CHARLES DARWIN'S BICENTENARY (THE 12th OF FEBRUARY 1809 - THE 19th OF APRIL 1882). THE MAN AND WORK

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Abstract. *Celebrating two centuries since the birth of the famous naturalist Charles Darwin, the first part of this paper presents briefly his origin, his childhood, his adolescence and his studies followed by an even shorter description of his journey around the world on the brig-sloop "Beagle" (the 27th of December 1831-the 2nd of October 1836) and the ulterior activity until his death. This continues with the summary of Darwin's evolutionary conception, the origin of the species, the natural and sexual selection and the concept of species.*

Keywords: *Darwin's life, the voyage on the "Beagle", the origin of the species, the natural and sexual selection, the evolutionary theory.*

Rezumat. Bicentenarul naşterii lui Charles Darwin (12 febr. 1809-19 apr. 1882). Omul şi opera. *La două sute de ani de la naşterea marelui naturalist Charles Darwin (12 febr. 1809-19 apr. 1882), autorii prezintă pe scurt originea, copilăria, adolescenţa şi studiile şi foarte pe scurt călătoria în jurul lumii la bordul bricului „Beagle" (27 Dec. 1831-2 Oct. 1836) şi activitatea sa de la revenirea din călătorie până la moarte. În continuare este prezentată sumar opera sa ştiinţifică: concepţia sa evoluţionistă, originea speciilor, selecţia naturală şi sexuală, conceptul de specie.*

Cuvinte cheie: *viaţa lui Darwin, călătoria cu „Beagle", originea speciilor, selecţia naturală şi sexuală, teoria evoluţionistă.*

INTRODUCTION

In the year 2009 two centuries have come to pass since Jean-Baptiste de Monet Lamarck (1744-1829) published his work "Zoological philosophy" in which the author of the first evolution theory offered a scientific explanation for evolution with insufficient arguments. At the same time, two centuries ago, Charles Robert Darwin was born (1809-1882), founder of a scientific theory on the evolution of animal and plant species through natural selection. The works of these two all time titans of Biology had, however, a different fate. If Lamarck's work lacked an echo in his own time-it could not be understood because, following the opinion of MOTAŞ (1973), "it had been brought into the world too soon" - Darwin's works enjoyed a far greater outlet seeing as he managed to place his evolutionary conception on a sturdier foundation. This foundation was possible due to mankind's considerable progress in the age in various natural science disciplines: Geology, Palaeontology, Physiology, Embryology, Agronomy as well as others. As one will easily come across further on, although he was a mediocre student, with barely any natural sciences bases, coming from a wealthy family and later accumulating enough data in his long journey around the world, he did manage to put together the "Theory of Evolution". A theory that, after having shocked his contemporaries, made Darwin immortal- known to all of mediocre education, known as the savant that proved "man comes from the ape" (in fact Darwin said that man and the ape have a common ancestry). According to MOTAŞ (1973) in his Magnum Opus "The origin of species", Darwin enunciated the natural selection concept - "the pivot for the entirety of the Darwinist evolutionary doctrine". "Discovering this principle - Motaş writes - is not in any manner surpassed by the discovery the principle of universal gravitation, of the transformation and preservation of energy. It can be compared - Motaş furthers - as the influence on scientific development in later ages, with the discovery of atomic energy and the recent nuclear physics discoveries". Along the same line, we further add for comparison, the computer science revolution brought about by the birth of the Internet.

DARWIN'S BIRTH, CHILDHOOD, ADOLESCENCE AND STUDIES

Charles Darwin was born on the 12th of February 1809 in Shrewsbury, from an old Scottish yeomen family. Before the 1600's, his ancestors spelled their name differently-all of them derivatives from Derwent, the name of a river from the Lincolnshire district, close to Yorkshire: Darwen, Darwynne, Darwyn and Darwin (MOTAŞ, 1973, p.11).

The grandfather, Erasmus Darwin (1731-1802), was a physician, philosopher, natural scientist and poet. His Magnum Opus "Zoonomia" (1794) served, as some say, as a source of inspiration for Lamarck. Charles Darwin inherited from his grandfather, his athletic frame, lively imagination, propensity for sports, his kindness and modesty so rarely encountered. His grandfather's "Zoonomia" contains medical psychological and physiological information on animals, comments concerning how exterior stimuli affect such considerations and the common traits to all animals-whereupon the conclusion that they all have the same origin - the diversity being a later phenomena, achieved through crossbreeding between species. In other words, the grandfather was a true precursor of the grandson soon to become a celebrity.

The father, Waring Darwin (1766-1848), was likewise a physician; after he got his PhD, at the age of 19 at Leyda (Today, Leiden) in Holland, he practiced medicine in Shrewsbury to his dying day. The mother, Susannah

Wedgwood (1763-1817), having left Charles Darwin an orphan at the age of 8, was the daughter of a ceramic worker that created a new kind of porcelain. With such well trained relatives and parenthood, Charles found within the bosom of his family the perfect environment for his intellectual superior formative project.

Charles Darwin commenced his studies in 1817, the year of the unfortunate loss of his mother. Disliking scholarly activity he was a poorer student than his sister Catherine. He was impassioned, however, by collecting minerals, coins, medals, stamps, shells, birds' eggs and was trying to find out the names of all the plants he had gathered. One year later he moved on to Preacher Butler's school where he studied for 7 years Latin, Greek, something of the works of ancient thinkers and poets, as well as some notions of history and geography. This scholastic education made him write in his autobiography that: "Nothing could have been more harmful for the development of my intelligence that Preacher Butler's school (DARWIN, 1962).

In those years of study, Darwin liked to wander alone and fish with a pole. He was 10 years old when, finding a book on bird watching, he proceeded to take notes on the lives of birds, and at the age of 15, having received a hunting rifle, he become a skilful hunter. Through these activities he came closer to nature. Reaching a point where he would understand it, in time he would give up hunting, because of his inborn love for animals. Although he had a keen capacity for analysis and interpretation of nature, Darwin was not suited with a matching memory. He could learn by heart hundreds of Homer's and Virgil lyrics but within a matter of days he would forever forget them. Further on, he was never able to seriously study any foreign languages (MOTAŞ, 1973, p. 16). I found out this biographical detail when during the "History of Biology" class of 1953, the 9th of November, Professor N. Botnariuc told us that Darwin, never having trusted the soundness of memory in general, and of his own in particular, during his great journeys he would always care to note down and collect as many study materials as he could before he would depart. Although written ad-hoc, his notes where rich in detail because he was convinced "rushed notes" leave gaps that later require adages of "vague and superficial hypotheses". He wrote: "Never rely on memory, because memory becomes an uncertain holder when an interesting object is followed by and even more interesting one" (DARWIN, 1958, p.32). Consequently, throughout his life, Darwin made concrete, exact notes, so that he may insure his memory. This explains the density and accuracy of his works, based from exact field observations, on his readings and consulting of other trust-worthy sources. (The same habit is still found, to this day, with the authors of this article, practiced diligently after professor N. Botnariuc spoke in the aforementioned class of Darwin's method. Today, students and researchers make use of a computer's memory, which basically is also based on a filling system). Darwin was extremely honest with himself and held no prejudices. He believed only in facts that he apprehended and sought to find a scientific explanation. It was only natural that upon returning from his great journey he studied his notes and collected materials – an occasion for hard work and meditation throughout the rest of his life (details to be found in NEGREA, 1953-1954, BOTNARIUC, 1961, MOTAŞ, 1972).

Upon graduating from school, both Butler and the other teachers tagged Charles as a "very regular boy, rather beneath a mediocre intelligence" (DARWIN, 1962, p.36), and his father scolded him bitterly: "Outside of hunting and catching rats you have no other interest in life; you will be a disgrace for this family and for yourself" (DARWIN, 1957, p. 4). It is clear the father did not understand his son and would in further times, further fail to do so. The son however, kept his eye on his passions as a collector and hunter. Chancing to read "The Wonders of the World", the yearning to travel arose in him and he read it several times.

In October 1825, Charles and his elder brother Erasmus (1804-1881), were sent by their father to Edinburgh in Scotland to study medicine. Soon, in order to escape the boring classes, the horror of assisting surgical interventions without anaesthesia and dissecting cadavers, he started allocating more time for meetings with natural scientists in town, growing closer most to Robert Grant, a pupil of Lamarck. From him he got word of Lamarck's zoological theory, but was not impressed by it; he was not interested in speculative theoretical ideas. He preferred to study nature without a proxy. In later years he would regret as a zoologist, his initial disgust for anatomy and his lack of talent for drawing.

In 1826 he became a member of the Edinburgh Natural Scientists Association, called "Plinius", wherein he presented his first scientific work about the *Flustra bryozoan* and the *Pontobdella muricata* hirudin. His mentor, Doctor Grant, made possible Darwin's taking part in the Royal Medicine Society meetings and those of the Wemerian Geological Society, thus becoming a true self-taught natural scientist. During his vacation he preferred to walk (up to 50 kilometres within one day), travel and hunt.

After Erasmus left the Medical College for the one in Cambridge, the father of the boys, seeing that his dream to leave Charles as his successor in his cabinet practice was in shambles, moved him to Christ's College in Cambridge, where he studied Theology for 3 years (1828-1831). At first he liked the idea of becoming a country Chaplin, being able as such to study nature, insects and birds, and hunt at ease. But, the more his passion for science grew the less time he had to study theology. He chose to follow the elective courses at the Cambridge University for Natural Sciences in spite of those at the Theological College. As such he took Sedgwick's Geology and J.S. Henslow's Botanics-a young professor, but knowledgeable in all biological disciplines. He did not miss one student trip, collecting plants and studying them. Noticed as a professor, a lasting friendship formed between them. Being invited to the get-togethers at his house, Darwin met and spoke with numerous men of science and culture. By this way, Darwin completed his self-taught natural scientist education. Worth mentioning is that in his 3 Cambridge years he managed to bring together a rich coleopterans collection-insects that he was well acquainted with and that allowed him to befriend known entomologists and got him his first researcher satisfaction. No poet - wrote Darwin in "Autobiography" - has ever felt a

more wondrous happiness that the one I am have experienced reading "Illustration of British Insects", the magical words "collected by Ch. Darwin Esq.". After he finished the Theological College in August 1831, Sedgwick, the geologist, took Darwin for a research in North Wales. With this opportunity, he learned to interpret the tectonic and geological structure of a region. Worth mentioning in addition is the fact that his reading of Alexander von Humboldt's "Journey to America", reignited his interest for expeditions that would allow him to know nature around the world. Enthused, he used to read to his friends entire passages from that book, promising them he will without a doubt see himself those wonderful places described in Humboldt's book. That promise came true occasioned by his trip around the world.

DARWIN'S TRIP AROUND THE WORLD (the 27th OF DECEMBER 1831-the 2nd OF OCTOBER 1836)

It is practically impossible to summarize, within the limits imposed on this commemorative article, the content of the second edition "corrected, with additions" from 1845, the only one translated into Romanian, titled in the original: "Journal of Researches into the Natural History and Geology of the Countries visited during the voyage of H.M.S. Beagle around the world under the command of Capt. Fitz Roy R. by Charles Darwin, M.A., F.R.S.". We will however, try to dot down some of the relevant data, taken from the Romanian edition (see DARWIN, 1985), accompanied by our comments. In spite of having more than 500 pages, Darwin's book stands to this day as a captivating, non-fiction novel.

Day 24 August 1831. It was the happiest day in Darwin's life: his protector, professor Henslow, gave Darwin notice that he was to be recommended as the natural scientist of the brig-sloop H.M.S. Beagle, that was getting ready for a round the world trip. Captain Fitz Roy, an energetic "sea wolf", good sailor, cartographer, hydrologist, geographer and meteorologist, was just about to deny Darwin passage on account of the shape of his nose, that, to the captain, betrayed a man without energy and endurance necessary for a long span trip (Fig. 1, 2).

Departure of the H.M.S. Beagle from Devonport. The young self-taught natural scientist boarded on the 24th of October 1831 but, due to some heavy storms, the ship only departed from Devonport on the 27th of December, heading for South America. The purpose was to map out Patagonia and Tierra del Fuego (started by captain King during 1826-1830), as well as mapping the topography of the Chilean and Peruvian coastlines, including of some islands in the Indian, Pacific and Atlantic Oceans. Likewise, it was also meant to make chronometric measures during the journey around the Terra. The H.M.S. Beagle was a robust ship, of 235 tones, with three masts and 6 cannons but, because of some manufacturing defects, it was classed as a "floating coffin". In spite of all these, it held together through all the storms and difficult seas of the Southern Hemisphere.

The H.M.S. Beagle Journey: Devonport (England)-Santiago Island (Capo Verde Arch.)-San Paolo Isl. (Atlantic Ocean)-Fernando de Noronha Isl.-Bahia (or San Salvador, Brazil)-Rio de Janeiro-Montevideo (Uruguay)-Maldonado-Rio Negro-Bahia Blanca-Buenos Aires (Argentina)-Santa Fe-Puerto Deseado (Patagonia)-Rio Santa Cruz-Tierra del Fuego-Falkland Islands-Magellan's Strait-Valparaiso (Central Chile)-Trip to the Andes Mountains-Santiago de Chile-Chiloé Isl.-Chonos Isl.-Tres Montes Peninsula-Conception-Valparaiso (traversing the Andes to Mendoza)-Copiapo (North Chile)-Iquique (Peru)-Lima-Galapagos Arch.-Tahiti Isl.-Eimeo Island-New Zeeland-Sydney (Australia)-Tasmania (Van Diemen Country)-King George Golf (Australia)-Keeling or Cocos Island (Indian Oc.)-Mauritius Isl.-Cape Town (South Africa)-Sf. Elena Island (St. Helena)-Ascension Island-Bahia (Brazil)-Pernambuco-Sao Tiago Island (Capo Verde Arch.)-Azores Islands-Falmouth (SE England). From the 5 years of the journey, mapping out the South American coast line took 3 years of hard work (this being the main purpose of the journey). This mapping proved however, beneficent for the development of maritime ports.

Darwin, the natural scientist modus operandi regarding field work. The extended station in Montevideo, Maldonado, and other South American ports was benign for Darwin as well, this allowed him to take trips around the continent, of over hundreds perhaps thousands of kilometres. While reading his field files, one is amazed at the precision of his descriptions, the logic of his interpretations and the depth of his conclusions. One is left to wonder what to appreciate more: his unusually keen sense of observation, his talent for clearly expressing his ideas, or the pages in which he describes the surrounding nature in a pure literary style. But he did not limit himself only to description and contemplation of natural phenomena and various discoveries. He compared, sought for causes, the scientific explanations of those that he observed, writing his ideas, hypotheses and certainties on the spot. He had no trust for memory. And he was perfectly right to do so. We know from our own experience that memory can deceive, deform, synthesize or erase any information old or new, if it is not recorded immediately. Although young, Darwin did not hesitated to advise naturalists to do as he did: to keep in mind that gathering collections is the least important side of field-work; that materials collected gain a "considerable" value (read as "scientific") only if they are tagged (correctly and completely, we add), if sketches and drawings are made and if a careful and patient research of all that needs comparing seen or read is industriously performed. It follows that Darwin was gifted with an exquisite methodical spirit, his thoroughness extending to pedantry. His results were as such to match the efforts. It was worth it, as much for him, giving him the satisfaction of being an accomplished natural scientist and allowing him to move from the "fixist" conception (fashionable at the time due to Cuvier's authority) to an evolutionist conception (whose precursor was Lamarck), *as well as for mankind,* determining its belief in facts only and not in unscientific based speculations.

Darwin's discoveries during his journey around the world. We will be referring herein only to some of the discoveries that led Darwin's thoughts, chiefly to a scientific argumentation of the origin of species through natural selection and the propounding of the evolutionary theory.

1. In Rio de Janeiro he noticed that the cultivated cabbage is not attacked by insects as it was in the home regions of England. Why? Darwin asked: isn't it possible that there are particular relations between species inhabiting the same region and that with time a reciprocal adjustment occurs? In this case, regarding the cabbage brought from Europe quite recently, is it possible that the local pests did not have enough time to adapt for attacking the plant?

2. Also in South America, in Maldonado, close the La Plata estuary, Darwin noticed the swollen, sick, practically sightless eyes of a small tucutuco rodent (*Ctenomis brasiliensis*) that digs galleries underground and vocalizes in a manner similar to his colloquial name. If we take into account his strictly subterranean life-style-Darwin writes (1958, p. 90-91) - the lack of sight cannot be a great disadvantage; nevertheless it is strange that an animal has organs so often exposed to harm. If Lamarck had known this fact, he would have been of course quite happy with his own speculations (probably more truthful than he was used to) on the gradually acquired blindness of the *Aspalax* rodent (*Spalax*, NN) or by the *Proteus* reptile (amphibian, NN)[...]. Without a doubt Lamarck would have said that the tucutuco is at present moving from the state of the *Aspalax* to that of the *Proteus*".

3. Journeying on land from Bahia Blanca towards Buenos Aires, Darwin discovered in the diggings of Punta Alta a fossil deposit made of primitive mammal bones, especially edentates, deposited in the estuary of a long gone river. "This discovery is very interesting-he noted-both on account of the large number as well as the extraordinary variety of the gigantic land animals buried here" (Darwin 1958, p. 115). There were bones of *Megatherium, Magalonyx, Scelidotherium, Mylodon* that in later times was to be dedicated to him (*M. darwini*) and several other skeletons, some nearly complete. Out of all the fossils, he was most impressed by the *Toxodon* ones, that was "one of the strangest animals ever discovered thus far: as big as an elephant or a *Megatherium* but the teeth formation, as Mr. Owen establishes, proves beyond any doubt that it was a close kin of the rodents [...]. How amazing it was that *Toxodon*'s constitution reflected the traits of different animal orders, presently so different from one another!" (DARWIN, 1958, p.118). Today, *Megatherium* and the other "gigantic animals" from Punta Alta are considered as the ancestry to the actual South-American forest sloths, likewise lacking the canines and incisors (wherefrom the edentate name). *Toxodon* is classified into a separate order of the South American ungulates; although their teeth resemble that of rodents, they are not related. What is important is that the Punta Alta fossils played a crucial role in Darwin's mind when forming the evolutionary ideas. Far from considering them "acts of creation", he advanced the hypothesis that it is more logical to consider the present edentates the descendant of the fossil ones.

4. Reaching South America at the end of a long drought (1827-1832) known as "Gran Seco", Darwin saw destroyed vegetation and barren land, dead wild animals, flocks migrating towards the Varana river, carcases being carried by the water towards its estuary, piles of bones. If Cuvier would have seen them, Darwin noted, he had interpreted them as a proof of creation! His natural scientist eye did not overlook neither the crop plants nor the domestic animals brought by the Europeans, and the modifications brought on by the former to the structure of the local fauna and flora, bringing some plants to extinction and some animals to turn feral, etc. Analyzing these observations the idea of the interdependence of species that populate a certain region came to him.

5. Researching the flora and fauna from the Galapagos volcanic islands, situated in the Pacific Ocean, almost 1,000 km from the Ecuadorian coast, led Darwin to believe that species indeed evolve. He observed that, although the fauna and flora is similar to the South American one, it has its particulars, that each island has its particular species. One example: while the aqua-endemic lizard *Amblyrhyncus cristatus* populates the rocky shores of all the islands within the archipelago, the land kind, *A. demarlii* (that do not have the flat-sided tail as well as palmed feet and does not feed on algae as the first species) inhabits only the interior of 4 islands from the central part of the archipelago (details in DARWIN, 1958, p. 378-383). In terms of Natural History the distinct characteristic of this archipelago - Darwin affirms (1958, p. 386) is to be found in the fact that each island is inhabited by living things with particular traits. He noticed that the natives can distinguish between the different turtles on the different islands, because of their various sizes and characteristics. Consequently, Darwin concludes, it is probable that every different island has a race of lizards or turtles particular to itself. Based on the numerous observations, Darwin deduced that the islands' flora and fauna come from ancestors brought on by oceanic currents and other ways and means of passive spread from South America that eventually adapted to the features of the environment special to each island. Thus Darwin contributed to solving the problem of common ancestry, of the environment's influence and adaptability to it. Also in the Galapagos islands, Darwin studied the behaviour of the birds that allowed men to come close to them and even posed on their hands. The given explanation was logical: on the uninhabited islands, birds did not have a self-defence instinct for their lives that is itself fixed in the nature of the organism and transmitted through the genes.

6. Until the beginning of the 18th century, Saint Helen's Island was covered with vast forests, among which the Great Forest. If in 1716 there were still trees, mostly dry, until 1724 all of them collapsed from old age. The cause? The goats that had been brought to the island in 1502, in the absence of any carnivores, had multiplied to such levels and, being left to wander everywhere, they destroyed the entire sylvan youth. As a result, the forests including the Great Forest, got smaller and smaller until they were extinct, their place being taken by a large field of spiky grass that with time engulfed everything. To no avail in 1731, it was ordered that all the pigs and goats without a master be slaughtered: without young trees the forests could not recover. Together with the trees, floor plants became extinct, as

well as birds and invertebrates. DARWIN (1958, p. 467) made the following note: "Such a considerable modification within the vegetation has not only affected the terrestrial mollusc population, provoking the extinction of 8 species, but in the same fashion it has touched a multitude of insects". From this example one can deduce how serious can man's reckless intervention be, through introducing species in an ecosystem without conducting a previous study and how complicated food chain interspecific relations can be.

In the last pages of his travel journal, Darwin analyses the "damages and gains, pains and pleasures of sailing around the world". According to him, the journey's satisfactions were not overweighed by the pains. If not for the scientific scope, it would not have been worth it, and he who, like Darwin, is pained by sea sickness, should himself dwell on the matter well before departing, because this affliction is without cure. It was a hard extenuating journey and it undermined his health so much that, when he returned home, he was constantly ill to his dying day. It remained however, the most significant event of his natural scientist life, being the occurrence that led to writing his immortal work. In the 23 years of hard work during which he processed the collected material and field notes and also edited his famous writ-piece "*On the origin of the species"* (DARWIN 1859), he would always remember the images and events that impressed him most: "The Southern Cross, Magellan's Cloud and all the other constellations of the Southern Hemisphere; the maritime waterspout; the blue ice glacier river, hanging over the sea more ominous than any gorge; the lagoon-island made by the coral reef; an erupting volcano, the terrible disaster of an earthquake" (DARWIN, 1958, p. 479).

AFTER THE VOYAGE (1836-1882)

After his journey, Darwin had a period of intense scientific activity in Cambridge and in London. On the 29th of January 1839 he wedded his cousin Emma Wedgwood and settled in London. His first child, Francis, as well as the girls and boys that followed, were equally the object of his affection and of his study. The outcome of those studies was included in the paper "*The expression of emotions*", translated in Romanian (DARWIN, 1969). His precarious health determined Darwin, in 1842, to isolate in the village of Down, found somewhere at a 20 mile distance from London (Fig. 3-7). But even here, although he would lead a modest life, care-free, in the bosom of his ever-growing family, tended to by his devoted wife, he was tortured by an affliction of the stomach, conducive of insomnia and nausea. He read very much, he studied and edited scientific papers, he conducted laboratory experiments, he walked and rode, but did not hunt anymore. As the head of the family he was good and kind, loved and respected, and as a host he was polite and pleasant, often telling stories from his childhood and from his journey around the world. He was not an able man when it came to disturbing or offending, he would patiently listen to anyone. His total lack of envy and quick tempers, his polite behavior and delicacy onto all, betrayed the equilibrium of a perfect soul, entirely opposed to his bodily suffering. It was only when his scientific convictions were at stake, they sometimes praised sometimes critiqued, that Darwin stood his ground firmly based on facts and scientific experiences.

Right in the year of his departure (1842), in the quietude of Down, Darwin found the necessary respite to draft for the first time his theory of evolution-a draft that would only be discovered 14 years after his death. Two years later (1844) he also brought together a larger draft, better prepared, that he, however, hesitated to publish even with the support of the geologist Charles Lyell and of other friends, because it seemed to him that the material on which his theory was grounded was still insufficient. After another dozen years, in 1858, Darwin received from Alfred Wallace (natural scientist) an article entitled: "On the Tendency of Varieties to Depart Indefinitely from the Original Type", in which Wallace asked Darwin to publish it. A great surprise: in said article, A Wallace formulated precisely Darwin's construal of the origin of species, including the particulars of Darwin's theory as to a principle of struggle for existence and of natural selection! Kind-hearted and modest, Darwin was about to give up on the priority of his theory but, upon Lyell's insistence, he presented in that same year (1858), in front of the 'Linnaean Society', Wallace's article, together with a short summary of his own theory. Upon the push of that same friend, Darwin edited his famous work: "The Origin of Species" that was made public on the 24th of November 1859, in 1250 copies, all of them sold that very day. Encouraged by his success, he went on to edit a series of works, apparently with no connection between themselves, but all aimed at the same scope: to prove the verity of his conceptions in various fields. BOTNARIUC (1961, p 315) gives a list of these papers, a total of 8 titles in 17 editions, with the publishing year and for some the printing serials. MOTAŞ, 1972, p. 109, estimates the number of these papers somewhere around 5000 pages.

- *On the origin of species (Edition II 1860, III 1861, IV 1866; V 1869; VI 1862 greatly added to, the last edition within Darwin's life time)*
- *On the various contrivances by which British and foreign orchids are fertilized by insects* (Edition I 1862, II 1877)
- *Variation of Plants and Animals Under Domestication* (Edition I 1868, II 1875)
- *The Descent of Man, and Selection in Relation to Sex* (Edition I 1871, II 1874)
- *The Expression of Emotions in Man and Animals* (1872)
- *Insectivorous Plants (1875)*
- *The Effects of Cross and Self Fertilization in the Vegetable Kingdom* (Edition I 1876, II 1878)
- *Cross-breeding in plants (1880)*

After Motaş's appreciation (1972), Darwin thought well when "receiving all the praise and acknowledgements without getting drunk on his successes and attacks, taking all with the utmost serenity and tranquillity". He was equally

overwhelmed by critics and honours. He received numerous medals, decorations, prizes and membership titles for over 69 associations from all around the world including from the "Transylvanian Natural Science Society in Sibiu".

In July 1881, at the age of 72, Darwin wrote to A. Wallace of his hardships; that he has it a loss as to what to do in the few years of his life that are left to him: "I have everything I need to be happy and content, but life for me is now terribly tiresome". He continued however, to work on a problem regarding plant physiology that preoccupied him: Ammonium carbonate's effects on roots and leaves. He was unaware that death was already stalking his affairs. Early in February 1882, his cardiac seizure, arrhythmia, atrial fibrillations came at a faster pace, so much that Friday, on the 19th of April, at 4 p.m. his heart stopped beating. He had just celebrated his 73rd anniversary. The illustrious naturalist was buried in Westminster Abbey with the representatives of France, Germany, Russia, and Spain present as well as numerous university and scientific society members, colleagues and friends. His tomb is situated in nave of the Abbey, close to Isaac Newton's, another giant of universal science.

DARWIN'S EVOLUTIONARY CONCEPTION

In the following lines we will attempt to offer a sketch, as brief as possible, of Darwin's evolutionary concept. For a more exhaustive briefing one must consult, chiefly, the following works: DARWIN (1957, 1958, 1962, 1967, 1969), RACOVIȚĂ (1929, 1993), BOTNARIUC (1961, 1967, 1992, 2003), MOTAŞ (1972), STUGREN (1965), HASAN (1998), GOULD (2002), MUSTAȚĂ (2003), MUSTAȚĂ & MUSTAȚĂ (2006). In what we are concerned, MUSTAȚĂ's paper (2003) contains the clearest and most concise presentation of Darwin's evolutionary conception, including post-Darwinist theories, and that in the author's attractive and characteristic style.

J. B. Lamarck was the first naturalist to reach the conclusion that the living world was not always the same, that species transform under the influence of the environment and that man is a descendent of "singes quadrumanes" (four handed apes). These ideas he exposed two centuries ago in his work "Philosophie Zoologique", published in 1809. He is considered the founder of the **transformist theory,** upon which God created the world which, through successive transformations, has become what it is today. Lamarck's theory is based on two laws: the law of use and of non-use, as stated by G. L. Buffon, and the law of acquired characters inheritance, the latter refused by modern genetics. What is incomprehensible is that Lamarck did not recognize the category of species on the grounds that, being in a continual transformation, it does not have an ontological status. The transformation theory was not accepted by his contemporaries, although it was heartily defended by Etienne Geoffroy de Saint-Hilaire against Georges Cuvier's attacks. Without being able to sell his book, he died forsaken, blind and poor at the age of 85. He was buried in common burial grounds.

The groundwork for the **theory of evolution** was done by Charles Darwin in his famous work on the *"Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life*" in 1859, held a century after Lamarck's Zoological Philosophy. It is considered the birth act of Evolutionary Theory. As we have seen, the direct contact with nature during his Voyage around the world, furnished enough material to favour this conception. Working on this material, he managed to decipher the mechanisms that determine the evolution of species. In the series of lectures given at the Biology Faculty in Bucharest (NEGREA, 1953-1954), Professor N. Botnariuc drew on the blackboard a guiding schemata of Darwin's though, schemata that he further used in his book "From the History of General Biology" (BOTNARIUC, 1961, p. 319):

VARIANCE AND HEREDITY:

- OVERPOPULATION–FIGHT FOR SURVIVAL–NATURAL SELECTION–WILD SPECIES TRANSFORMATION
- ARTIFICIAL SELECTION–DOMESTIC SPECIES TRANSFORMATION

Professor Botnariuc drew our attention to the interspersed dashes that indicate chronology and not derivatives: *variance* furnishes material for evolution; *heredity* is the factor that establishes variation, it leads to an accumulation in time; *overpopulation* generates or intensifies the *struggle for survival*, and *natural selection* (*"*survival of the fittest*"* with A. Wallace) leads to the transformation of wild species. The schemata for domestic species is grossly simplified due to man that selects with a view to his own interest. As it is well put by MUSTAȚĂ (2003, p. 27), natural selection stands for the factor as well as the engine of evolution; it represents the natural mechanism through which the evolution of species is channelled in one direction.

Evolution Factors

1. Variance is organism's character to respond differently, from one individual to another, to environmental factors, giving birth to so called variations. There are several types of variance: *defined,* it occurs within all the individuals of a population in the aftermath of environment modifications; *indefinite*, this affects the individuals of a populations differently when that population's environment factors change; *corresponding,* this is derived from the two types stated above and unfolds according to the law of correspondence (ex: an organ's transformation affects the other organs with which it corresponds-but there are unexplained phenomena: white coloured cats with blue eyes are deaf etc); *extended,* this manifests over several generations (if the conditions that provoked the variance are maintained); *saltatory* (that does not consist of small modifications accumulated by degree), such as with some sheep or cattle races

(ex. Ancona sheep race with short legs, etc.) - the latter variance was considered by Darwin as insignificant for the evolution of species.

2. Heredity is just as important as a factor of evolution, because it fixes the small variations that occur and it transmits them to the future generations. This refers to the new character transmission from ancestors to descendents. Darwin makes a precision point on that matter that not all variation is transmitted by way of heredity (ex. extended variance can impede hereditary fixation if, with each generation, that particular character is affected). Darwin explains hereditary characters transmission through the theory of pangenesis. Following Democritus, he admitted the existence of material particles with a hereditary role, called *gemules*, located in the reproductive cells, which can circulate through the organism, where they can be influenced by the environment. Darwin holds that there is a *simple type of heredity*, which occurs when the traits of a single parent are inherited, achieved thusly through vegetative reproduction (autogamous) and there is also a *combined type of heredity* that occurs when two partners are involved, this being the case of sexual reproduction (allogamous).

3. Overpopulation is an important factor that can determine or intensify the fight for survival. Darwin was inspired by Thomas Malthus' principle of overpopulation from his paper "*An essay on the principle of population*". In fact he had noticed a tendency with organisms to multiply indefinitely as a means of survival of their species long before he became acquainted with Malthus' book. Darwin brought irrefutable proof that the high number of individuals does not depend with necessity on the number of laid eggs (e.g. the ostrich lays up to 20 eggs and the condor 2 at most but there is still a greater number of condors than of ostriches; the explanation is simple: the condor eggs are not destroyed by predators). Exaggerate reproduction with some organisms occurs in special situations, as a result of the powerful influence of some environmental factors or when man intervenes and destroys natural equilibrium within the species of the ecosystem (we have mentioned the consequences of introducing goats on St. Helen's Island). Some of Darwin's examples prove the impossibility of overpopulation in a natural, virgin environment. The great number of "germs" is not and cannot be the cause for overpopulation.

4. The struggle for survival is a factor of the utmost importance in Darwin's theory. This struggle can only be of 3 kinds: *the struggle with the environment* (drought, frost, floods etc.); *the intraspecific struggle* (between the individuals of the same species, for the same food, space, breeding grounds etc.) *the interspecfic struggle* (considered by Darwin to be the biological engine of evolution). The interspecial struggle for survival has as its effect the limitation of territory extensions of that species and exaggerated breeding; also it influences the development of the species. In other words, this refers to the fight between predator and prey, to what we among us, ecologists, call food chain relations between carnivores and herbivores; referring to food chains and cycles made up of a considerable number of strains after the following schemata: nutritional resources –> primary producers (especially plants) –> primary consumers (animals that feed on producers) –> secondary consumers of different degrees (animals that feed on primary producers and/or primary consumers) –> decomposers (that close the respective cycle) (details in NEGREA, NEGREA, ARDELEAN, 2004).

5. Natural selection is the most important factor of evolution, titled as aforementioned, "the engine of evolution". This is the factor that maintains the equilibrium in nature, eliminating or promoting the increase in some happenstance variance or another. Resorting to natural selection, Darwin excluded the necessity of an intervening force from outside the surrounding nature. In other words, he discovered that nature acts as a unique selector. Any of the environmental factors that determine modifications, can act accordingly. The variations resulted from this action can be positive, favouring the individuals that bear them, some though could prove negative, disfavouring their carriers. It follows with logic that only the individuals fitted for the modifying environment will survive. The more these conditions are maintained, the more accentuated positive variations will enhance, making possible, through organ correspondence, that new traits will be genetically transmitted to descendents. Natural selection sorts out variations that occur in individuals, in no case it induces the apparition of new variations the evolution of species. It results that the natural selection insures both the adaptation and the evolution of the species, that it has a creative role. The phenomenon of homochromia, for instance, is created by natural selection. One could therefore state that in light of Darwin's conception that "evolution is adaptable and adaptation is, in its own turn, evolutive" (MUSTAŢĂ, 2003).

6. Sexual selection. Darwin noticed that it does not always happen that secondary sexual characters are useful to the individual that carries them for his struggle to survive: that some do not give it an advantage, and others can place him at peril's end. Likewise, there are habits such as singing or mating ritual dances with birds that, by attracting attention to carnivores, can be attacked by surprise. However, why are these morphological traits and behaviours not eliminated but fortified? Darwin explained this through sexual selection that promotes and insures the mating of the fittest, capable of yielding the most enduring of descendants, the best genetically endowed, and therefore being a benign selection. "This manner of selection, Darwin emphasized (1967), depends not only on the struggle for survival but on the connection with other organisms and external conditions, but on the fight between same-sex individuals, mostly males, for possession of the opposite sex". Darwin was convinced that all secondary sexual characters are of a real use in the attempt to possess the female. Better endowed, bolder and more attractive males will prevail in this competition, that is less hard that for survival: "A hornless elk or a spurless rooster, writes DARWIN (1967, p. 179), will have a lesser chance to leave a more numerous lineage".

7. The origin of domestic organisms and artificial selection. Based on an in-depth study of morphological, ecological, palaeontological and historical data, as well as on the results yielded by comparing domestic species with

wild similar species, Darwin managed to prove the common monophyletic origin of many grown plants and domesticated animals. Among others, he proved beyond a reasonable doubt that all races of house pigeons are descending from *Columba livia.* Using the same procedure with domesticated races of poultry, he proved without a doubt that they descended from *Gallus bankiva*, which lives to this day in the wilderness of forests in India, Indonesia, the Philippines and the Malay Archipelago. By the same way it was proved that domesticated species of hares come from *Oryctolagus cuniculus* from South-East Europe, and domesticated races of donkeys come from *Equus taeniopus* etc. Once more, in the same fashion, Darwin solved the problem of the origin of domestic plants, by proving that the numerous kinds of corn, cabbage, beans, peas, potatoes, apricots etc. have a common monophyletic origin (details in BOTNARIUC, 1961, p. 338-340). Both in animals and in plants there are cases of a common polyphyletic origin, meaning that one entire group of domestic races comes from a wild species, another from another species, each of these groups having therefore a common monophyletic origin as well. Solving the matter of the origin of home-grown plants and of domestic animals was of a great importance because if the existence of polyphyletic common origins would have provided grounds for rigid interpretations, while proving common monophyletic origins was alone the proof for evolution (BOTNARIUC, 1961, p. 338).

All sorts of homegrown plants as well as domesticated animal species have been created by men with precise goals, concretely anchored in economic necessities, esthetical taste or fantasies. They have reached desired results through artificial selection. For Darwin this is of two kinds: unconscious and methodical.

7.1. *Unconscious artificial selection* was practiced by man ever since he started to hunt and grow plants. He did not propose to create a rase or a kind in particular, having in his perview the sole satisfaction of the immediate household or collective needs of his life. Practically, he kept only the individuals that served his interests: productive birds, the best cattle for milk or meat, the best productive plant seeds etc. In fact this sort of selection has been and is to this day continuously practiced.

7.2. *Methodical or conscious artificial selection*. A selector proposes a specific scope, the creation of a new race of animals with particular qualities or with modifications in a singular direction. These goals are achieved through selecting appropriate individual variants, by way of cross-breeding, dispariging unfit individuals without hesitation. Methodical selection lasts for several generations until it reaches its set goal. Obtaining new sorts of plants is reached by the same way. For details regarding artificial selection see BOTNARIUC (1961, p. 340-344).

Darwin's conception of the species

Is species a reality that sits at the basis of evolution or is it an artificial category, invented by taxonomists, like all supraindividual traditions? If it is a reality, how was it formed and how did it evolve? Darwin retorted adequately and well documented by elaborating "The scheme of diverging characters" (BOTNARIUC, 1961, p. 383), which, given its length, cannot be reproduced or commented upon here. We can however reproduce the conclusions reached by the author at the end of the diagram, summarized by BOTNARIUC (op. cit., p. 385): "From this diagram it is clear that the evolutionary process, therefore the process of descendency of forms, can be presented through a phylogenetic tree, within which the thinnest more numerous branches stand for the diverging character superlatively diversified of the forms. The forms' divergence and diversification appear as necessary consequences of natural selection, they are advantageous to the evolving forms. During this process, its continuance (although irregular, some species remaining unchanged over prolonged periods of time) leads with necessity to a discontinuity of the forms at every moment, due to a struggle to survive that usually eliminates the intermediary forms. This way, through the application of the principle of divergence, Darwin solved the contradiction between a continuity of the evolutionary process and the discontinuity of the species from nature and thus he explained why *species are real groups*, generally well framed, that have a constant relative in time and space".

Following BOTNARIUC (op. cit., p. 385), Darwin errs when he explains the character divergence as a result of interspecific struggle. He also did not bring proof for this type of struggle, and therefore, it cannot be invoked as a necessary and permanent factor of the evolutionary process. According to N. Botnariuc, "this role can be successfully performed by the fight between species closer to one another or distanced from one another, the fight at the outset of which the intermediary forms, the lesser adapted as they are to some precise conditions, will generally be eliminated".

Darwin did not give a definition for the species. Furthermore, like Lamarck, he did not recognise that the species is real, as an evolutionary stage but as an ever-changing entity. "I look at the term species - Darwin writes - as being arbitrarily given, for reasons of comfort, to a group of individuals that are very much alike; the term species is not at all different from what is essentially called variety, that is given to forms less distinct and more variable. Also, the term variety, in comparison with simple individual differences, is applied arbitrarily and for comfort, so much that at this time species are divided one from the other by large or small hiatuses, and some of them are found at the threshold between species and sub-species". Although he did not recognize the species as a reality, Darwin contributed greatly to knowledge of the species in its dynamics.

Related to the problem of the species, of divergent evolution, we need to mention that Darwin was the one who scientifically fundamented **man's descendence from humanoid apes,** setting forth in his paper (DARWIN, 1967) far more arguments than Lamarck.

CONCLUSION

Furthermore opposed to Lamarck, Darwin enjoyed great success with his evolutionary theory that spread quickly throughout the scientific world and beyond, changing equally philosophical and biological thought. This immense success is due, without a doubt, to the ardent defence and support on the part of 2 great scientists. It is Thomas Huxley that defended Darwinism against an accusing church and Ernst Haeckel that enriched the evolutionary conceptions with his own personal achievements in the field. What is important is that Darwinism has lasted over decades well into our times, cleansed of its outdated aspects and enriched with new ideas, achieved from accumulated data coming from different disciplines of modern biology.

We could further our brief exhortation about Darwin and Darwinism by presenting Neo-Darwinist theories: micelar theory of heredity as formulated by NÄGELI (1884); mutational theory founded by HUGO DE VRIES (1901-1903); August Weismann's Neo-Darwinism (weismannism) that developed Nägeli's ideas; hereditary factors theory fundamented by Gregor Mendel; chromosome heredity theory based on Mendel's laws and launched by Th. Morgan; geographical isolation theory fundamented by M. Wagner. In the end we dwelled on the Synthetic Evolution Theory (TSE) based, itself, on the theory of natural selection – "the spine" of Darwin's theory, and we would conclude with the most recent of evolutionary theory: M. Kimura's and T. Ohta's neutralist theory; antisynthetic theory (leapist, of marked equilibrium); Lima de Faria's autoevolution theory and we would conclude with modern Neolamarckism. However, presenting these theories, however in brief, we would occupy tens of pages, therefore we send the reader three referential works: BOTNARIUC (1992), GOULD (2002), MUSTAŢĂ (2003) - the latter of the works being benefited by a final attractive and accessible edition.

EPILOGUE

Fate, willed paradoxically, that a theology doctor (as willed by the father) and self-taught naturalist (through his calling and passion) would scientifically build the evolution theory? How did Darwin solve this problem of consciousness? His discussion with L. Büchner and dr. Aveling, relayed in N. Leon's "Memories" (1925, p. 16) is most edifying and is taken further by MOTAŞ (1972, p. 137). At a luncheon offered by Darwin in his Down household, wherein his two brethren had come to speak of Büchner's book on animal intelligence, Darwin asked them: "Why do you call yourselves atheists?" Aveling answered: "Because we do not have any proof of God's existence [...], because man's science does not know anything but the natural order of things, or an uninterrupted chain of causes and effects, and because invoking supernatural causes will barricade the road of science [...]. We do not admit God's existence because His existence is not proved and therefore our hopes have to be oriented towards this world and not the next".

"Well why don't you call yourselves agnostics instead of atheists?" Darwin replied. Afterwards, laughing, he asked if it just so happened that such ideas are fitted only for superior cultured and thinking men, but not for the masses, not yet sufficiently trained to fully understand such matters. From this discussion it follows that Darwin, in his modesty and prudence, strived spare all from the harm done by his personal convictions. He was a self-declared "agnostic" and not an "atheist", and he respected any sincere opinion irrespective of who was the holder of that opinion. "He was interested, as he confesses himself in many places, in evolution of any kind, even that of man's conceptions", concludes C. Motaş the story in his book dedicated to Darwin.

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ILLUSTRATION EXPLANATION

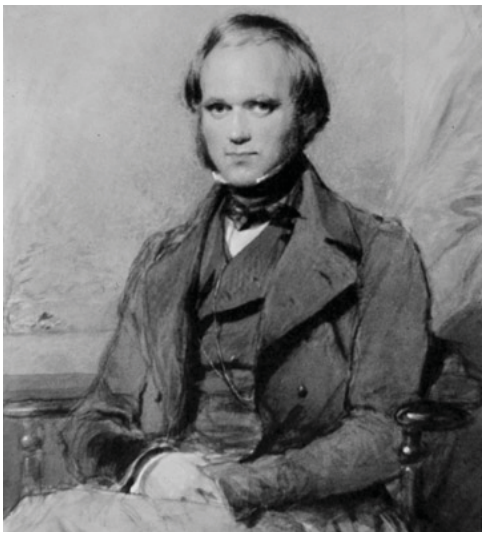

Figure 1. Charles Darwin at 22 years old (1831) before his departure with HMS "Beagle" in the great five years journey around the world (DARWIN, 1958).
Figura 1. Charles Darwin la 22 ani (1831) înainte de plecarea cu bricul "Beagle" în marea călătorie de cinci ani în jurul lumii (DARWIN, 1958).

Figure 2. Robert Fitz Roy, captain of the „Beagle" (DARWIN, 1958)
Figura 2. Robert Fitz Roy, căpitanul vasului „Beagle" (DARWIN, 1958)

Figure 3. Charles Darwin' office in Down (www.englishheritageimages.com)
Figura 3. Cabinetul de lucru al lui Charles Darwin din casa de la Down (www.englishheritageimages.com)

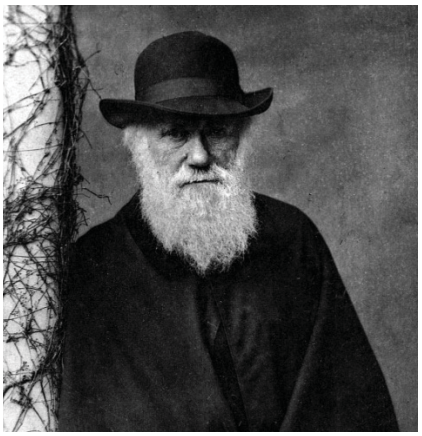

Figure 4. Charles Darwin at the end of his life in his garden in Down (LEROY, 1966).
Figura 4. Charles Darwin la vârsta senectuţii în grădina casei sale din Down (LEROY, 1966).

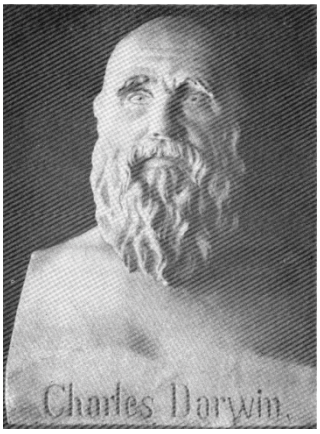

Figure 5. Ch. Darwin' bust at the Botanical Institute of Bucharest (photo Şt. Negrea, at the request of C. Motaş for his book, „Charles Darwin", published in 1973).
Figura 5. Bustul lui Ch. Darwin de la Institutul Botanic din Bucureşti (foto Şt. Negrea făcută la solicitarea lui C. Motaş pentru cartea „Charles Darwin", publicată în 1973).

Figure 6. Ernst Haeckel (1834-1919), the most fervent disciple of Charles Darwin, tireless preacher of the Darwinism (MOTAŞ, 1973).
Figura 6. Ernst Haeckel (1834-1919), cel mai înflăcărat adept al lui Charles Darwin, propagator neobosit al darwinismului (MOTAŞ, 1973).

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