangerous mistakes and scientific prejudices which had been consecrated by ignorance.”

**Medicine**

This chapter starts with a paragraph on functional signs, those felt by the patient, like “the pains due to difficult movements, the diseases affecting the soul of the sufferers.” Then it moves to the subjects of medicine, which are life, health, diseases, death, the causes which promote them and the means which direct them.”

Medicine has progressed 1. through experience, 2. through the description of diseases, their remedies and their successes, 3. the diseased persons exposed at crossroads and in public squares to oblige those passing near by to see their diseases, to indicate remedies (in the case they knew them) and to apply them (empiric medicine developed through these means), 4. later on, one started to reason and to compare observations with present experience and those expected in the future.

The art reached perfection (a) through physicians who studied all diseases, as well as with the study of few dis-
eases (specialization), (b) through classification, (c) by observation and the description of remedies. It is a pity that a few families and priests put their honor before progress, since it further retarded progress. It was “Harvey who removed with his demonstration, the false theories of those who preceded them.”

“The road leading, not to perfection, but to intelligence appropriate to the art of healing, is full of difficulties which are nearly insurmountable. Experience and reasoning promoted the great medical discoveries. Both of them, as two arms. Of course there was a gap between knowledge and needs, which gave origin to false, subtle, and nonsolid speculations. From the times medicine became a science, medicine was the happiness of the world.” This started with Hippocrates, based on the simplicity of his style and impartiality. For Hippocrates, “medicine was an addition of what lacks and a subtraction of what is superfluous.” Hippocrates used to conclude “these rules are the most general and all drive to the great principle that nature heals.”

“Galen does not follow dogmatics, empiricists, eclectics, he studies human and comparative anatomy.” “Chemistry added a lot through the experience of van Helmont and Sylvius de la Boe. That time has given voice to many outstanding people. France was illuminated by the lights of anatomy and surgery. However, all of this started in Italy, while Great Britain advanced innovations, Germany contributed important details, France many ideas.” “However those great people were helped by advancements in physics but the other sciences made small progress.” “A true physician will learn through those who have followed nature, those who have depicted nature as it is.” “New knowledge must be explained by the physics of [the] human body, such a physics takes light from the other sciences also born by experience, and also the theory which may guide practical applications depends on the growth of those different [types of] knowledge.”

**Semiotics**

Semeiology, also a term from a Greek root, should not be separated by physiology and pathology. Its object is the description of signs pertinent to the healthy state and to the various diseases. So one can distinguish a semiotics of health and a semiotics of disease. Those are corollaries which must be deduced at the end of the elements of pathology and physiology. In fact only through exact knowledge of the healthy man can we acquire knowledge of the present state of someone’s health. The same is true for pathology. Having analyzed the general causes of diseases and their symptoms, we should go back from effects to causes, to establish their reciprocal correspondence, their mutual relationship, and this natural graduation might establish the signs of the diseases. “The “illuminated observer” subsequently called a semiotologist, with his penetrating vision can recognize the state and disturbances of various parts and identify through external signs, the disease of internal organs and establish the specific character and its particular site.” “Signs are derived from the examination of functions: pulse, respiration, excretions and their changes. For Diderot, medicine was based on signs and symptoms which “can illuminate objects which are not caught by senses being hidden or positioned internally.” This is the physical examination.

The study of function will develop at a later stage, at the end of the 19th century, when knowledge was acquired about the biological basis of organic medicine, in the laboratory as well as in clinical settings. For Diderot, “there is no part of the human body unable to provide to the illuminated observer a typical sign. All actions, all movements of this marvellous machine behave at [sic] his eyes like mirrors reflecting and depicting internal dispositions, the natural as well as those against nature.... He sees with secure eye the changes which shall take place in health and disease, he holds the chain which links all events and these first rings which are under his hand let him know those which will come later, because nature, which has various external parts, at the end is always uniform.”

This may be considered the first formulation of determinism which was illustrated by Claude Bernard, a philosophy of science which recently came to its ends with cybernetics. Indeed with the Encyclopédie, importance was given to the signs of functions, such as pulse, respiration, excretions and sweat, although in physical terms only color and temperature should be considered physical signs (G. Richet, unpublished).

Unfortunately no reference was made to skin lesions or palpation.

“Another relevant aspect regards not only the present status of the health of a given patient, but the possibility to anticipate its constancy over the years and if he will have a long life. To solve this important problem there is not only the need to know the present status of functions, but there is a need to obtain information about previous life going back even to infancy and to its diseases, that is acquiring knowledge about fevers, breast feeding, birth, pregnancy, nutrition, if delivery was natural, if the infant suffered during delivery, if the father was either healthy,
or young, or old, or with hereditary diseases."
"Even the season at birth might have importance:
One might foresee a long life if all these data combine
with healthy functions, a great head, a large thorax,
strong arms and high stature, as previously described by
Hippocrates who, among those who wrote on semiology,
especially on that concerning disease, is the only origi-
nal. All other[s] have copied him. Perhaps one should add
something on the pulse since Hippocrates neglected it."

Sign

"Sign (signe) is all that destined to represent something.
Sign encloses two ideas: the first is the idea of the thing
which it represents, the second idea concerns the repre-
sented thing. Its nature consists in stimulating the second
through the first."
"Sign is any evident effect through which one catches
knowledge of a hidden effect, which is not available to
the testimony of senses. So that the phenomenon or
symptom can be turned into a sign when it is no longer
abstractly considered and use it as a light to discover the
black interior of healthy and diseased man. The typical
type is that of the pulse, a sign of good health when
it is regular and of various diseases when it is irregular.
Signs are the effects of their causes. They are based on
observation, which must be reiterated so that the corre-
spondence between a sign and the signified thing, is sol-
didly established. It was difficult to establish and fix this
relationship, which confused the early semiologists, and
this must have cost them an indefinite work and time. In
this consisted the work of Hippocrates."
Observations are therefore needed to decide the value of
various signs. It is necessary to go back to the past (anam-
nesis), to explain the situation (diagnosis) in order to foresee
future events (prognosis).
How a group of signs are defined is equivocal: they mean
different things according to the circumstances in which they
are seen. "This is typical of urine clearness which in acute
fevers announces a delirium, in renal colic the paroxysm of
pain ... and sometimes is only a sign of watery drinks."
There are signs which are pathognomonic, which precisely
indicate a disease, a condition. For example the pulse in
fevers, the excretion of fluid in gonorrhea. It is rare to find
diseases characterized by 1 sign, usually diseases are char-
acterized by various signs, as happens, for example, in pleu-
risy characterized by difficult respiration, fever and cough.
However, the article lacks any description of physical
signs. The point of departure is the sensation expressed by
the patient.

Edema

Edema, a Greek word introduced by Hippocrates (oide-
ma), in the Encyclopédie is a surgical term, indicating a
swelling, a soft tumor, due to lymph stagnation, not caus-
ing pain or changes of the color of the skin and retaining
the imprint caused by digital pressure. It may be localized
or generalized, in the latter case, one speaks of anasarca.
Edema is usually localized, in the feet, in the leg, in the
thigh, as well as in the arms. A special type of edema is
that associated with cancers of the thorax and breast; an-
other is that due to pregnancy due to compression of iliac
vessels by the uterus.
The prognosis and therapy of edema depends on causes.
For intractable cases due to cancers with and without in-
flammation, therapy shall be palliative and aiming to reduce
the risk of gangrene. In some cases, the ultimate therapy is
surgical (cancers). Diuretics have a role; also forced sweat-
ing may have a role, as well as purges. When general drugs
are ineffective, local treatments come into discussion, in-
cluding the use of various kinds of cataplasms.

Discussion

On Enlightenment

For René Descartes (1596-1650) in, e.g., his Tractatus de
homme (Treatise on Man), man was a machine directed by
a reasonable soul; however, as a machine (Tab. I), his func-
tioning is explained by principles which are typical of phys-
ics (10).
Pierre Bayle (1647-1706) defended religious tolerance, free-
dom of thinking and the need to obey one's conscience,
and he expressed opposition to traditions and beliefs. Na-
ture helps humans to understand their limits.
Also for Julien Offray de La Mettrie (1709-1751), man is a
machine, and one cannot understand its functioning unless
one analyzes its constitutive parts (L'homme machine). The
human body is not different from a watch, and humans are
watchmakers. The machine which constitutes the human
body is guided by a law which nature introduced in its or-
ganization. “Nature created us to be happy. All of us, from
worms to eagles in the clouds. Men are guided by the natu-
rallaw which teaches the roads to pleasures.”
For Paul-Henri d’Holbach (1723-1782), “man is a physical
being and all his events occur in accordance with the natu-
ral law,” whereas for Claude-Adrien Helvétius (1715-1771),
human kindness is a product of education which makes
TABLE I
THE ADVENT OF REASON AND SENSATIONS: KEY IDEAS OF THE ENLIGHTENMENT IN ENGLAND, FRANCE, GERMANY AND ITALY

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<tbody>
<tr>
<td>1</td>
<td>Man is minister and interpreter of nature. Francis Bacon (1561-1626).</td>
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<td>3</td>
<td>The mind is a white sheet on which we write through experience. John Locke (1632-1704).</td>
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<tr>
<td>4</td>
<td>Esse est percipi (to be is to be perceived). George Berkeley (1685-1707).</td>
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<tr>
<td>5</td>
<td>Human mind is made of perceptions. David Hume (1711-1776).</td>
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<tr>
<td>6</td>
<td>I serve the truth. Pierre Bayle (1647-1706).</td>
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<tr>
<td>7</td>
<td>Body is a machine which reloads the springs which move it. Julien Offray de La Mettrie (1709-1751).</td>
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<td>8</td>
<td>Fewer superstitions produce less fanaticism, less fanaticism causes fewer misadventures. François Marie Arouet Voltaire (1694-1778).</td>
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<tr>
<td>9</td>
<td>Our ideas are sensations. Jean Le Rond d'Alembert (1717-1783).</td>
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<tr>
<td>10</td>
<td>Law in general is human reason. Charles de Secondat, Baron of Montesquieu (1689-1757).</td>
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<tr>
<td>11</td>
<td>Man was born for freedom, however he is everywhere enchained. Jean-Jacques Rousseau (1712-1778).</td>
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<td>12</td>
<td>Sensations are the basis of knowledge. Etienne Bonnot Abbot de Condillac (1714-1780).</td>
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<td>13</td>
<td>The march of human spirit cannot be stopped. Jean Caritat Marquis de Condorcet (1743-1794).</td>
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<tr>
<td>14</td>
<td>Theology should adopt a mathematical method. Christian Wolff (1679-1754).</td>
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<tr>
<td>15</td>
<td>Aesthetic is the science of sensible knowledge. Alexander Gottfried Baumgarten (1714-1762).</td>
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<tr>
<td>16</td>
<td>The state has a physical power. Moses Mendelsshon (1729-1786).</td>
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<td>17</td>
<td>Man's value is not in the truth achieved but in the effort to conquer it. Gottfried Efraim Lessing (1729-1781).</td>
</tr>
<tr>
<td>18</td>
<td>Philosophy is history, history is philosophy. Mario Pagano (1749-1799).</td>
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<tr>
<td>19</td>
<td>Law is certainty. Gaetano Filangieri (1752-1788).</td>
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private and public interests to coincide. However, he gave great value to private interest.

What a machine is was explained by d’Alembert in the “Introduction” of the Encyclopédie, where one reads, to give the idea of a complex machine “one should start by disassembling it and by showing separately and distinctly its components, thereafter one might explain the relation of each component with those neighbouring them, thus one might be able to clearly understand the functioning of the whole machine without being obliged to reassemble it.”

With Descartes, reason did not dare enter the field of morality and of politics. With the Enlightenment, reason started to investigate therein to promote tolerance and political freedom and a revolt against privileges of social and political origin. Reason became the force capable of transforming the human world and driving it to happiness and liberty, freeing it from prejudices: a reason opposed to tradition, which discusses tradition at the court of reason. A natural religion was advanced against revealed religion, a religion acting “within the limits of reason.” Any act, any event, any law, any writing had to be evaluated by reason without entering into the realm of personal passions.

It was the triumph of Newton’s doctrine, that it started from facts, not from general hypotheses or from discussions. From facts and experience, one can find the primary causes: “Hypotheses non fingo” (I do not formulate hypotheses), said Newton. The need emerges to describe nature, not to explain it. This was just Newton’s attempt to bring a rationale into religion and to link science to faith (7).

In the 17th century, the work of Galileo, Grotius, Descartes, Spinoza and Leibnitz promoted reason and extended her powers to all fields of human reality, so that her supremacy became unlimited and opened to new developments. The 18th century kept intact faith in reason. Therefore, Kant in Was ist Aufklärung (What Is Enlightenment) pointed out that the “Enlightenment was man’s way-out from childhood, which depends on him. Infancy is the incapacity to use his own intellect without a guide. Infancy depends on man himself when it is caused not by a lack of intellect but by a lack of decision and courage to use the intellect without being guided. Sapere aude! Take the risk to use your own intellect. This is the motto of Enlightenment. Laziness and cowardice are the causes for which a consistent number of men, even after nature has made them free from a guide (naturally come of age) they remain willingly childish life-long, so that easily other[s] start acting as tutors. How comfortable [it] is to remain underage.”

“[However,] Enlightenment is not a compact system of doctrines, rather [it] is a movement based on the trust for human reason which with her development makes mankind progress and [get] clear from tradition, ignorance, superstition, myth and oppression. Reason[,] which defends science and technology, is an instrument of transformation and progressive betterment of spiritual and social conditions of mankind. Reason also supports ethical and religious tolerance, defends the natural rights of men and citizen, refutes dogmatic system, criticises superstition, supports deism and fights privileges” (8).

So a new era of Western culture advanced. It was based on the light of reason, without authorities and traditions. Philosophy was separated from theology. Reason became the method for all knowledge. “Enlightenment and the progress of new sciences had the same origin and baked each other.” Mathematics and physics, which had prevailed with Descartes, “gave space to new sciences like medicine, biology, physiology, geology, chemistry, natural sciences and economy,” (8) but also to history. New science foresaw a new idea of the world. In those days, “it was thought impossible to overcome the abyss between sciences” (8). The system of science and its link to arts and crafts was the ideal of the time. Diderot was capable of overcoming the mathematical idea of the world, which aimed to regulate the natural becoming, through mechanical laws and to introduce the process of Enlightenment biology, physiology and all aspects of organic life. “He was capable to understand man and matter even beyond the concept of harmony of nature” (8).

The Encyclopédie “gave the readers a vision of universal knowledge in the difference of styles. It was the triumph of individualism.” De Buffon was not against God but contrasted Christians when they tried scientific explanations, which was a really significant step in warranting to all sciences the possibility to lack a scientific explanation:

“As in [the] history of men one studies documents, medals, and inscriptions to understand historical developments, for natural history one should study [the] world’s archives to collect fragments and unify all those signs of physical changes which may drive back to the different ages of nature. This was the only possibility to fix in the immensity of space some reference points, thus collating some milestones on the eternal road to time (9).

Diderot is the speaker for [the] illuminated bourgeoisie aiming at an ideal national state, based on the powers originating in the people of the nation and warranting the freedom of the citizen, the free interplay of the economic powers, and ... [taking] into consideration the public opinion which is represented by the Encyclopédie. Diderot is the speaker of the third state of whom he expresses in clear and sure form its aspiration, even those which were in [a] latent state ... [and he] was capable to move from theory into practice when handling eco-
nomical problems.... The authority of state is legitimate in respect to the public opinion and in respect to equality and freedom of all citizens which is the natural limit of any absolute power” (9).

On literary salons

The aristocracy turned their houses into literary salons, which became centers of intellectual life, of exchanges which later became the places where the so-called public opinion was generated. Salons were lively places where relations grew, and exchanges occurred. Women had a pivotal role.

Many ladies became famous and are still discussed by posterity. Among them, Madame de Tencin, the mother of d’Alembert; Madame Geoffrin, who attracted d’Alembert, d’Holbach, Diderot and Marmentel; Madame Necker, the spouse of a rich banker; and Madame Lambert who attracted Marmontel and Marivaux. One of these ladies – Madame de Pompadour – played a significant role in the survival of the Encyclopédie (11).

On Diderot

Diderot – philosopher, poet, writer, mathematician and expert of arts and crafts – symbolizes the quest for changes typical of encyclopedism. He had faith in reason and exercised doubt and used it as a unique guide. “When testimony of senses contradicts or does not support the data from reason, the latter must prevail, there are no other possibilities” (Pensée philosophiques) (12). So one cannot be surprised that with a coordinator of this level, the Encyclopédie was enthusiastic about medicine, biology, philosophy, geology, chemistry, natural sciences and history. These sciences seemed appropriate for driving the transformation of the world. One is not surprised by the role of history, since Montesquieu had identified history as the constituent law granting the freedom of each single citizen, by granting certainty in the use of man’s own rights.

On science and medicine

The 18th century was a time of great changes, and the end of the ideas of the Middle Ages. According to Sprengel (15):

“Science, literature, laws, habits, practice, governments, relationship fell down or were regenerated.... The century has peculiar characteristics, it abated or reformed the work of middle age.... Science became universal, it grew to perfection with immense celebrity.... So many sciences were created or reborn or driven to perfection[...]: astronomy, physics, chemistry, theology, geography, crystallography, electrodynamics, politics, economy, strategy and many others neglected or ignored theretofore had a chief role in the spirit of the century, and in progress. Who could arrest their steps and their enthusiasm? They expanded everywhere in Europe. The world appreciated the influence of the true (verum) [which in Naples, the Genovesi substituted with the indubitable (certum)].... In Europe civil freedom was generated. [With the French Revolution the work was completed:] Europe promoted new works, nurtured new hopes, created new institutions.... The remains of the Middle Ages disappeared, laws, habits, passions, tendencies, ideas, institutions, methods, science, arts, all were changed, modified, reformed.... The idea[s] of the past had reached their azi-
muth, the point of infertility, unable to further expand. New ideas got their space by necessity.... This was true for all sciences and especially for medicine, which in comparison with the other sciences had a heavier charge of mistakes, superstitions to abandon, thus conquering the attitude and the value of a useful and experimental science” (15).

In the 18th century, systematic classification emerged as a method of inquiry, as a method of knowledge. Linnaeus (1707-1778) took a great step in 1735 with the publication of Systema naturae, sive regna tria naturae systematice proposita per classes, ordines, genera, & species, a work without theories, without speculation, where he advanced a new classification of living beings and of minerals. In addition he subsequently developed a binomial nomenclature for plants and animals (1753), based on sexual organs, to describe animals and vegetable species. The first word is common to other species of the same gender, the second is a quality (specification) of the first. Both words depict a species (e.g., Homo sapiens). Linnaeus thus described all species known in his time and gave the key to identify all species to be discovered subsequently. He therein proved to be a Christian Aristotelian when writing “Tot enumeramus species quot a principio creavit infinitum ens” (we have described all the number of species). The staticness of Linnaeus was forgotten, overcome. This was the birth of modernity as well as of the idea of evolution. Lyons and Petrucelli (17) make a good point on the medicine of those times:

“It is often thought that the XVIII century – with its insistence on a rational and scientific approach to all historical issues confronting mankind – succeeded in sweeping away forever the tyranny of medieval dogma. Undoubtedly the vistas unfolded in the previous century by the genius of Newton, Boyle and Bacon led man away from blind belief in authority to a new faith in progress and the inexorable triumph of the human spirit. Nevertheless the physician, always noted for his conservatism, has seldom been able to keep pace with contemporary scientific advances to immediate practical use. The men of medicine could hardly disregard the rapid succession of startling advances, especially in other fields, or to put revival of interest in the systems of iatrophysicists and iatrochemists did nothing to advance the practice of medicine and it may have contributed to a period of stasis or decline” (17).

Gottfried Wilhelm Leibnitz (1646-1716) was instrumental for the Medieval theorists of the 18th century. Logic, natural law and vital force governed the body. This influenced Stahl, who postulated a vital force governing the body and postulated an anima or sensitive soul which regulates body health in a manner not unlike that of the physis of Hippocrates or the psyche of Aristotle (16).

Friedrich Hoffman, giant teacher of anatomy, forwarded a mechanistic view which was adapted by Cullen at Glasgow and Edinburgh, whereas Théophile Bordet centered everything on internal secretion. It was Herman Boerhaave from Leyden (1668-1738) who made his university the most important medical center in Europe by concentrating on research, bedside teaching and the superb anatomical lectures of Prosper Albinus. From Leyden originated Van Swieten and the Vienna School. However, Van Swieten, who promoted a great number of fellows to the rank of professor, failed to recognize the importance of the Inventum novum ex percutione thoraci published by Leopold Auenbrugger (1761). A great discovery was not put to use for a long time, and the author could not advance his career as physician of a Spanish hospital.

From Leyden originated, through Alexander Munro, the school of Edinburgh which turned into the most important English-speaking medical center. From Leyden, and from Boerhaave personally, Albrecht Haller received strong encouragement, as a man of many excellences in poetry, botany and physiology, a true European scientist ante litteram. With him, physiology became indispensable to understanding diseases.

The 18th century was also the century of Brown (brownism), Rasori (counterstimulation), Messmer (magnetism), Hahneman (homeopathy) and of Morgagni and Bonet (anatomy/pathology), so diseases could be checked at autopsy, and thus the pathologist was able to see the diseased functions.

As Arturo Castiglioni (18) has pointed out: “in the classical writing of Morgagni, for the first time a physician-anatomist who does not forget to be a clinician, at the table of autopsy is always inspired by clinical findings and the bed-side data, recalls the findings of patho-
logical anatomy and establishes a connection between the clinical data and the pathological anatomy and facts. Morgagni was the first to drive medicine to its essence, to pathology which had been foreseen by the followers of Hippocrates who had been unable to catch the essence of her mysteries. Morbid anatomy had not been a science, takes on her high dignity and enters in the medical field” (18).

Bonetus (Sepulchretum seu anatonia practica ex cadaveribus morbo de notis (1679)), Valsalva and Harvey had made important contributions to that field. But it was Morgagni who analyzed the data, collected the most important observations, criticized them, linked together the pathological phenomenon and the clinical events and between diseased organs functions and morbid manifestations. He studied and described the difference between healthy and diseased organs, and showed that to any anatomical change on the organs corresponded a change in function. He was an unsurpassed master in clinical medicine and a founder of pathology (18).

He deserved the esteem of great investigators like Virchow who pointed out that “anatomical thought trespasses the limits of the thought around pathological anatomy, it is no longer linked to visible changes which [the] anatomist’s knife renders appreciable, but it goes back to life’s functions, thus assuming a duty, now typical of the clinician” (18).

It was also the century of John Hunter (premier surgeon in England), Edward Jenner (vaccination), of Domenico Cotugno (anatomy, albuminuria and bedside teaching), of Pierre Joseph Desault (the first professor of surgery in the French University after the Great Revolution (bedside teaching associated with the surgical theater and autopsies), of Xavier Bichat (the relevance of tissues), of Lavoisier (discovery of oxygen and its physical changes during respiration) and Philip Pinel (psychiatry). It was the century of hospital reorganization. In that century, which was preceded by Marcello Malpighi, no great expert of microscopy emerged. The newborn technique advanced by the Galilean lens, which had led to great advancements, was soon abandoned, and for a hundred years it was in a stagnant phase.

References
