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ENCYCLOPEDIAS AND LAMARCK

HARRY GERSHENOWITZ
Department of Life Sciences
Glassboro State College
Glassboro, New Jersey 08028
U. S. A.

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The writer analyzed nine encyclopedia articles found in the reference section of Glassboro State College's Library as to their treatment of the French evolutionist Jean Lamarck (1744-1829). The students using these encyclopedias are undergraduate and graduate students in the field of the history of science. Four outstanding errors are repeated in seven encyclopedias. They are:

1. Lamarck's chemical theories were worthless;
2. Charles Darwin considered Lamarck as one of his forerunners;
3. Lamarck was inept;
4. Lamarck's colleagues did not study his work, considering it unimportant.

There were two encyclopedias that presented Lamarck as a courageous person who served as a harbinger of the modern evolutionists. Many of Lamarck's contemporaries testified to his greatness as a teacher, person and scientist. One of the outstanding misconceptions was the claim that Charles Darwin admired Lamarck publicly, which was a blatant error. Darwin condemned Lamarck's ideas both publicly and privately, even though he took over one of Lamarck's theories, Pangenesis, and claimed it as his own.

This paper analyzes the information concerning the philosophy and character of the French evolutionist, Jean Lamarck (1744-1829), found in nine encyclopedias in the library of a six-year college, Glassboro State College, in New Jersey. The students utilizing these sources are non-science undergraduates in a course called "The Influence of Scientific Thought on the Development of Man" as well as graduate students in an advanced course called "History and Philosophy of Science". Both groups are required to study and then report on the current controversy dealing with the biological theories of use and disuse and the inheritance of acquired characteristics.

Of the nine encyclopedias, two give fair and accurate treatment of Lamarck's temperament, and his theories concerning use and disuse and the inheritance of acquired characteristics. These are: *The New International Encyclopaedia*, Volume XIII, Dodd, Mead And Company, New York, 1915 and *The American Peoples Encyclopedia*, Grolier Incorporated, New York, 1972. *The New International Encyclopaedia* says about Lamarck, "Lamarck was a man of exceedingly fine character, generous, free from jealousy and self-assertion. He was patriotic, imperturbable under the assaults of fortune, and patient under affliction. His mind was essentially philosophic, broad, and synthetic; he was a bold thinker and in every respect an epoch-making man."[1]

The American Peoples Encyclopedia discusses the philosophical contributions of Lamarck in this fashion, "Lamarck's theory of evolution paved the way for the work of Charles Darwin, Alfred Wallace, and Thomas Huxley."[2]

The remaining seven encyclopedias present misleading and inaccurate information about this sage. The four major resounding errors are:

1. Lamarck's chemical theories were worthless;
2. Charles Darwin considered Lamarck as one of his forerunners;
3. Lamarck was inept;
4. Lamarck's colleagues did not study his work, considering it unimportant.

The 1890 and 1911 issues of *The Encyclopaedia Britannica* (Volume XIV) and *The Encyclopaedia Britannica* (Volume XV) reflect the hostile feelings against Lamarck's chemistry and meteorological prognostications because that period was the height of the anti-Lamarckian sentiment launched by the aging Darwinists. The 1911 edition carried the same article as that written in the 1890 book:

> The most prominent defect in Lamarck must be admitted quite apart from all consideration of the famous hypothesis which bears his name, to have been want of control in speculation. Doubtless the speculative tendency furnished a powerful incentive to work, but it outran the legitimate deductions from observation, and led him into the production of volumes of worthless chemistry without experimental basis, as well as into spending much time on fruitless meteorological predictions.[3]

In the later issue of the *Encyclopaedia Britannica* (Volume XIII), published in 1970, the author altered the earlier approach in the following manner, "While studying medicine in Paris, he became interested in meterorology and in chemical speculations, but especially in botany."[4]

Lamarck, as a materialist, believed that life originated on this planet through the process of spontaneous generation which acted as an essential part in his evolutionary theory of transformation. Carozzi's[5] critical study of Lamarck's 1802 physical science study, *Hydrogeology*,[6] confirms the essentiality of the chemical breakdown of the vegetable and animal life for the continuation of the process of the re-formation of the simplest life forms. This action served Lamarck's scheme which only allowed for known physical causes to act upon the existing chemicals in order to give rise to life. Lamarck's investigation of meteorological phenomena was linked to his theme, which explained that the chemical elements of life were derived from previous complex organic matter that disintegrated into original constituents which were then put into the motion of re-formation by the exertion of the power of the ubiety of containable and uncontainable fluids.

Lamarck in his masterwork, *Zoological Philosophy* (1809), Part II, Chapter VI, "Of Direct or Spontaneous Generation," made his stand against the vitalistic armamentarium with the following guide to his doctrines;

It is useful to note that one of the conditions, essential to the formation of these earliest outlines of organisation, is the presence of moisture and especially of water in a fluid mass. So true is it that the simplest living bodies could not be formed or perpetually be renewed except in the presence of moisture, that none of the infusorians, polyps or radiarians are ever met with except in water; so that we may regard it as an undoubted fact that the animal kingdom originated exclusively in this fluid.

Let us continue the enquiry into the causes which have created the earliest outlines of organisation in suitable masses, where it did not previously exist.

If, as I have shown, light generated heat, heat in its turn generates the vital orgasm that is produced and maintained in animals, where the cause of it is not within them; thus heat may create the earliest elements of orgasm in suitable masses, which have attained the earliest stages of organisation.

When we remember that the simplest organisation needs no special organ distinct from other parts of the body and adapted to a special function (as is made clear by the simplification of organisation observed in many existing animals), we can conceive that such organisation may be wrought in a small mass of matter which has the following qualification.

The body that is most fitted for the reception of the first outlines of life and organisation is any mass of matter apparently homogeneous, of gelatinous or mucilaginous consistency, and whose parts though cohering together are in a state closely resembling that of fluids, and have only enough firmness to constitute the containing parts.

Now the subtle expansive fluids, distributed and constantly moving throughout the environment, incessantly penetrate and are dispersed in any such mass of matter; in passing through it they regulate the internal arrangement of its parts; they convert it into the cellular state; and they make it fit for continually absorbing and exhaling the other environmental fluids which may penetrate within it, and are capable of being contained there.

We have indeed to distinguish the fluids, which penetrate living bodies, in two categories:

1. Containable fluids, such as atmospheric air, various gases, water, etc. The nature of these fluids does not permit them to pass through the walls of the containing parts, but only to go in and escape through the exits;
2. Uncontainable fluids, such as caloric, electricity, etc. These subtle fluids are naturally capable of passing through the walls of investing membranes, cells, etc., and hence cannot be retained or preserved by any body, except for a brief period.

From the principles set forth in this chapter, it appears to me certain that nature does herself carry out spontaneous or direct generations, that she has this power, and that she utilises it at the anterior extremity of each organic kingdom, where the most imperfect living bodies are found; and that it is exclusively through their medium that she has given existence to all the rest.

To me then it seems a truth of the highest certainty, that nature forms direct or so-called spontaneous generations at the beginning of the plant and animal scales.

> But a new question presents itself: is it certain that she does not give rise to similar generations at any other point of these scales? I have hitherto held that this question might be answered in the affirmative, because it seemed to me that, in order to give existence to all living bodies, it was enough for nature to have formed directly the simplest and most imperfect of animals and plants.[7]

Had the seven writers who registered negative reports about Lamarck's work read his writings in-depth, they would have appreciated the relevance of his application of the above influences which operated as necessary physical forces of energy. These ergal forces in turn serve as an impetus for inorganic chemical combinations in the environment to pass the threshold from inanimate, inorganic materials to the fundamental viscous, jelly-like organic substance of life. Lamarck's theory of spontaneous generation required the birth and decay of organic molecules as a recurring natural process over long periods of time. Lamarck believed that these abiogenetic-biogenetic happenings acted as continuous chemical self-restorers. When reading with eyes unclouded by prejudice, a serious student can appreciate Lamarck's statements advocating a theory that was highly speculative to the scientists of his time.

Another area of science that is poorly portrayed was Charles Darwin's ambitendencies toward the scientist Lamarck and his theories. Charles Darwin, although he used Lamarckian theory to explain the action of pangens or gemmules never recognized Lamarck's contributions to the subject. The theory of Pangenesis advocated that each somatic cell of the body produced very minute particles called gemmules which entered into the blood stream and then were deposited in the germ cells. These gemmules became part of the reproductive cells and acted as the units of hereditary transmission. Some of the gemmules or pangens remained latent for several generations but possessed the capability to develop under favourable conditions. Darwin wrote about this seldom-understood theory the following:

> Gemmules are supposed to be thrown off by every unit, not only during the adult state, but during each stage of development of every organism; but not necessarily during the continued existence of the same unit. Lastly, I assume that the gemmules in their dormant state have a mutual affinity for each other, leading to their aggregation into buds or into the sexual elements. Hence, it is not the reproductive organs or buds which generate new organisms, but the units of which each individual is composed. These assumptions constitute the provisional hypothesis which I have called Pangenesis.[8]

It is interesting to notice with particular care that Darwin timidly labeled this theory a "provisional hypothesis".

In *The Encyclopedia of Philosophy* the article on Chevalier De Lamarck ends with the following sentence, 'He (Lamarck) first did the eminent service,' Charles Darwin remarked, 'of arousing the attention to the probability of all change in the organic world being the result of law, and not of miraculous interposition.'[9]

In a letter dated January 11, 1844 to his friend and colleague, Joseph D. Hooker (1817-1911), Darwin's true estimation of Lamarck's theories was clearly stated,

"Heaven forfend me from Lamarck's nonsense of a 'tendency to progression,' 'adaptations from the slow willing of animals,' & c.!"[10] Yet, throughout his published works, which were voluminous, he applied Lamarckian ideas in explaining biological change through use and disuse as well as the inheritance of acquired characteristics.

However, Lamarck never offered a mysterious immortal germ plasm which the Darwinists claimed had the power to regulate the organism and also determine the future of the species. Lamarck as a materialist, taught that the organs of a body act harmoniously in order to allow life to survive. He shunned any dogmatic statements concerning a special area in the body which had mythical powers. One of the leading Darwinists, August Weismann (1834-1914) was the chief mythographer for the eternal plasma whereas, Lamarck and the Lamarckists were supporters for reality and the truth. To set the record straight Lamarck wrote:

> Doubtless no vital faculty can exist in a body without organisation; and organisation is itself simply a collection of organs in combination. But those organs, whose combination is necessary for the existence of life, are not peculiar to any one portion of the body they compose; they are, on the contrary, distributed throughout this body, and they bring life to every part of it, as also the essential faculties which spring from life. Hence the faculties common to all living bodies are exclusively due to the same causes which lead to the existence of life.[11]

The ancient theory of Pangenesis, which interested Aristotle (384-322 B.C.), has reappeared in different forms down through the centuries. The theme of Pangenesis runs through all of Lamarck's work, and he was considered by his followers a major modern exponent of Pangenesis.

Darwin chose to explain the origin and source for the inheritance of acquired characteristics through the engendering of invisible pagens produced in the soma in response to external stimuli. These pagens, according to Darwin, manifest themselves upon the germ cells and cause new characteristics to be inherited by the succeeding generations. In his two volume book, *The Variation Of Animals And Plants Under Domestication* (1868), Darwin introduced his interpretation of Pangenesis. Darwin defended this Lamarckian treatise with pride. In a letter to his wise and faithful counselor, Charles Lyell (1797-1875), Darwin displayed his usual hauteur when he wrote, "I have been particularly pleased that you have noticed Pangenesis. I do not know whether you ever had the feeling of having thought so much over a subject that you have lost all power of judging it. This is my case with Pangenesis (which is 26 or 27 years old), but I am inclined to think that if it be admitted as a probable hypothesis it will be a somewhat important step in Biology."[12]

To his long standing friend, Alfred Russel Wallace (1823-1913), Darwin continued to flaunt his self-proclaimed rightfulness to the theory of acquired characteristics when he communicated, "You cannot well imagine how much I have been pleased by what you say about 'Pangenesis'. None of my friends will speak out ...."[13]

Notwithstanding, Darwin's debt to Lamarck is heavy; yet he condemned him in public and in private. In his masterpiece, *The Origin of Species*, Darwin considered the case of a beetle's wings and concluded with the Lamarckian theory of use and disuse. He deduced that the "wingless condition of so many Madeira beetles is mainly due to the action of natural selection, combined probably with disuse."[14]

Perhaps, in disapproving while still using Lamarck's theories, Charles Darwin revealed his determination to be acknowledged the greatest scientist of his century. He also cut all academic connections with his grandfather, Erasmus Darwin (1731-1802) who independently came to believe in the transmission of acquired characteristics.

Two encyclopedias suggested that Lamarck's abstract ideas made no impression or drew scoffing and mockery from his contemporaries. *Chambers's Encyclopaedia* (New Revised Edition), Volume VIII states, "His (Lamarck) ideas made little impression on his contemporaries and were not studied seriously until after the publication of *The Origin of Species*."[15] In the *New Catholic Encyclopedia*, the charges are made that Lamarck was guilty of oddity, buffoonery and laughable strangeness. The article notes that "Further, his published theories, often bizarre, invited merciless ridicule. Socially he was inept, for his dress and manner were eccentric."[16]

A whole generation in France between 1830 and 1860 was captivated by Lamarck's theories. Most writers, scientists, and statesmen respected and admired his philosophical and scientific thought. Lamarck, throughout his life, conducted himself with professional dignity. As a young scientist, Lamarck was asked by Comte de Buffon (1707-1788) author of a mass of scientific materials consisting of forty-four volumes, *Histoire naturelle*, to take his son on a tour throughout Euprope to study nature. Lamarck's skills as a knowledgeable naturalist and responsible person already were recognized. Furthermore, there are no records whatever substantiating the charges that Lamarck was either eccentric and/or inept during his long teaching career.

The Italian naturalist, Franco Andre Bonelli (1784-1830), writing to his brother from Paris in 1810, described Lamarck's compassion for students. He commented, "Oggi ho fatto una visita al signor Lamarck il quale, avendomi trovato partigiano di alcune sue idee, mi si affeziono particolarmente, mi istruisce sopra molte cose, e m'accorda grandi facilita per istudiare gli animali invertebrati".[17] Paul Pelseneer (1863-1945), in 1922, as secretary to the Real Academy of Belgium, spoke favourably of Lamarck's influence in the classroom. Pelseneer's investigation indicated that "Enfim, entre os auditores estrangeiros havia o italiano Bonelli (furturo professor na Universidade de Turim e director do Musen desta cidade), o belga d'Omalius d'Halloy, celebre geologo, sobre quem o ensino de Lamarck exerceu uma influencia profunda."[18]

Augustin-Pyramus De Candolle (1778-1841), botanist, recalled, *Memoires Et*

Souvenirs (1862), his awe in first meeting Lamarck and the subsequent influence the evolutionist had on his studies. De Candolle remembered:

> Je fis aussi, d'une maniere assez singulière, la connaissance de M. de Lamarck, et je dois la citer parce qu'elle eut immediatement quelque influence sur la direction de mes études. Je le connaissais de vue pour l'avoir apercu à l'Institut, mais je n'avais aucun moyen de l'aborder. Je remarquai qu'avant les séances de l'Académie il venait souvent diner seul chez un petit restaurateur, voisin du Louvre, ou je dinais moimême; j'engageai mon camarade Pictet à venir un jour se placer comme par hasard a la même table que lui et je me mis à parler avec Pictet de mes courses de botanique et de l'utilité très-rèelle dont la Flore francaise avait été pour moi. M. de Lamarck écoutait avec attention et finit par se mêler a la conversation. Il m'engagea à aller le voir; je n'y manquai point et je conservai dès lors quelques relations avec lui....[19]

Another student of Lamarck was Charles-Augustin Sainte-Beuve (1804-1869), the famous writer and critic, who, in his youth, attended lectures in science given by Lamarck. In 1834, he published a novel, *Volupte*, partly autobiographical, which demonstrated the influence of Lamarck upon this period.

Honore de Balzac (1799-1850), world renowned novelist, exhibited since childhood an interest in science. He studied with Lamarck's colleague, Etienne Geoffroy St. Hilaire (1772-1844) at the Museum d'Histoire Naturelle. Saint-Hilaire introduced into the science curricula the philosophy of the followers of German Natur-philosophen. Saint-Hilaire expounded on unity in the animal kingdom, a philosophy that Balzac extended to the human world. In addition to Saint-Hilaire's teaching, Balzac accepted the prevailing Lamarckian theory of the inheritance of acquired characteristics. In 1842, Balzac published *La Comedie Humaine*, a sprawling naturalistic novel which displayed social neo-Lamarckian ideology. Social neo-Lamarckism strongly advocated that beneficial moral characteristics of a culture could cause a social predisposition for transmission to future generations. The novelist described many different types of people who were influenced by their backgrounds and their environments. Balzac wrote with great realism, a multitude of details and formed a panoramic landscape of society in his huge novel, all indicating support of Lamarckian thought.

Saint-Hilaire, Lamarck's associate at the Museum D' Histoire Naturelle, specialized in the study of organic remains of reptiles. He applied scientific principles to the field of morphology, and brought the subject matter into modern times. His scholarly work, *Philosophie Anatomique*, established the public and the scientific community's esteem for his popular prestige. In February, 1830, sponsored by the French Academy of Sciences, Saint-Hilaire debated with Baron Georges Cuvier (1769-1832) the disputed question concerning species' ability to change or remain in an everlasting steadfast condition. Cuvier defended the fixities of species and morphological type. Cuvier, a favourite of the political regime of Charles X (Charles X abdicated August 2, 1830), championed the anti-transformist posture. Unfortunately, Cuvier won the debate and Saint-Hilaire and Lamarckism had to wait for more receptive academic and political

environments. This erroneous victory retarded the queries and scientific investigations pertaining to organic evolution throughout the intellectual circles of Europe.

Saint-Hilaire's work reflected Lamarckian thought in the fields of Phylogeny, Embryology, and Evolution. The academic respect, sympathy, and friendship held by Saint-Hilaire for Lamarck were supported with numerous references and documents.[20]

The *Encyclopaedia Judaica* declared that neo-Lamarckism is a vitalistic philosophy. The author of the article, "Evolution," purported that neo-Lamarckists maintained that evolving life is impelled by an orthogenetic principle. He claimed, "According to neo-Darwinism the fortuitious mutations and the operation of natural slelection were responsible for evolution, whereas according to neo-Lamarckism, development cannot be accounted for without assuming that there is something in the living substance which guides it toward development."[21]

The fact is that Lamarck was no vitalist. It is devious to raise this charge as a legitimate point in question. This point of vision is not eligible to become one of the thorniest issues in the Lamarckian-Darwinian controversy. However, the schools of neo-Lamarckism are composed of many differing factions with varying approaches and versions of defining the tenets of Lamarckism.

Social neo-Lamarckism appeared in the writings of the Marquis de Condorcet (Marie Jean Antoine Nicolas Caritat) (1743-1794), the French mathematician and philosopher, who applied mathematical formulas to forecast the rate of social development in man. As one of the prophets of Paris, Condorcet wrote about "the intellectual and moral attainments of one generation could be passed on intact to its successor."[22] Lamarckian philosophy appeared in the tenth epoch of Condorcet's *Esquisse* which was published by P C F. Daunou and Mme. M.L.S. de Condorcet in 1795.

In 1910, H. G. Moreau in his paper, "Le Positivisme de Lamarck,"[23] labeled Lamarck as the Father of the philosophy of Positivism, though the title is often given to Auguste Comte (1798-1857), the French philosopher and exponent of positivism. The basis of this system of principles is the doctrine that man's knowledge is confined exclusively to phenomena, and that even this knowledge is relative and not absolute. It therefore rejects all attempts at metaphysics or speculative philosophy, whether as to natural causes or First Cause and as to substances, physical or mental, human or divine. The philosophy of positivism has been called "Comtism". Comte, living in the same period as Lamarck, believed that organisms evolved through a gradual process. Like most of the French intellectuals of his day, Comte viewed the growth of sociology as a developing organism. Comte read and studied Lamarck's work. Underlying this theme is F. S. Marvin, who writing about Comte, asserted, "Had there been no Lamarck, there had been no Comte."[24]

Conclusion

The Darwinists, with their blind insistence on treating natural selection as the only viable evolutionary principle, have once again maligned a competitor. The quest for stability in evolutionary theory by the Darwinians for the acceptance of a single process, natural selection, as the only pathway by which new variations can arise is illusory. However, biological change through many differing natural procedures portrays the dynamism of evolutionary development. Seven of the nine encyclopedias analyzed for Lamarck's personality and peer acceptance offered the "Faustian bargain". Perhaps, they made a compact with the Darwinists concerning the truth of Lamarck's character and ideas. This writer believes that the Darwinists presented a *fieri facias* (cause it to be done) to the academic writers in order that their sole judgments be duly carried out. In the period between 1900 and the end of World War II the Darwinists captured most of the major chairs in biology and the history of science at the large American universities (Thomas Hunt Morgan, 1866-1945, Columbia University; W. E. Castle, 1867-1962, Bussey Institute, Harvard University; Conway Zirkle, 1895-1972, University of Pennsylvania). The Darwinists proclaimed that there can be only one evolutionary change. The exclusion of the Lamarckists from academia acted as a distinct guideline for the encyclopedists of the history of science.

The writers of these seven encyclopedia articles have swept aside the evident teleological accounts of Darwin's views of inheritance, such as so-called "haphazardness of chance," as the cause of variations. Chance is often personified as the determiner of fortuitous events. During the early 1900's the dominating biometricians did not allow the Batesonians and the Lamarckians academic outlets to have their say. The controlling Darwinists were aware that unpredictability exists only for a given individual but predictability in the long run does exist for a large number of individuals or species. The lack of a predictable factor implies a metaphysical determiner. The neo-Darwinian geneticists accepted this interpretation of nature by endorsing the validity of the works of the Austrain botanist, Gregor Johann Mendel (1822-1884), and the American zoologist, Thomas Hunt Morgan (1866-1945). Mendelism-Morganism enriched the assumed mythical powers of the "deathless and sempiternal germ plasm." Needless to say, to label Lamarck and all of the schools of neo-Lamarckism as followers of "vitalism," is painful vulgarity.

The writers of these articles present Lamarck's chemical and meteorological studies as disjointed, with no meaning, or as medieval philosophy. These studies were the basis for Lamarck's theories of geology. His geological theories were steeped in the hypothesis of uniformitarianism and not the prevailing Cuvierian theory of catastrophism. It would not be groundless to report that Lamarck's scientific reputation received the wrath of Baron Georges Cuvier's vehement anger. Charles Lyell, one of the founders of modern geology, based his principles on Lamarck's writings and passed this information on to his student, Charles Darwin. Lamarck's theory of gradual and uniform geological changes demonstrated his sound belief that time and space were subject to this quality of uniformity.

Lamarck's hypothesis of uniformitarianism served as a logical base for his conviction in the re-occurrence of the spontaneous generation of the lowest forms of life. It is not known by this writer if the authors of the seven articles studied Lamarck's chemical and geological theories in the context as acting as the stroma for his more detailed evolutionary thought. By 1802, Lamarck accepted transformism and used the above hypotheses and theories in his works, *Hydrogeology* and *Recherches sur l'organisation des corps vivans*. Lamarck's meteorological studies functioned as a link between his biological and geological theories. Lamarck's study of weather and climate encouraged the government to establish weather stations throughout France. The information from these posts was then sent to the Ministry of the Interior, who used it to attempt to solve the problems of agriculture.

Darwin cannot be counted among Lamarck's fair-weather friends. To call Darwin a public admirer of Lamarck's contributions is simply in error. The influence and importance of Lamarck's biological and social thinking has been presented by several noted academic and contemporary witnesses in his time.

Only two of the nine encyclopedia articles indicate the true worth of Lamarck. The writers of the other seven articles on Lamarck and Lamarckism from 1890 to 1970 did not show Lamarck as the founder of the theory of the progressive transformation of one species into another by the natural process of evolution. These past and current encyclopedias, available for undergraduate and graduate students of the history of science, do a disservice to such nonprejudicial and unformed minds. The current writers of evolutionary theory must correct past wrongs by returning to Lamarck's original works and depicting accurately his theories of inherited changes. The encyclopedists of the history of science must remember what Johann Wolfgang Goethe (1749-1832) maintained about the debates between Saint-Hilaire and Cuvier. He insisted, "Je ne juge pas; je reconte."

The nine encyclopedias analyzed are listed below in sequence as they appeared in this paper. They are:

1. *The New International Encyclopaedia*, Dodd, Mead And Company, New York: Volume XIII, Second Edition, 1915.
2. *The American Peoples Encyclopedia* Grolier Incorporated, New York: Volume XI, 1972.
3. *The Encyclopaedia Britannica R. S. Peale & Co., Chicago*, Volume XIV, 1890.
4. *The Encyclopaedia, Britannica* The Encyclopaedia Britannica Company, New York: Volume XV, Eleventh Edition, 1910-1911.
5. *Encyclopaedia Britannica*, Encyclopaedia Britannica, Chicago: Inc., Volume XIII, 1970.
6. *The Encyclopedia of Philosophy*, Crowell Collier and Macmillan, Inc., New York: Volume Four, 1967.

7. *Chambers's Encyclopaedia—New Revised Edition*, International Learning Systems Corporation Limited, London: Volume VIII, 1973.
8. *New Catholic Encyclopaedia*, The Catholic University of America, Washington, D. C.: Volume VIII, 1967.
9. *Encyclopaedia Judaica*, Keter Publishing House Ltd., Jerusalem: Volume VI, 1971.

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[7]Lamarck, J. B., *Zoological Philosophy*, (Trans. Hugh Elliot). Hafner Publishing Co., Inc., New York, 1963. Originally published in 1914 by Macmillan and Co., Ltd. pp. 246-247.

[8]Darwin, Charles, *The Variation Of Animals And Plants Under Domestication*, D. Appleton And Company, New York, 1896, Volume II, p. 370.

[9]Goudge, T. A., Lamarck, Chevalier De, *The Encyclopaedia of Philosophy*, Crowell Collier and Macmillan, Inc., New York, 1967, Volume IV, p. 377.

[10]Darwin, Francis, (ed.), *The Life And Letters Of Charles Darwin*, D. Appleton And Company, New York, 1896, Volume I., p. 384.

[11]Lamarck, *Zoological Philosophy*, *op. cit.*, Part II, p. 259.

[12]Darwin, Francis, (ed.), *op. cit.*, Volume II, p. 255.

[13]Ibid., p. 262.

[14]Darwin, Charles, *The Origin of Species*, The New American Library of World Literature, Inc., New York 1958, p. 134.

[15]Ewer, Dennis William, Lamarck, Jean Baptiste Pierre Antoine De Monet, Chevalier de, *Chambers's Encyclopaedia-New Revised Edition*, International Learning Systems Corporation Limited, London, 1973. Volume VIII, p. 317.

[16]Coonen, L. P., Lamarck, Jean Baptiste De Monet De, *New Catholic Encyclopaedia*. The Catholic University of America, Washington, D.C., 1967. Volume VIII, p. 337.

[17]Camerano, Lorenzo, "Contributo alla storia delle teorie Lamarckiane in Italia. Il corso di zoologia di Franco Andrea Bonelli, "*Atti Della R. Accademia Delle Scienze Di Terino*, Libraio della R. Accademia delle Scienze, Torino, 1902. Volume Trentesimosettimo, 1901-1902, pp. 456-457.

[18]Pelseneer, Paul, "Os Primeiros Tempos da Idea Evolucionista," *Extraido do Journal de Sciencias Naturais*, Traducao de A. Ramalho Oficinas Graficas da Biblioteca Nacional, Lisboa, 1922, Volume II, p. 21.

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