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This year marks two darwinian anniversaries, the second centenary of Darwin's birth, and the 150th anniversary of the publication of his book, *The Origin of Species*. Coming from a wealthy family, Charles Darwin (1809-1882) began his studies at the University of Edinburgh, in order to graduate as an MD, the profession of his father. Two-years college were enough for him to realize that this was not his destiny. His father then instigated him to embrace priesthood and sent him to Cambridge, where he became an unrestricted cleric (although not ordered) very close to the Bible, and an avid naturalist, thanks to the friendships with several naturalists, among them his two most important mentors, J. S. Henslow, professor of botany, and Adam Sedgwick, professor of geology. In fact, it was Henslow who secured him a job on the Beagle, her Majesty's ship about to sail around the world. That is how Charles Darwin, 23 years old, and a graduate in theology and classical studies, ended up travelling on the ship as "naturalist". This somewhat abnormal situation became feasible because Charles offered to pay his subsistence during the trip.

The voyage of the Beagle (1831-1836), under the command of Captain Fitzroy, covered most of the coast of South America, including the Galapagos (5 weeks) and other Pacific islands, New Zealand, Australia, the Mauritius Island, etc. whose experiences were published by Darwin in his book *Journal of Researches* (1839), one of the best known travel books, published in Spanish as Viaje de un naturalista alrededor del Mundo. No one in England, not even the naturalist on his ship, foresaw the tremendous impact that this trip would produce, not only in the field of Natural History but in Western thought itself. Darwin wrote down everything: color of plants and animals, behavior, similarities between bones of extinct species with the bones of current ones, geological formations, volcanoes, variations of organisms from region to region and from island to island, turtle shells, the beaks of finches, etc. The Charles Darwin that returned to England in 1836 would no longer be the same as when he left its shores confused still about his future.

The world of the nineteenth century, with the exception of contrary voices barely audible, based the existence of living beings in their creation by God, following the biblical Genesis. Hence, species were considered fixed and unchanging from the time of their creation. That was also Darwin's thought, until his epiphany of the Beagle. Historians of science have tried to pinpoint the date at which Darwin left "fixism" for "transmutation". But it is easier to determine the time when the new idea was conceived, perhaps since 1832 when he faced the South American fossils, then the impact caused by the landing on the Galapagos Islands in 1835 and finally in 1837 when he began to sketch the new idea. In his letters and manuscripts, Darwin usually referred to the change of species as transmutation, translated into Spanish as *transformación*,

from which derives the name of
*transformismo*
for Darwinian theory -although Darwin preferred for himself to call it theory of
*descent with modification*
. Significantly, neither Darwin nor Wallace originally used the word evolution, whose derivative (evolutionism) was widespread since the early twentieth century. In English, the theory was initially known as
*Darwinism*
.

After classifiyng, with the help of Owen (fossil mammal expert) and Gould (bird expert), his collections from the voyage, Darwin spent many years working in publications on coral reefs (1842), volcanic islands (1844), the geology of South America (1846) and the Beagle voyage, already mentioned. It would seem that the savant had taken on a valuable but diverse scientific production. However, almost secretly, in 1837, he had begun to write some notebooks on the transmutation of species, notebooks that gradually increased in volume to become a large draft of over 200 pages on the theory of evolution. Indeed, Darwin was not the first to assert that species are transformed over time. Quite at the beginning of his *magnum opus*, he mentions no less than 30 authors who preceded him in this view, citing among others, Lamarck, Geoffroy Saint-Hilaire, Professor Owen, Herbert Spencer. The important point was that Darwin, unlike these authors, had found a mechanism of change to which he called
*natural selection*
. Well... someone else had discovered it at the same time. The case was unveiled when Darwin received, in 1858, a letter from the English naturalist Alfred Russel Wallace, who was at the time in the volcanic island of Ternet (Malay archipelago, now Indonesia), asking him an opinion about an article he had written on the subject. Great was Darwin’s surprise (and despair!!), when he realized that Wallace´s letter contained, almost in the same terms (although the concept is not completely indentical), an outline of the mechanism of natural selection. The matter produced intense discussion in London because of the potential risk of Darwin’s precedence in the discovery of the concept. Finally, a Solomonic decision, known as the "delicate arrangement”, was reached by Darwin's influential friends (Lyell and Hooker, among others), who suggested that the
*Linnean Society*
read and publish together both Wallace's article and what Darwin had already sketched in his notebooks. However, the event went unnoticed: no one in the room made any question, Darwin was not even present because he was burying his child, and the President of the Society left the premises not without pointing out that in that year no important discovery had been made. Now that the ins and outs of the delicate arrangement are being unveiled, it is perhaps about time to refer to the theory of natural selection as the Darwin-Wallace's theory, as some authors are currently doing.

Darwin was planning to publish three volumes on his research, but vis-à-vis Wallace's case, he

accelerated the publication of just one - and eventually the only one, revised in several subsequent editions - which appeared on 24 November 1859 with the title of *The Origin of Species by Means of Natural Selection or the Preservation of Favored Races in the Struggle for Life* . The 1250 copies printed sold out the same day, not because they had an equal number of fans waiting for the book, but because the booksellers literally tore away the whole edition. A good copy of the original edition (John Murray, London, green cloth, gilt titles) is being sold now *online* at prices between $ 45,000 and $ 200,000. However, this must not disturb the reader because there are cheap editions in almost all languages.

The principle of natural selection states that environmental factors impact on organisms, ensuring the survival of those who are better adjusted to the environment, and condemning to extinction those who are not. The context implies that the group has internal variability, i.e. individual variations of the members (for example, humans look alike, but each one is a variation, to the point that no human being is identical to another). Natural selection does not create variations, but acts on those already existing within each group. Access to resources for life creates a *struggle for existence* (a concept borrowed from Malthus), in which less fit variations fall. In the end, the selection process may lead to radical changes in the group and eventually to the formation of new species, a matter particularly noticeable when it occurs in geographical isolation ( *allopatric speciation*). At this point, the visit to the Galapagos Islands was key to Darwin, as he found that each island had its own species of finches, mocking-thrushes and tortoises. For instance, in finches only, there were 13 species with different beaks, as if an original population of these birds had been released in several islands, becoming, over time, different species as a result of the powerful forces of natural selection in each island, acting independently on organisms.

To clarify this phenomenon, Darwin proposed that natural selection has an agency similar to that of humans, who, in the process of domestication, select the features that interest them most in the formation of domesticated species (eg, animals that produced more wool or milk, run more, are stronger, etc..), thus becoming the agent of an artificial selection. The importance of this analogy led him to start *The Origin…* with a chapter on the production of variations in the process of domestication. However, under criticism, Darwin published *The variation of animals and plants under domestication* (1868) to show that his analogy was rather didactic, and that he was aware of the major differences between natural and artificial selection. Indeed, a tourist watching herds of giraffes or zebras quietly grazing on the African savannah, could hardly think right away that natural selection is doing its job or that the animals are in close fight for survival. As well noted by Darwin, the phrases "natural selection" and "struggle for existence" are only metaphorical in order to explain the intricate and slow plot of survival and extinction of organisms. Indeed, Darwin could have used other phrases, and actually Wallace urged him to use, rather than natural selection, the phrase of Herbert Spencer's: survival of the fittest. That is, formal changes

which in any way rule out the fact that natural selection of organisms is inevitable and inexorable.

After enunciating his principles, Darwin took the rest of *The Origin…*, to give appropriate evidence of his theory, citing hundreds and perhaps thousands of cases from zoology, botany, geology, biology, paleontology, biogeography, and so on. For less enlightened readers, he tried to present evidences on dogs, cats, orchids and mice. After reading Darwin, it is difficult not to recognize him as the best naturalist of his time. However, no theory is completely waterproof. For example, the male Irish elk has developed huge antlers that simply endangers the animal when he flees from predators into the woods and gets caught in the bushes. Why natural selection would let this feature been developed if it seems to be obviously maladaptive? Darwin solved this problem with the mechanism of sexual selection, according to which males (usually) develop showy features to attract females and mate, thus ensuring the preservation of their genotype. This mechanism was discussed at length in his book
*The Descent of Man, and Selection in Relation to Sex*
(1871).

Equally problematic was the pace or speed of evolutionary change. Darwin envisioned a process so slow that it became virtually imperceptible; more so when he believed that nature does not make jumps (*gradualism*). In his time, the age of the earth, estimated at 4000 - 5000 years, made it impossible for evolutionary change. Fortunately, the development of geology has allowed dating the age of the planet at 4500 million years, time enough to cover the Darwinian model. Furthermore, it was discovered that *mutations* (abrupt changes in the genetics of organisms) could not only accelerate the process, but also introduce more variability in organisms.

The most difficult obstacle was trying to explain how evolutionary changes were transmitted to succeeding generations. Darwin needed urgently a theory of heredity to confirm his own. The best known in his time was the *fusion theory*, whereby the characteristics of the parents disappeared in fertilization, producing a brood that was kind of average of both. Fortunately, in 1865, an Austrian monk named Gregor Mendel had published a paper on plant hybridization in which he showed that particles of inheritance were independent and that the results of its junction could be calculated mathematically (in Mendel's experiments, tall plants crossed with short plants gave always tall ones in the first generation; but in subsequent generations the short ones would reappear. In other words, no medium-length plants, as would be expected under the fusion theory). Darwin died in 1882 without knowing that this had saved his theory, and Mendel in 1884, unaware that his garden experiments will have the repercussions that they have now. His triumph was largely due to the translation of his work into English in 1900, and its dissemination among Western scientists. At mid-twentieth century, the union of Darwinian theory with population genetics, gave way to different approaches, now put together into what

has been called the *modern synthetic theory of evolution*. The unit of analysis became the breeding population whose gene pool (the total sum of genotypes of all inviduals of a population) can be estimated quantitatively in the number and frequency of all alleles (forms of a gene, p. eg. the blood has four alleles: A, B, O and AB) of its members. Any change in frequency of alleles is considered an evolutionary change. It means that individuals bear, grow and die, but only populations evolve.

While moderately educated readers, and even less, became evolutionists overnight (it is said that Darwin had been worried about the price of the book after learning that workers in Lancashire had to give each other a contribution to buy a copy), the problem arose with the scientists and thinkers, who were reluctant to accept the new theory. Many were, of course, Christians and saw with pain or disappointment the elimination of God in all this biological process. Indeed, Darwinian natural selection worked completely at random, and of course there was no reason to think that humans escaped its influence. Not without reason, a cleric warned botanist Henry Trimen that Darwin was the most dangerous man in England. The very extensive correspondence of the savant bears testimony to the intense scrutiny Darwin put on his colleagues to find out who had "converted" to evolutionism. In fact, no theory has ever basculated from success to collapse, as some titles of books selected at random seem to suggest: *At the deathbed of Darwinism* (E. Dennert 1904), *The Eclipse of Darwinism* (P. Bowler 1983), *Dar win on trial* (Ph. Johnson 1993), *The triumph of Darwin* (M. Ghiselin 1983), *Taking Darwin seriously* (M. Ruse 1987), *De la séduction à la supercherie transformiste* (J.-F. Peroteau 1978), *The Evolution Wars* (M. Ruse 2000). Indeed, there were great battles in which the small circle of Darwin had to argue with scholars, clerics and “creationist biologists" in long discussions that often ended in public derision of the evolutionists. Darwin was one of the most caricatured of the time, usually represented as a monkey with the head of the scientist. However, over the years, evolution turned into a strong scientific theory that even began to be taught in public schools.

Creationism retreated… but only to redesign new strategies. Today it has strong presence in the United States, where various fundamentalist Protestant denominations are trying, in recent years, to include in school curricula the teaching of creationism, in equal terms as those intended for teaching evolutionary theory. Of course, not without formal changes, in order to disguise the religious character of the new approaches. In 1972, a PhD in engineering, Henry M. Morris, founded in California the *Institute for Creation Research*, and soon after published a

book called *Scientific Creationism*, the first manifesto of the biblical story treated as "science". Basically, Morris tries to show that the Bible is, more than a book of divine revelation, a scientific treatise of nature (although based on the immutability of species and creation in six days) and that the creation model can compete on equal footing with the evolutionary model, because “both” are scientific proposals. The battlefield is the public school in the U.S. where at least 20 states (Kansas the most prominent, no doubt) have passed, or intend to pass, laws to eliminate the teaching of evolution or the equal treatment of evolution and creationism in schools. Everything depends on the conformation of State Education Departments: If the board has conservative majority, a creationist law is issued; if liberal majority, the former law is revoked and a return is made to the teaching of evolutionism. All this in an almost annual game that becomes persistent in part because renowned evolutionists refuse to get off their pedestal to argue with creationists in the assemblies of the Boards of Education. Morris’s *Institute* has a *Creation Museum*, and provides a unique degree in USA: Master of science… from a creationist perspective. It also has many students and followers. Still, the phrase "creation science" is too evident of hidden intentions. So a new metamorphosis is taking place. Without appearing overtly religious, and without naming God, creationists are now promoting a new theory called *Intelligent Design*, which argues that life is too complex to be explained by evolution, and that therefore there must be behind the curtains an intelligent designer who made it all. "

*Quo vadis, Domine?*

Probably nowhere. The Grand Canyon is a deep gorge carved by the Colorado River in Arizona, with outcropping strata and fossils of up to 2 000 million years old. More than 4 million people visit it each year. Jodi Wilgoren of the *New York Times* reported in 2005 the journey through the Canyon of two separate groups, one evolutionary and other creationist: the instructor of first one explained that the folding of a formation dated back 500 million years, and the instructor of the second, that it was the result of the Flood which occurred 4500 years ago as God's punishment for the sins of mankind. "Two groups examining the same evidence," says Wilgoren, "travelling nearly identical itineraries, snoozing under the same stars and bathing in the same chocolate-colored river. Yet, standing at opposite ends of the growing creation-evolution debate, they seemed to speak in different tongues.”

When Darwin visited the Galapagos Islands, the archipelago was recently functioning as part of Ecuadorian territory (formal possession in 1832). The navigation chart of the islands was made in 1684 by pirate Ambrose Cowley, who gave them English names still current in international use, although the Ecuadorian state imposed Spanish names. The tiny island of Culpepper is the only one that lost its name in homage to Darwin. Darwin found a single village of 200 or 300 souls on the island Floreana "nearly all people of color, who have been banished for political crimes from the Republic of Ecuador”. Today the archipelago has a population of 40 000

inhabitants and a number of intractable environmental and social problems.

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What happened in the far away Ecuador after the publication of *Origin …?* Apparently nothing. Tracking in Quito editions of Darwin's book, the oldest is from 1910 (in the Jijón Fund). The Ecuadorian historian Gonzalez Suárez should have been aware of the work, but he never mentioned it in his writings. Was Darwin an
*unholy word*
in late nineteenth century? It seems so, although
*Origin…*
never appeared on the famous index of forbidden books of the Catholic Church. It turns out that the only “Ecuadorian” Darwinian was not even Ecuadorian. I am talking about Theodore Wolf, the country's first geologist who taught evolutionism at the Escuela Politécnica and even made two trips to the Galapagos Islands (1875, 1878), where he performed more or less the same kind of observations that Darwin did: the geology of the islands and the variations of organisms.

The state has published the trip of Darwin to the Galapagos only twice, once in 1935 (*Darwin en el Archipiélago de Galapagos*
, Ministerio de Educación, Quito), to mark the centenary of his visit to the islands, and another incomplete text in 1960 (Charles Darwin, 1835, in
*El Ecuador visto por los extranjeros*
, Biblioteca Minima Ecuatoriana, pp. 273-296). Interestingly enough, in 1938, students in the Science course of the Cotocollao College published papers from a short symposium on Transformism, led by its Professor of Biology, Manuel Maria Espinosa Polit, SJ. Interesting discussion, an acceptable knowledge of the subject, and an expected epilogue with a lecture about the decline of evolutionism, with an emphatic statement about how "revealed truth" has witnessed "the crumbling of the transmutation doctrine”.

Fithty years ago, the Charles Darwin Foundation of Belgium established in Puerto Ayora, Santa Cruz, a Station with the same name, in order to preserve the ecosystem of the archipelago and to conduct scientific research. The station has received numerous international awards and grants for the quality of its management. In 1968, the archipelago was recognized as National Park and ten years later was named by UNESCO as natural heritage of mankind. Separately, the Ecuadorian state has contributed to the relevant legislative and administrative apparatus, which unfortunately failed to prevent the gradual degradation of the ecosystem. In 2007, the archipelago was declared as World Heritage in Danger.

The man who sparked the storm of radical ideas was called Charles Darwin. His powerful mind and his overactive imagination soared on the whole planet only with his books because, apart his travel in the Beagle, Darwin never made another trip outside England. In 1839, he married Emma Wedgwood, a refined woman of biblical faith. Once she wrote him a letter commenting her fears of being separated from him in eternity because of his ideas. In 1842 the couple moved to their new home in Down, near London, where the scientist would live until his death. Darwin never had any work, except the duties concerning science: writing, reading, observing, experimenting, always experimenting. Unfortunately, his powerful mind was housed in a very fragile earthly wrapping. Darwin lived literally sick every day of his life after his voyage on the Beagle. Half handicapped, he often needed the help from others to move even in his own house. He was vomiting, he had anxiety, chronic fatigue, weakness and other symptoms that have led some scholars to think that he had the Chagas disease. When he died of heart disease, he left in heritage to the world 17 books, 155 scientific articles, a huge correspondence (The University of Cambridge has published so far 16 volumes of his correspondence that covers only up to 1868) and, as a good Darwinian, 10 children, for ensure the prolongation of his genotype.

Charles Darwin, 1989, *Viaje de un naturalista alrededor del mundo*, Ediciones Grech, Madrid (exploración de las islas Galápagos en cap. XVII, p. 343-365). Adrian Desmond y James Moore, 1994, *Darwin, the life of a tormented evolutionist*, W. W. Norton, New York. Manuel María Espinosa Pólit, ed., 1938, *El Transformismo*, Editorial Ecuatoriana, Quito. Julian Huxley y H.D.B. Kettlewel, 1984, *Darwin*, Salvat Editores, Barcelona. Stephen Jay Gould, 2004, *La estructura de la teoría de la evolución*, Tusquets Editores, Barcelona. Camille Limoges, 1976, *La selección natural*, Siglo Veintiuno Editores, México. Richard Milner, 1995, *Diccionario de la Evolución*, Biblograf, Barcelona. Karl Rahner y Paul Overhage, 1973, *El problema de la hominización. Sobre el origen biológico del hombre*, Ediciones Cristiandad, Madrid. Ross A. Slotten, 2004, *The heretic in Darwin's court. The life of Alfred Russel Wallace*, Columbia University Press, New York. Michael Ruse, 2000, *The evolution wars, a guide to the debates*, ABC-CLIO, Santa Barbara. Robert Charles Williams, 1983, Scientific Creationism: an exegesis for a religious doctrine, *American Anthropologist* 85(1):92-102. Jodi Wilgoren, 2005, Seeing creation and evolution in Grand Canyon, *The New York Times*

, octubre 6.