THE THEORY OF SPONTANEOUS GENERATION, BETWEEN IDEOLOGY AND SCIENCE

Ion COJOCARU
Faculty of Biology, Alexandru Ioan Cuza University, Bd. Carol I 11, 700506 Iaşi, Romania.
icojo@uaic.ro

Abstract. Belief in spontaneous generation of beings had a millenial existence, right up to the end of the 19th century, and stayed in the debate of two camps: spontanists and anti-spontanists. Today the problem of spontaneous generation is a closed case in the history of science. What makes it unique but this dogma is her ideological interpretation extremely varied, being invoked by materialistic or idealistic thinkers, theologians or darwinist biologists. For demonstration of these traits, the present work is structured around an ideological theme: idealist spontanism, materialist spontanism, idealist anti-spontanism, materialist anti-spontanism. It is remarkable that an idea so easily dismissed today, just on the basis of elementary knowledge and logical arguments persisted so long in history. The theory of spontaneous generation was not unmasked but little by little, in successive stages: first to the large, highly organized organisms, then for small organisms and, finally, for the microscopic (Leeuwenhoek: *animalculi*). The disproving of the spontaneous generation dogma involved, in the ideological plan, the release of preconceived ideas, and in practical, eliminationthe sources of errors in experiments and perfecting experiments**.**

Keywords: spontaneous generation theory, materialist spontanism, idealist spontanism, idealist anti-spontanism, materialist anti-spontanism

Rezumat. Teoria generaţiei spontane, între ideologie şi ştiinţă. Credinţa în generaţia spontană a fiinţelor a avut o existenţă multimilenară, până spre sfârşitul secolului al XIX-lea, şi a stat în dezbaterea a două tabere: spontaniştii şi anti-spontaniştii. Astăzi problema generaţiei spontane este un caz închis în istoria ştiinţei. Ceea ce face unică însă această dogmă este interpretarea ei ideologică extrem de variată, fiind invocată de gânditori materialişti sau idealişti, de teologi sau biologi darwinişti. Pentru evidenţierea acestor trăsături, prezenta lucrare este structurată pe o tematică ideologică: spontanism idealist, spontanism materialist, respectiv anti-spontanism materialist, anti-spontanism idealist. Este remarcabil faptul că o idee atât de uşor de respins astăzi, doar pe baza unor cunoştinţe elementare şi argumente de logică, a persistat atât de mult în istorie. Eroarea teoriei generaţiei spontane nu a fost demascată decât încetul cu încetul, în etape succesive: mai întâi pentru organisme mari, superioare, apoi pentru organisme mici şi, în cele din urmă, microscopice (Leeuwenhoek: *animalculi*). Demontarea dogmei generaţiei spontane a presupus, în plan ideologic, eliberarea de dogme preconcepute, iar în plan practic, eliminarea surselor de erori din experimente şi perfecţionarea experimentelor.

Cuvinte cheie: teoria generaţiei spontane, spontanism idealist, spontanism materialist, anti-spontanism idealist, anti-spontanism materialist

Introduction

Spontaneous generation of organisms represented a conception about the occurrence of organisms in different environments, not from their parents too, but even in the material or assumed immaterial elements, in a relatively short time. F. A. Pouchet a defender in the modern period of spontaneous generation, gives the following definition: "Spontaneous generation is occurence of a new organized beings lacking parents and whose main elements were entirely extracted from the surrounding substances" (Pouchet, 1859).

The first ideas on spontaneous generation of organisms originate from ancient times. Aristotle asserted that some animals come from parents and others do not. There is

the belief that the complex organisms, small or large, previously known as fauna, may arise from mineral elements or from dead matter in the decomposition, at temporal scale (hours, days, seasons) (Aristoteles, 1860, 1868). This thing called *spontaneous generation* (*generatio spontanea*) can be repeated whenever shall meet the biogenetic conditions envisaged. Another situation is that of living organisms that occur in other living organisms (host organisms in current terms), which does not relate (intestinal worms, for example), called *equivocal generation* (*generatio aequivoca*), *heterogenesis* or *xenogenesis*. Emergence of insects in galls on plants fall into this category also. Compared to these mysterious origins of living beings, the natural occurrence of organisms through reproductive processes known, was called the *univocal generation* (*generatio univoca*).

Biogenetics factors suspected to be responsible for spontaneous generation were very different: the Sun's rays (Diodore of Sicily); divine powers which have left since the days of creation, whether material, "divine seed" and awaiting favourable conditions for development (Augustine); Special creation of divinity, without the existence of \"divine seed\" (Thomas Aquinas); the mark of divine creation (Jan Swammerdam); \"ferments\" contained in matter (Van Helmont); animal spirits, or seminal release from corpses (Athanasius Kircher); the primordiums such eggs, which can be formed directly from inert matter (Harvey: primordium = egg appeared spontaneously) (Rostand, 1975; Bastian, 2001).

"The theory" of spontaneous generation (which, in fact, did not meet the conditions of a scientific theory ever) was dismantled little by little, being removed permanently from Pasteur, in the second half of the 19th century. The idea of spontaneous generation was differently understood and presented. He spoke of spontaneous emergence of individuals of certain species (Aristotle, tomist dogma), or spontaneous emergence of life itself in the early times of the world (Buffon, Diderot, Maupertuis, etc.). On the other hand, the rejection of the theory of spontaneous generation was very different exploited: rejecting the possibility of occurece of forms of life observed (Redi, Leeuwenhoek, Pasteur, Spallanzani), the possibility of the creation of beings (Swammerdam) or denying the possibility of moving naturally from matter devoid of life to life (Pasteur's initial hesitation, clergymen).

It is remarkable that an idea (also called Virchow, 1855 "heresy"), so easily dismissed today, just on the basis of elementary knowledge and logical arguments persisted so long in history. What makes it unique but this dogma is her extremely varied ideological interpretation, being operated as materialistic or idealistic, thinkers and theologians or darwinist biologists.

I. The dogma of spontanism and its disproving

The disproving of spontaneous generation theory dogma was a gradual process, influenced by developments in scientific knowledge, improvement of methods of experimentation, the elimination of sources of errors in experiments and the release of preconceptions. In fact, removing the spontaneous generation dogma meant overcoming a capital impasse, conceptual and methodological, appeared between spontanists and anti-spontanists: how many times anti-spontanists will carry out experimental conditions such as microorganisms may no longer appear in the culture medium, spontanists will object that desiring to prevent the intervention of germs, they disturbed, in fact, the conditions which allow the formation of life. Thus, Needham will claim in 1748 that an excessive heating of

matter infused, destroy "vegetative force" necessary aggregations of organic molecules in living beings; torturing nature, "forces it to be a false witness" he said (Rostand, 1975). Instead, whenever spontanists will present facts that seem to advocate in favor of a spontaneous genesis, anti-spontanists they argued that they never managed to take all the necessary measures to exclude the germs.

One can identify three stages/aims of abolition, experimental way, spontaneous generation theory: (1) the invalidation of spontaneous generation theory for macroscopic animals (F. Redi, M. Malpighi, A. Vallisneri); (2) invalidation of spontaneous generation theory for microorganisms, through isolation and heat the sample (L. Spallanzani); (3) the invalidation of the theory of spontaneous generation for microorganisms, in natural conditions (normal temperature, presence of air, especially oxygen) (Pasteur, Schwann, Tyndall). To achieve these objectives were required the invention of three categories of methods: (1) environmental organic putrescibil isolation from the external environment (Redi). (2) isolation and heated to boiling temperature (Needham, Spallanzani). (3) insulation, heating, cooling, constant contact with the external air, plus use of biological liquids placed in sterile air (Pasteur).

II. Spontanism and anti-spontanism

Division of authors who have discussed the theory of spontaneous generation in spontanists and anti-spontanists is very general and relative. In general, spontanists are the supporters and defenders of the theory of spontaneous generation, and anti-spontanists those who do not support this conception. But there were all grades and shades in assigning these names for a specific author. For example, Redi was anti-spontanist with regard to the origin of insects from dead matter, but spontanist with regard to the occurrence of insects from the galls on plants. Swammerdam was anti-spontanist in that it does not accept the birth of living things in the mud, manure, dead bodies, etc., but did not say that the spontaneous emergence as such is impossible, it is put on the account Creator.

The ideological movement of the spontanism

Theory of spontaneous generation was supported, along time with arguments mostly idealistic or predominantly materialistic. Over time, is observed an ideological movement of the concept of spontaneous generation, from a naive materialism (Anaximander), toward a philosophical idealism (Empedocles, Aristotle) and religious (Albertus Magnus, Augustine, Thomas Aquinas), then toward a materialism that was the framework of some scientific theories (Buffon, Haeckel).

Doctrinal separation in idealistic spontanism materialistic spontanism is general and not exclusive. As the opera's great ancient thinkers, and later, non-scientific doctrines have incorporated in different proportions elements of idealistic thinking and materialistic thinking. Thus, the *preformism* and the *pangenesis theory* of antiquity had a materialistic character, trying to explain the phenomenon of heredity and embryonic development through living matter's properties. Then, this doctrine take the form of Idealist doctrine, being taken over by philosophers theologians, including the preformation in the divine plan Act (Augustine).

The vitalism originated in idealist Aristotelian thinking about *entelechia* and *psyche*, but it represented a reaction to mecanicist materialism from the 17th century (analogy between the supreme force of inanimate bodies, viewed as a machine-the gravity,

and the supreme force of living beings - the vital force). Thus, Benoît de Maillet (1656-1758) consider that germs, which included living beings in miniature, were spread everywhere in nature and are not created by the deity. This scenario, in which divinity is not involved was a materialist scenario on the origin of species. Maupertuis will imagine combining seminali germs (also Maillet's germs from nature), not just on the basis of chemical affinity, but also through an instinct, desire, or intelligenceto associate, opening the way vitalistic doctrine. Mechanistic materialist explanation of the origin of life will lead to an idealistic vision.

Epigenesis theory as a theory of embryonic development have, in the conception of Aristotle, a materialistic character, but she served an idealistic ideology – the finalism of biological transformation (intrinsic goal of the motion of the matter) (Balme, 1962; Gotthelf, 1986). The theory of spontaneous generation, like other old dogmatic doctrines (pangenesis, preformism, vitalism), underwent radical, ideological changes over time, oscillating between naive materialism, creationist, vitalist and preformist idealism, and scientific materialism. Find it interesting that an institution which declares that recognises the dogmas "immutable", the Church, had with regard to the theory of spontaneous generation diametrically opposed attitudes: the incorporation of the theory of spontaneous generation in the dogma of the Church (12th-13th centuries), to outright rejection of this conception, which had become, over time, an assumption too materialistic and taken in laughter of the experimental science (18th-19th centuries).

With the advancement of science, knowing more and more about the environmental chemistry and the way of life of organisms, numerous experimenters will pass, with regard to the theory of spontaneous generation, from a creationist, religious spontanism, toward a *dualistic philosophy* (specific of "natural theology"), in which Divinity is offered a role less important. As the theory of spontaneous generation assigned an increasingly materialist, idealist orientation the theory of spontaneous generation finds refuge in vitalism: in the 18th century (1748), John Needham was talking about a *vegetative force* which allows organic molecules to the living beings agrege. Gradually, is taking shape the idea of a *vital force* called *exciting cause* (J. B. Lamarck, 1744-1829), or *vital energy* (Pouchet, 1859). About this this direction were, from the beginning, also critical reactions. Charles Bonnet (1720-1793), opponent of the theory of spontaneous generation said: "When to explain the emergence of animalculi in a liquid are resorting to\" vegetative capacity", no place does the words instead of things?" and Claude Bernard, the great French physiologist (1813-1878) show that we can use the expression "vitality" as chemists use the word "affinity".

At the end of the 17th century, the idea of spontaneous generation in other organisms of living beings, which they were not related (e.g. intestinal worms), have fewer supporters. The idea that Divinity would have imposed these creations were not sympathized; on the other hand, was more widely accepted belief that all organisms originate through the union of a male and a female. Result that the new living being was preformed miniature in the seed of one of the two parents. The discovery of the phenomenon of partenogenesis from Charles Bonnet in aphids, in 1745, has been interpreted as an argument in favor of preformism. The preformism fit perfectly with the doctrine of the Church in relation to a pre-set plan regarding the origin of living beings.

A. The idealist spontanism. The idealist spontanism put at the origin of spontaneous generation a immaterial force of matter, or the Act of divinity. There is a

gradual movement of this conception, from the principles of Aristotelian philosophy, in direction of religious dogmas and vitalist science. As a result we will separate the idealistic spontanism into three categories: (1) the philosophical; (2) the theological and (3) the vitalist.

1. The philosophical spontanism. Ancient mythology offered explanations for almost all things otherwise inexplicable that they find the man. Thinkers such as Empedocles, Democritus, Epicurus, Theophrastus, Lucretius, Vergilius and Aristotle (but not Pythagoras) (Chiorcea, 2005) have agreed, in one form or another, the idea of spontaneous generation. Aristotle, dualist thinker, in his *Historiaanimalium* says several times that animals of different kinds appear directly in the material elements and *pneuma*-a vital force (heat) translated into Latin by *anima* (soul). He explains, in *Generatione animalium*, that living things appear from decaying matter, vegetable matter (some insects), the internal secretions of some animals and excrement (some parasites), or in any thing dry that gets wet. He believed that "everything is alive can be achieved not only as a result of mating, but also by the decomposition of soil". Aristotle rejected the idea that the universe or Earth had a beginning, as a result the process of spontaneous generation occurs all the time, not just at the beginnings, as believed by other Greek thinkers.

In the 17th century, Descartes, mecanicist, materialist philosopher considered spontaneous generation as a process naturally knowable of complicated machinery construction – beings, from non-living matter, without the intervention of the vital forces, but after the creator's laws (Dorobanţu, 1980).

2. The theological spontanism. The theory of spontaneous generation will come to the attention of the Church, it will adapt and integrate religious dogma. The Church turn into dogma the idea of Aristotle, being in her support, transforming the conception of spontaneous generation in a official conception, fact which constituted a serious obstacle to the progress of scientific knowledge. Among the early fathers of the Church, Gregory of Nyssa (335-394) and Augustine (354-430) argued that not all kinds of plants and animals were created by God directly, rather some appeared in historical times, indirectly, from those created in the beginning. Augustine believed that spontaneous generation is due to the divine powers *(rationes seminales*). All beings that it produces have been created even from the fifth or sixth day of Creation.

These "divine seed" will wait wait for a period more or less long, having the possibility to develop further, in favourable conditions, through natural processes. The idea that organisms might change through natural processes was considered as a possibility by a number of Christian theologians of the middle ages, including Albert the Great (Albertus Magnus, 1193/1206-1280) and his pupil Thomas Aquinas (1224-1274). Thomas Aquinas accepted the spontaneous generation as a form of God's special creation, without the involvement of "divine seed". He considered that the development of spontaneous living things, such as worms and flies, from a non-living matter, such as altered meat, is not incompatible with the Christian faith or philosophy.

In the 12th century, the idea that a variety of geese can occur from a marin crustacean ciriped, had implications in the practice of lent when the fish was permitted, not the bird. Monks ate in the days of fasting meat of duck and goose, counting that they originate from fish, until Pope Innocent III himself was decided to intervene (1215), prohibiting this. Albert the Great, the great dominican theologian and scholastic philosopher takes in his books legends about the birth of some birds of the crustaceans from

the sea, or the birth of ducks, geese and even from certain fruit trees. The concept of spontaneous generation of creative force thanks to the beings of the deity is widely accepted. A representative of this was Van Helmont (1577-1644).

3. The vitalist spontanism. The vitalism was developed as a reaction to mecanicist materialism which does not deny existence of spirit, but give them a secondary role in relation to physical-chemical factors. The vitalism, in turn, does not deny the role of physical and chemical factors, but consider that life cannot be reduced to them. Biological processes are directed to specific, vital forces. Needham spoke of a "vegetative force", at 1748 (supported by Buffon), which allow aggregation of organic molecules in living beings. Later, rival of Pasteur's debates, F. A. Pouchet (1800-1872) (*Hétérogénie ouTraité de la Génération spontanée*, 1859), presents an idealised conception of the spontaneous generation of creationist-vitalist type, that wishes to support with "scientific" experiments (concession of materialism). He admits the primordial divine creation, spontaneous generation is a gift of divine beings explained in terms of vitalism: "each primary organic molecule possesses, without a doubt, two elements: one material and other vital ". For life to emerge-says Pouchet – are needed and sufficient the conditions: a body that can rot, water, air and a suitable temperature. The old claim that, for example, from dirty laundry moistened and cheese or wheat grains etc. may arise spontaneously mice (van Helmont) are considered by Pouchet "exaggerations" mentioned by some to compromising the theory of spontaneous generation. From the composition of some materials in the environment will not obtain an animal never completely formed, but only the egg from which it may subsequently develop adult beings (Eșanu, 1985). Even sexual reproduction was considered a spontaneous generation produced by the vital force of the elements coming together at mating. The vital force not acting randomly, but according to the will of the divine.

B. The materialist spontanism. In this category falls the old interpretations, naive, of the genesis from matter of living beings, together with the erroneous results of some scientific experiments, or ideological response to the invocation of supernatural in explaining the origin of living beings. As a result we distinguish in the materialist spontanism, four categories: (1) the materialist, naïve spontanism; (2) thematerialist, philosophical spontanism (3) the anti-theological materialist spontanism; (4) the materialist spontanism incorporated into scientific theories.

1. The materialist, naïve spontanism. A number of Greek thinkers, Anaximander, Anaximenes, or Xenophanes believed that plants, animals and humans arose in the interaction of the elements of nature: a primordial mud (mixture of Earth and water) under direct solar heat. In this case, the spontaneous generation appears as an expression of the properties of matter - a form of naive materialism.The materialist, naïve spontanism was the consequenceof the lack of knowledgethe way of life of organisms and observation errors.

2. The materialist, philosophical spontanism. Democritus believed that life is the result of mechanical forces of nature (Mohan and Neacșu, 1992). In this case, the spontaneous generation appears as an expression of the properties of matter-a form of materialistic thinking. F. Bacon (1561-1626), author of the inductive method of the new times, no doubts of spontaneous generation, at least in terms of a lot of plants and lower animals. He defines the process of spontaneous generation as a path by which one can make the transition from non-living to the living world.

3. The anti-theological materialist spontanism. Many scholars have interpreted the Pasteur's experiences as a proof of absolute impossibility to pass on naturally from non-living matter to living matter. As a result, biologists and materialist philosophers, darwinist evolutionists such as Ernst Haeckel,have tolerated the theory of spontaneous generation, in order not to admit the Act of divine creation. Haeckel declared: "to deny the spontaneous generation mean to admit a miracle, to admit a divine creation of life". In an era heavily influenced by fixism and creationism, the idea that beings arose spontaneously from inorganic matter was the only non-creationist scientific conception and even anti-creationist (Eşanu, 1985). In our country, materialist and darwinist philosophers have defended the point of view of Haeckel in spontaneous generation, in response to alternative Creationism: Vasile Conta in *Teoria ondulaţiunii universale* (Conta, 1876, 1876a, 1876b, 1876c, 1876d, 1876e, 1876f, 1877, 1877a, 1877b, 1877c) or Nicolae Leon, in *Generaţiunea spontanee şi darwinismul* (Leon, 1903).

4. The materialist spontanism incorporated into scientific theories. Materialistic rationalism that characterize scientific research was born under the dualist philosophy. The historical development of the theory of spontaneous generation show a change to its content, moving from idealism to materialism as scientific knowledge progressed. Spontaneous generation is explained by the properties of matter showing, on this way, a link between the non-living and living. The dualistic philosophy allowed the progress of science, avoiding as far as possible, the conflict with religious dogma. Descartes (1596-1650), father of rationalistthinking, assert that all existing structures, however complex they may be, are the result of a natural process, but after the laws established by God. Even if dualist philosophers maintained, circumstantial, the sovereign role of the Divinity in nature, scientific explanation of specific phenomena became increasingly important.

Redi, in concession to the spontaneous emergence of insects in galls on plants, talks about "live" juices of the plant that generates insects and the parasites of animals originating in "living juices" of the host animal. A materialist vision of the spontaneous generation has also W. Harvey (1578-1657), who believed that beings come from eggs that appeared spontaneously ("*ex ovo omnia*").

A precursor to evolutionary theory, Buffon (1707-1788) issues a materialist theory of spontaneous generation with with a vitalist component, which did not bring a progress in science – *the theory of organic molecules*. According to Buffon, all beings, from the simplest infusoria to man, are made up of some particles-"organic molecules"- qualitatively different from the particles from which inorganic matter is formed. "Organic molecules" are spread everywhere, are immortal, and the beings represent only certain combinations of these molecules. After being death, decompose only combination, without those molecules to perish. The number of organic molecules is fixed, but they can be combined in infinite ways, giving the infinite diversity of nature. Buffon resume, in fact, Athanasius Kircher’s conception, "organic molecules " being in fact "volatile animals spirits" of the cleric. The idea of combining by hazard of some molecules or living germs spread in nature, through which it can produce higher organisms, was widely accepted until the middle of the 18th century (Maupertuis, La Mettrie, Diderot and others). To point out that the formulation of such ideas in the 18th century, represents a considerable regress.

Scientific thinking could not reject from the beginning the dogma of spontaneous generation. Explanatory gaps in certain areas, such as the cell theory or of evolution theory,

allowedkeeping the theory of spontaneous generation, especially for explanation of the origin of life or of the great differences between the groups of living things. Thus, Lamarck and Geoffroy, deists and evolutionists, have invoked often spontaneous generation to explain their discontinuities between groups of living things. The combination of the concept of spontaneous generation and the *scala naturae* led, in fact, to Lamarck's theory of evolution: the spontaneous emergence of simple beings from inanimate matter, which then transforms slowly into more complex forms (Mayr, 1989).

Development of cell theory by Mathias Schleiden and Theodor Schwann in the early part of the 19th century paved the way for understanding the unicellular organisms reproduction through cell division. Question asked by Leeuvenhoek on the origin of animalculi can now find the answer. But, to understand the process of cell division, as a way of origin of new microorganisms from the preexisting microorganism, Schleiden believed that young cells occur inside the old cell from a fluid substance without structure called *citoblastem*. This explanation of the origin of living forms fits into the logical explanation of schema theory of spontaneous generation (Mayr, 1989).

The ideological movement of the anti-spontanism

The historical rejection of the theory of spontaneous generation was made from two completely different considerations: (1) finding that this conception of materialistic type don't fall into the dogmatic claims of the Church (anti-spontanism idealistic, theological) and (2) the development of experimental science, able to dismiss baseless theories (scientific, materialist, anti- spontanism).

1. The idealist, theological anti-spontanism. The idea that living beings could take birth through the decomposition of corpses came at a time, in contradiction with the the biblical data. Why was designed Noah's Ark, if organisms can be born from the corpses of dead animals, asks Thomas Browne (1605-1682), English physician and writer. The dutch naturalist Jan Swammerdam (1637-1680) was a great opponent of the theory of spontaneous generation (Botnariuc, 1961). For Swammerdam, the concept that one animal could arise from another or from putrification by chance is impious and irreligious. He studied the development of many animals, metamorphosis in insects and frogs, and made meticulous observations on those smaller animals (mites, lice, efemerids, bees) (*Historia insectorum generalis*, 1669). Swammerdam is very impressed by the complex organization of these small living machines and considered crazy to admit that the blind hazard can composed of rotting, incidentally the complex organisms. His assessment is correct fair, but explains these wonders of nature as a result of divine creation. For Swammerdam, the anti-theological spontanism does not lead to discrediting the theory of spontaneous generation, but only replaced the natural causes of this pseudo-phenomenon with voluntary action of divinity.

The theory of spontaneous generation, started from the naïve thinking, mythological, idealist vision of mankind about the various phenomena of nature, gradually acquired a character materialistic, even being imagined as a natural process that man, however, does not understand well this. Spontaneous generation was, of course, in contradiction with the dogma of a unique creations at the beginning of the world. Such a natural process of creation, that no longer involves the divinity, could no longer be accepted by the Church. Spontaneous generation seemed a faith for atheism. The same thing it has been argued, a century before, also by Voltaire (preformist in biology), an enemy of

atheism, which did not want to take the Creator the role of Planner and active force in the emergence of forms of life (Lepeltier, 2009).

Pasteur proved through scientific experiments error of the spontaneous generation theory and showed that the environment around us is full of micro-organisms that come from some of the others, after a process of reproduction. But, during a Conference at the Sorbonne, Pasteur make the association between the spontaneous appearance of living beings, from matter, with the materialistic doctrine of non-believers: if there is spontaneous generation, "what good the idea of a creator God?" (Rostand, 1975). The clergy have adapted these words in their best interests, praising Pasteur which brings such an evidence of the involvement of the divine creative force. Matter itself has no creative power, only God. Abolition of the theory of spontaneous generation by Pasteur has left some evolutionists the impression that it denies the possibility of evolution from non-living to living, a fact which has negatively influenced the research about the origin of life. It appears, then, that the demolition of this "theory" has been differently exploited, both the evolutionists and creationists..

2. The materialist, scientific anti-spontanism. The field of action to prove the theory of spontaneous generation was neither philosophy nor religion, but experimental science. It was necessary to be imagined experiments to eliminate the sources of error in formulating of the explanations.

Leeuwenhoek, practitioner, discoverer of microorganisms, spontaneous generation denied preferring to adhere to the old pre-existence germs theory in the Universe or *panspermia* (as described by the theory of Anaxagoras, 500-428 BCE). The experimental contributions of anti-spontanists, regardless of their religious or philosophical orientation, resulted in the consolidation of the materialist vision about natural processes. The whole scientific contribution of scholars such as Redi, Vallisneri, Malpighi, Bonnet, Spallanzani, Pasteur, Schwann, Tindall had finally allowed the victory of biology as a science. Experimental science disassembled spontaneous generation theory, as pointed out above, gradually and in stages, from the higher forms of life, from the simplest ones. After Darwin proposed his theory of descendence, the concept of spontaneous generation had suffered violent attacks, followed by it rejection on the experimental wayby Pasteur and others. Darwin himself said that the conditions which preceded the emergence of life are still present and have always been present, but the actual living things would devour any more complex substance necessary of life (Mayr, 1989). This scenario suggests that the emergence of life was a unique and historic process, and no spontaneous generation of complex beings, previously known.

Pasteur's experiments are simple; they derive directly from the technique inaugurated in the 18th century of Needham and Spallanzani; but to correctly execute them, it was necessary a clarity of mind, perseverance, a logical tactic. Pasteur introduced the sterilization of samples at a temperature of boiling water, 100 C°; subsequently, were found spores (*Bacillus subtilis*) that rezisted at that temperature, but which were destroyed at a temperature of 120 C° (Taton, 1972). John Tyndall (1877) publishes his method for fractional sterilization, showing the existence of heat-resistant bacterial spores.

Pasteur could finally conclude with certainty: "spontaneous Generation is a chimera ... No, there is no circumstance known to be able to affirm that the microscopic beings have come into the world without germs, without parents like them. Those who

claim have been victims of the bad experiences made, flawed by errors, which they knew not to see them or could not avoid them" (Rostand, 1975).

Today it is generally accepted that life on our planet is a unique phenomenon of occurrence of life from inorganic matter, through natural processes, following an long prebiotic chemical developments. Artificial life can be produced under laboratory conditions? This is another issue. Theoretically, in terms of chemistry and molecular biology, it would seem possible. Basically though, beyond methodological difficulties,expected and unexpected, remains to be seen if mankind can recreate at extremely small temporal scale a grand and unique process, produced by itself, at spatial-temporal scale extremely large.

Conclusions

The spontaneous generation is a pseudo-phenomenon inherited from the ancient thinking, adapted to different ideological conjecture of the time. Spontaneous generation problem divided the authors into two camps: spontanists and anti-spontanists. It was not a camp to hold the truth always and another who always to go wrong. There was, however, a camp-the spontanists, situated on a runway entirely wrong, and another, that of antispontanists - directed correctly, even though more committed errors in method. These camps did not have a well-defined ideological identity and constant, ranging from idealism to materialism (Table 1).

The spontanism presents itself as being appropriate, naïve, philosophical, mystical, idealistic, vitalist, materialistic, without scientific value. The Church, circumstantial, has accepted the theory of spontaneous generation, the spontaneous occurrence of beings, being regarded as a divine creation, or he rejected the spontanism, when the spontaneous generation was regarded as a natural phenomenon, material. The Spontanism was a refuge of materialist scientists, who did not want to turn to the Act of creation (E. Haeckel). The Anti-spontanism is presented as being rationalist, materialist: naive or scientifically accepted by some theologians as a reaction to the materialist spontanism (theological anti-spontanism).

Spontaneous generation, as pseudo-phenomenon, was at first interpreted as an expression of the creative powers of matter, then as an expression of divinity, then, the divinity and nature have also been deprived of these powers. Ideas about spontaneous generation were influenced not only by the quality of observations and experiments, but the flow of cultural ideas (philosophical, religious, mythical), which circulated and were at one time dominant in society.

The same pseudo-phenomenon, spontaneous generation, was materialist interpreted by the ancient naïve thinking, idealist creationist of scholastic thought of the Church, idealist vitalist (van Helmont, F. Pouchet) materialist and vitalist (Buffon), scientific materialist (Pasteur). The same pseudo-phenomenon, spontaneous generation, was accepted and criticized by the Church, was supported and criticized by scientists.

Table 1. The ideological orientations of spontanism and anti-spontanism and the main representatives.

Spontanism			Anti-spontanism		
idealist	**philosophical**	Aristotle Descartes	**idealist**	**theological**	Th. Browne Swammerdam Voltaire Pasteur in clerical vision
	theological	Augustin Toma d'Aquino A. Kircher	**materialist**	**scientific**	Redi Leeuvenhoek Malpighi Spallanzani Ch. Bonnet Cl. Bernard Pasteur
	vitalist	Van Helmont J. Needham Buffon F.A. Pouchet			
materialist	**naive**	Anaximander Anaximenes Xenophanes Avicenna J. Carda			
	philosophical	Democritus F. Bacon			
	anti-theological	E. Haeckel			
	incorporated in scientific theories	W. Harvey Buffon De Maillet Lamarck Schleiden			

The theory of spontaneous generation was an error supported by enlightened spirits-Descartes, F. Bacon, Buffon, Lamarck, Haeckel, which expresses the naivety of free thinking or, on the contrary, the power of preconceived ideas , the power of authority or tradition. This error was not unmasked but little by little, in successive stages: for large organisms, then small and microscopic. The spontanists will oscillate between spontaneous emergence of higher adult animals (van Helmont), eggs (Pouchet), from the miraculous apparition of life, at explanations based on vitalistic mechanisms. The dismantling of the spontaneous generation dogma involved, in the ideological plan, the release of preconceived ideas, and in practical, eliminationthe sources of errors in experiments and perfecting experiments.

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