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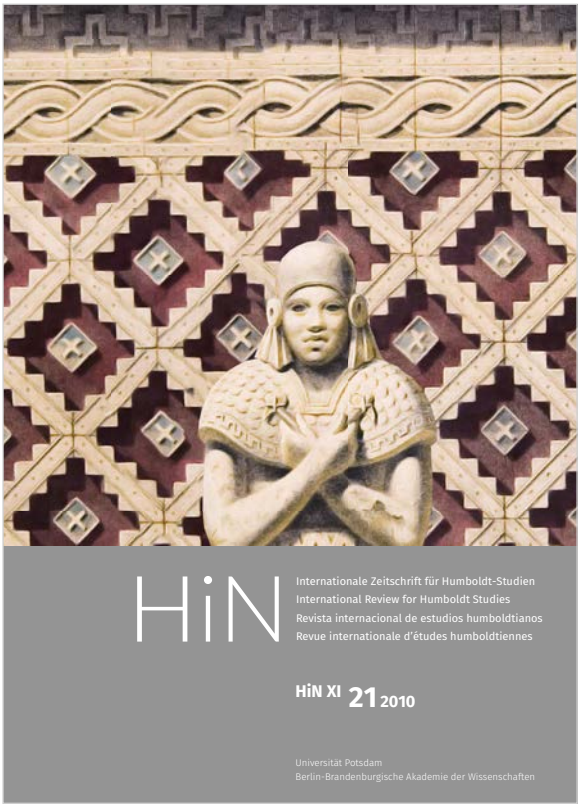

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Charles Darwin and Alexander von Humboldt: An exchange of looks between two famous naturalists

Zusammenfassung

Die besondere Beziehung zwischen Humboldt und Darwin, zwei der bedeutendsten Persönlichkeiten in der Welt der Naturwissenschaften und der Biologie des 19. Jahrhunderts, wird detailliert auf den verschiedenen Ebenen ihres Kontaktes analysiert, sowohl was das real stattgefundene persönliche Treffen betrifft, als auch hinsichtlich ihrer Korrespondenz und der Koinzidenz von Ideen. Dieser wechselseitige Blick zeigt uns wie sich die beiden Gelehrten gegenseitig wahrnahmen, ob sie wirklich versuchten, mit dem Paradigma ihrer bedeutenden Vorgänger zu brechen, oder ob sie lediglich schrittweise das bereits erlangte Wissen erweiterten, bis es durch die Erstellung einer genialen Idee zu einem Bruch des bisherigen Wissens kommt.

Bekannt ist die wiederholte Referenz von Darwin auf die Werke Humboldts, insbesondere auf die Tagebücher des deutschen Naturwissenschaftler und seine Art der Beschreibung der amerikanischen Natur in ihrer ganzen Reichhaltigkeit. Weniger bekannt hingegen sind andere Verweise in seiner Autobiografie, sowie die wissenschaftliche Verwendung des Humboldtschen Werkes oder die Zitate in seiner Korrespondenz, die in diesem Beitrag aufgezeigt werden. Darüber hinaus wird die Verwendung der frühen Schriften von Darwin durch Humboldt in einigen seiner Publikationen, vor allem im *Kosmos*, erwähnt.

Resumen

La especial relación entre Alexander von Humboldt y Charles Darwin, dos de las personalidades más destacadas en el mundo de la Historia natural y la Biología del siglo XIX, es analizada detalladamente en los distintos niveles de contacto entre ambos, tanto en lo que se refiere al encuentro real, en persona o a través de su correspondencia o al encuentro de ideas. Este cruce de miradas nos pone además en el camino de vislumbrar cómo se perciben los sabios entre ellos, si realmente intentan romper con el paradigma establecido por su importante predecesor o simplemente mejoran progresivamente el conocimiento ya elaborado hasta llegar a provocar la ruptura del conocimiento anterior con la elaboración de una teoría genial.

Es conocida la continua alusión de Darwin a la obra de Humboldt, especialmente al Diario del naturalista alemán y su forma de describir la naturaleza americana en todo su esplendor, pero no tanto otras citas en su Autobiografía y menos aún el uso científico de su obra o las citas en su correspondencia, que presentamos en este artículo. Asimismo estudiamos el uso de la obra científica temprana de Darwin por Humboldt en algunas de sus publicaciones, especialmente el *Cosmos*.

We have always thought, in Newton's phrase, that an emerging scientist stands on the shoulders of a previous giant of science in order to be able to see further into the discovery of new laws, or simply to increase his knowledge. Today we can look at a case in point, and observe the phenomenon where one giant climbs on the shoulders of another, still living, to go further in the fields of science. This comparison of mutual observations is perhaps particularly topical at this moment, when we are commemorating not only the bicentenary of Darwin's birth but also the death of Humboldt 150 years ago in 1859; this was also the year in which Darwin's famous work *On the origin of species* was published, his most avidly discussed work, which catapulted him to his position as one of the best-known naturalists[1].

This exchange of looks, furthermore, helps us to catch a glimpse of how these two scholars perceived each other: whether they were really trying to break with the paradigm established by their illustrious predecessor, as Thomas Kuhn affirmed many years ago, or whether they were simply improving their already acquired knowledge, until they finally caused a break with previous knowledge in order to produce a brilliant new theory.

In the following pages we shall give a detailed analysis of the different levels of contact between the two individuals, both in their actual contact, personally or through their correspondence, as well as in their meeting of ideas. One of the testimonies which is of greatest interest in this context is the well known reference Darwin makes in his autobiography to the influence Humboldt's works had on him in his formative years:

> During my last year at Cambridge I read with care and profound interest Humboldt's *Personal Narrative.* This work and Sir J. Herschel's *Introduction to the Study of Natural Philosophy* stirred up in me a burning zeal to add even the most humble contribution to the noble structure of natural science. No one or a dozen other books influenced me nearly so much as these two. I copied out from Humboldt long passages about Teneriffe, and read them aloud on one of the above-mentioned excursions, to (I think) Henslow, Ramsay and Dawes; for on a previous occasion I had talked about the glories of Teneriffe, and some of the party declared they would endeavour to go there; but I think that they were only half in earnest. I was, however, quite in earnest, and got an introduction to a merchant in London to enquire about ships; but the scheme was of course knocked on the head by the voyage of the *Beagle*.[2]

We should bear in mind that at the time when Darwin undertook his expedition, there already existed a great fund of knowledge gathered by travellers and expeditions to different regions of the world, undertaken from the 18th century onwards by Englishmen, Frenchmen, Spaniards, Germans and Russians. In addition, travel literature was largely accepted not only by naturalists, who were inspired by reading the descriptions of these expeditions, but also by the general public. Some decades before, Alexander von Humboldt had lived in the age of the great explorations, such as those undertaken by Louis Antoine de Bougainville (1766-69), James Bruce (1768-73), Carsten Niebuhr (1761-67), and Alejandro Malaspina (1789-94), or the many voyages of James Cook. The accounts of these adventures fascinated Humboldt from his earliest years, and aroused in him a romantic approach to these tropical regions, idealized in the works of Rousseau and Buffon. With the same enthusiasm he read the original works of Haller, MacPherson and Goethe, who recreated Nature, voyages or the return of the human being to his original state, supposedly far away from civilization. Humboldt also acquired knowledge of the exotic world through Bernardin de Saint-Pierre, whose work *Paul et Virginie* (1787) he had read on several occasions; and on the other hand the work of his childhood tutor, Joachim Heinrich Campe, author of *Robinson, der Jüngere* (1779) and *Die Entdeckung Amerikas* (1781-82), had a notable influence on him.

1 Regarding the relationship between Darwin and Humboldt see Barret, Paul H. and Corcos, Alain F., "A Letter from Alexander Humboldt to Charles Darwin". *Journal of the History of Medicine and Allied Sciences*, 27: 2, 1972 (Apr.), p. 159-172; Chirino, Luis and Yudilevich, David, "Humboldt y Darwin". *Ciencia al Día Internacional,* November 1999, 4, vol. 2 (http://www.ciencia.cl/CienciaAlDia /volumen2/numero4/articulos/articulo8.html); Egerton, Frank N., "Humboldt, Darwin, and Population". *Journal of the History of Biology*, 2, vol. 3, 1970, p. 325-360. Puig-Samper, Miguel Ángel, García González, Armando and Rebok, Sandra, "Un cruce de miradas entre Darwin y Humboldt". Publication of the *IV Coloquio Internacional sobre Darwinismo*, celebrated in Mexico D.F., February 2009 (in press). Théodoridès, Jean, "Humboldt et Darwin". In: *Actes du Xie Congrès international d'histoire des sciences*. Warsaw, Torun, Kielce, Kraków, August 1965, 5. Wroclaw, p. 87-92; Werner, Petra, "Zum Verhältnis Darwins zu Humboldt und Ehrenberg". *Humboldt im Netz* (http://www.unipotsdam.de/u/romanistik/humboldt/hin/pdf/hin18 /hin18_komplett.pdf), Berlín/Potsdam, X, 18 (2009), p. 68-95; Wuketits, Franz M., "Alexander von Humboldt und Charles Darwin. Retrospektiven einer Annäherung". *Universitas. Orientierung in der Wissenswelt*, 64 (2009), n. 1 (751), p. 46-56. About the same subject a presentation can be found in internet, developped by the Facultad de Ciencas of the University of Granada: http://www.slideshare.net/sequeiros/darwin-humboldt-y-la-geologia-1093792.

2 Barlow, Nora (ed.), *The autobiography of Charles Darwin 1809-1882. With the original omissions restored. Edited and with appendix and notes by his grand-daughter Nora Barlow*. London: Collins 1958, p. 107.

Although the reading of these titles did not provide him with any specific knowledge about the regions they described, the expressiveness with which those exotic worlds were depicted awoke in him the desire to travel, so that from his early years he thought of carrying out a scientific expedition himself. At first, the possible destination was not clearly defined, but it was rather the personal challenge of undertaking such a project, as he himself confessed in his work *Voyage aux régions équinoxiales du Nouveau Continent*.

After seeing the failure of several attempts to put his desired voyages into practice, imbued with a certain romantic inspiration and rather vague ideas, he took the decision to undertake his own scientific voyage, accompanied by the French botanist Aimé Bonpland, whom he had met in Paris. This finally turned out to be his famous American expedition, carried out between the years 1799 and 1804.

One of the first published results of this important scientific enterprise was in fact his work *Voyage aux régions équinoxiales du Nouveau Continent*, which Darwin mentions as a remarkable source of inspiration. This travel narrative was first published by Humboldt in French between 1805 and 1834, and the English version was published with the title *Personal Narrative* in 1818-1819. One copy of the work was given to Darwin by his friend, the botanist and professor John Stevens Henslow[3]. Darwin copied and read passages of the work to Henslow and to other friends, where Humboldt talked about the nature and vegetation of Tenerife, as well as his ascent of Mount Teide: this intensive reading was the origin of Darwin's dream to visit the Canary Islands. With this in mind he started to study Spanish[4] and even conversed with a merchant in London in order to obtain information about the vessels that visited the islands. Darwin's plan, which he originally hoped to carry out in June of 1832, suddenly seemed to be feasible with his incorporation into the expedition of the *Beagle* in September 1831. It also seemed possible to emulate the voyage undertaken by the Berlin geographer, who besides the "Fortunate Isles" had travelled round the Iberian Peninsula, Cuba, Mexico, Venezuela, as well as other regions of America.

But this travel narrative of Humboldt's was not the only one which interested Darwin: there were also several of his other works, such as *Ansichten der Natur*, *Fragmens de géologie et de climatologie asiatiques* as well as the *Cosmos*. The result of this inspiration is reflected in the fact that Humboldt was one of the scientific personalities most quoted by Darwin in several of his works, such as his *Diary of the Voyage of H.M.S. Beagle*, as well as in *On the origin of species*, *The Descent of Man, and Selection in Relation to Sex*, *The Variation of Animals and Plants under Domestication,* etc., and also in his scientific and personal correspondence.

References to Humboldt in Darwin's correspondence

As many of Darwin's letters reveal, Humboldt was present in his thoughts before, as well as during, his voyage on the *Beagle*. In April 1831 he wrote to his second cousin, the clergyman and naturalist William Darwin Fox, commenting on his obsession – "I speak, think and dream" – about visiting the Canary Islands, particularly Tenerife, which Humboldt described as a marvellous place[5]. At the same time he wrote to his sister Caroline, telling her that he was reading Humboldt and expressing his eagerness to visit Mount Teide and to behold the great *Dracaena*- the Dragon Tree:

> (…) in the morning I go and gaze at Palm trees in the hot-house and come home and read Humboldt: my enthusiasm is so great that I cannot hardly sit still on my chair. Henslow & other Dons give us great credit for our plan: Henslow promised to cram me in geology. — I never will be easy till I see the peak of Teneriffe and the great Dragon tree; sandy, dazzling, plains, and gloomy silent forest are alternately uppermost in my mind.[6]

In July of the same year he notified his friend Henslow that he was reading and re-reading Humboldt in relation to the Canary Islands, and repeated his intention to see the famous *Dracaena* described by the Prussian[7]. Shortly before he left, in December of the that year, he asked his sister Susan, among other things, to search for works by Humboldt regarding isothermal lines[8] and to consult Vice admiral Robert FitzRoy (1805-1865) about

3 This work of Humboldt was also recommended to Darwin by the geologist Adam Sedgwick. See letter 129, Adam Sedgwick to Charles Darwin, Carnarvon, 18 September 1831 of the Darwin Correspondence Project, University of Cambridge (www.darwinproject.ac.uk). All the letters cited in this article, unless otherwise indicated, are taken from the website of this Project.

4 Letter 98, Charles Darwin to C. S. Darwin, 28 April 1831.

5 Letter 96, Charles Darwin to W. D. Fox, 7 April 1831. See also letter 132, Charles Darwin to W. D. Fox, 19 September 1831, where he earnestly recommends him to read Humboldt's works concerning tropical countries.

6 Letter 98, Charles Darwin to C. S. Darwin, 28 April 1831.

7 Letter 102, Charles Darwin to J. S. Henslow. Shrewsbury, 11 July 1831.

8 Letter 115, Charles Darwin to S. E. Darwin, 4 September 1831.

the advisability of taking some books with him, among which he explicitly mentioned "his Humboldt"[9].

In March 1832 Darwin wrote to his father from the Orinoco, describing the beautiful vegetation which he could see, and later recommended that, in order to get an idea of the tropical regions, he should read Humboldt, skipping the most scientific parts, from his arrival in Tenerife onwards[10]. With the same enthusiasm and at the same time – in May of that year – he also sent Henslow a letter from Rio de Janeiro telling him that, whereas before he had admired Humboldt, at that moment he almost adored him, since "he alone gives any notion of the feelings which are raised in the mind on first entering the Tropics"[11].

After his return from his voyage on the *Beagle*, he also discussed with other scientists several issues relating to the Prussian scholar and his works. For instance, in April 1837, in a letter directed to the zoologist Leonard Jenyns, Darwin mentioned the possibility of enlisting the help of two other naturalists, the search for the necessary funding and the format for the publication of the zoological results of the expedition on the *Beagle*[12]. In October 1839 he wrote to John Washington, the Secretary of the *Royal Geographical Society*, expressing his gratitude for sending him the highly favourable quotation of Humboldt in the latter's article published in the *Journal of the Royal Geographical Society of London*[13] about *The Diary of the Voyage of the Beagle*. Darwin told him of his satisfaction at the scientific acknowledgement of Humboldt, whom he had always admired when he was a young author[14]. With his friend, the botanist Henslow, he also dealt with other issues in which the Prussian scholar was involved. In November 1839, for example, Darwin wrote to Henslow informing him of Humboldt's interest in the study of Henslow's "curious collection of plants" from the Galapagos Islands, an interest shared by Darwin[15].

One of the other scientists with whom Darwin discussed the ideas of Humboldt was William Hallowes Miller (1801-1880). Miller was a professor of mineralogy, and for three months, with his help, Darwin had examined the rocks he had gathered during his expedition on the *Beagle*. He also maintained a correspondence with the geologist David Milne-Home (1805-1890), to whom Darwin commented in February 1840 on his work regarding the earthquake which took place in Chile in 1835, and the possible connection with earthquakes in other parts of the world, particularly in South America. Apparently Darwin did not completely agree with Humboldt about the relationship between Sabrina Island in the Azores and subterranean activity in South America.[16]

Darwin also pointed out Humboldt's interest in translating his *Diary of the Voyage* into German. In July 1843 Darwin wrote to Ernst Dieffenbach thanking him for his interest in translating this work at the suggestion of the German chemist Justus von Liebig and Humboldt[17], a fact on which Darwin commented proudly to his friend Joseph D. Hooker the following year[18]. It was precisely with Hooker that he made most references to Humboldt. In January 1845 Darwin told him that the geologist Charles Lyell had recommended that he should "write to the great Humboldt & set him to worry the little Devilbach"[19]. Furthermore, bearing in mind the possibility that Hooker might visit Humboldt in Paris, which in fact he did on 30 January 1845, Darwin asked him to communicate to Humboldt the great influence his work *Voyage aux régions équinoxiales du Nouveau Continent* had had on his entire life, besides asking him about specific details[20].

Darwin also wanted to know which was the best translation of Humboldt's *Cosmos*, and so at about the same time he asked Hooker for advice[21]. Hooker answered him in September 1845, affirming that the translation of Prichard was abominable, that there were many pages he was not even able to understand, that it was not worth buying it, although he warned him that he might be wrong in his judgement[22]. Besides, Darwin showed himself to be in considerable disagreement with this work of Humboldt: while he considered some

9 Letter 135, Robert FitzRoy to Charles Darwin, Devonport, 23 September 1831.

10 Letter 158, Charles Darwin to Robert Darwin, 26 February, 1 March 1832.

11 **Charles Darwin to J. S. Henslow, Rio de Janeiro. May 18th** 1832 (Humboldt Digital Library, http://avhumboldt.net/index.php?page=154#correspondence).

12 Letter 354, Charles to Leonard Jenyns, 10 April 1837.

13 Humboldt, Alexander von, "On the longitude of Valparaíso and Callao, in a letter from Baron Alexander von Humboldt". *Journal of the Royal Geographical Society*, vol. 9, 1839, p. 502-506.

14 Letter 537, Charles Darwin to John Washington, 14 October 1839.

15 Letter 543, Charles Darwin to J. S. Henslow, 10 November 1839.

16 Letter 560, Charles Darwin to David Milne-Home, 20 February 1840.

17 **Letter 680, Charles Darwin to Ernst Dieffenbach, 4 July 1843. See also** letter 698, Darwin to Dieffenbach, 2 October 1843.

18 Letter 735, Charles Darwin to J. D. Hooker, 3-7 February 1844.

19 Letter 817, Charles Darwin to J. D. Hooker, 22 January 1845.

20 Letter 826, Charles Darwin to J. D. Hooker, 10 February 1845.

21 Letter 889, Charles Darwin to J. D. Hooker, end of February 1845.

22 Letter 910, J. D. Hooker to Charles Darwin, 1 September 1845.

parts admirable, some others for him were repetitions of his work *Voyage aux régions équinoxiales du Nouveau Continent*, without really offering anything new[23]. In August 1845 Darwin recommended that Charles Lyell should look in this book for information concerning the topic of simple or multiple creations, a subject which Humboldt had analyzed with Hooker[24]. In October of the same year, Darwin wrote to Lyell the following negative comment about the English translation of the *Cosmos*, as well as the semi descriptions in the first part:

> Have you read 'Cosmos' yet? The English Translation is wretched, & the semi-metaphisico-poetico-descriptions in the first part are barely intelligible; but I think the volcanic discussion well worth your attention; it has astonished me by its vigour & information[25].

On the other hand, Darwin apparently identified himself with Humboldt to such an extent that when he wrote he followed a very similar descriptive system, in aesthetic terms: perhaps what Ottmar Ette calls *Humboldtian writing*, which had given Humboldt such good results on the dissemination of his ideas. The sister of the British naturalist, Caroline, after reading parts of Charles' diaries, noticed in his writings the same flowery style full of French expressions that Humboldt used. So she recommended that he should rather use his own simple style, direct and natural, as she comments in a letter written to him in October 1833:

> I thought in the first part (of this last journal) that you had, probably from reading so much of Humboldt, got his phraseology & occasionly made use of the kind of flowery french expressions which he uses, instead of your own simple straight forward & far more agreeable style. I have no doubt you have without perceiving it got to embody your ideas in his poetical language & from his being a foreigner it does not sound unnatural in him— Remember, this criticism only applies to parts of your journal, the greatest part I liked exceedingly & could find no fault, & all of it I had the greatest pleasure reading (. . .).[26]

Something similar had happened earlier to Alexander von Humboldt in the eyes of his family members, who were not particularly fond of his French cosmopolitanism, which was no doubt evident in the way he wrote. In a conversation between his brother Wilhelm and his wife Caroline we find a very interesting statement regarding the visit of Alexander to London in 1817:

> Aber wahr bleibt dabei immer, daβ einem leid tut, wie er aufgehört hat, deutsch zu sein und bis in alle Kleinigkeiten pariserisch geworden ist. Auch die BERG hat das gefunden, und was am schlimmsten ist, auch bei Lesung seines Buches. Hierin ist nun jetzt nichts mehr zu ändern.[27]

But Darwin was attributed not only with the language, but also the style of describing nature in vivid images in Humboldtian style, for instance by the editor Hermann Kindt, as the latter pointed out in a letter sent in September 1864[28]. In 1865 Darwin still continued to refer to the influence of the works of Humboldt when he commented to the naturalist and co-discoverer of natural selection Alfred Russel Wallace (1823-1913) on the importance of travel diaries in the development of a predilection for natural history[29]. Even at the end of his life, around the year 1881, Darwin commented to the botanist Joseph D. Hooker that Humboldt was the "greatest scientific traveller who ever lived" and went on to give more details: "I have lately read two or three volumes again. His Geology is funny stuff; but that merely means that he was not in advance of his age. I should say he was wonderful, more for his near approach to omniscience than for originality. Whether or not his position as a scientific man is as eminent as we think, you might truly call him the parent of a grand progeny of scientific travellers, who, taken together, have done much for science"[30].

References to Humboldt in the Works of Darwin

As already mentioned, Darwin referred to Humboldt in his main writings as one of the most important authorities of his times. We know that he quoted the German on various topics, for instance concerning the syenitic rocks of the waterfalls of the Orinoco, the Nile and the Congo, which were "coated by a black substance, appearing as if they had been polished with plumbago"[31]; as well as

23 Letter 922, Charles Darwin to J. D. Hooker, 28 October 1845.

24 Letter 905, Charles Darwin to Charles Lyell, 25 August 1845.

25 Letter 919, Charles Darwin to Charles Lyell, 8 October 1845.

26 Caroline Darwin to Charles Darwin, 28 October 1833 (Humboldt Digital Library, http://avhumboldt.net/index.php?page=154#correspondence).

27 Hanno Beck (ed.), *Gespräche Alexander von Humboldts*. Berlin: Akademie Verlag, 1959, p. 52.

28 Letter 4615, Hermann Kindt to Charles Darwin, 16 September 1864.

29 Letter 4896, Charles Darwin to A. R. Wallace, 22 September 1865.

30 Letter 13277, Charles Darwin to J. D. Hooker, 6 August 1881.

31 Darwin, Charles, *Viaje de un naturalista alrededor del mundo*. La Habana: Editorial Gente Nueva, 1978, vol. 1, p. 31. According to Darwin, this quotation refers to Humboldt (1814-1829), vol. V, part I, p. 18.

on the formation which Humboldt called gneiss-granite to refer to hills of a conical form; on the large conical twelve-foot high anthills, which attracted his particular attention and which made the plains resemble the mud volcanoes of Jorullo, described by Humboldt. Darwin also remembered him in Rio de Janeiro, when he described the "thin vapour", pointed out by the Prussian, which in the tropical climate "renders its tints more harmonious [and], softens its effects", which were not observed in the milder climates[32]. In the same way he quoted Humboldt's remark about the lethargy of crocodiles and boas[33].

After having visited the silver mines in Coquimbo and having subsequently travelled around different villages or locations and their copper foundries etc., Darwin arrived at the valley of Copiapó where he stayed at a *hacienda* which belonged to another Englishman, who received him with great kindness. He spent several days at this place, exploring the entire valley and reflecting on earthquakes and the opinions Humboldt expressed on the issue, besides collecting shells and fossilized wood, which was very abundant there and which still astonished the settlers. When Darwin visited the coasts of Peru there was widespread fever, thought to be caused by the miasma or fumes emanating from the swampy regions. The surroundings of Callao were covered with grasses and small pools of stagnant water, where these miasmas were abundant; the same occurred in the town of Arica, but there the pools had dried out, which made the region more salubrious. Darwin concluded that the miasmas were not always engendered by an extreme climate and exuberant vegetation, since countries with the very same conditions, such as Brazil, nevertheless presented fewer health problems.

After several weeks of rainfall, it was common to see how the air became poisonous, and both Indians and Europeans were subject to fevers during a large part of the year. This did not occur on the Galapagos islands, for example, where the air was very healthy. Darwin quoted the opinion of Humboldt on this point: he thought that the most insignificant marshes were the most dangerous ones, because – as frequently happened in Veracruz and Cartagena[34]-- they raised the temperature of the air too high. Since on the coasts of Peru the temperature did not rise so much, the fevers were not so pernicious; but sleeping on the coast was a greater danger, and it was therefore more advisable to spend the night on the ship.

In *On the origin of species* there are also several references by Darwin to Humboldt, such as, for instance, a quotation relating to the extensive zones with no strata layers, such as the granitic region of Parime, nineteen times larger than Switzerland. He also referred to him in connection with the geographical distribution of plants, and specifically the genera of plants which were characteristic of the Cordillera, but which were found in the Silla de Caracas[35]. Some allusions to Humboldt may also be found in Darwin's work *The Variation of Animals and Plants under Domestication,* such as for instance Humboldt's reference to a parrot from South America which spoke the language of an extinct tribe, the assumed immunity of white people born in the torrid zone to the attack of the jigger or *Pulex penetrans*, but not of white Europeans[36], or a mention of the character of the *zambos*, of great interest, since it revealed one of the few prejudices shared by both scientists.

References to Darwin in the writings of Humboldt

As to the comments referring to Darwin which are to be found in Humboldt's writings, we should bear in mind the difference of age between the two naturalists, which necessarily leads to an asymmetrical relationship between their mutual inspirations and influences. When Humboldt returned from his fruitful American expedition, Darwin had not yet been born; during the youth of the British naturalist, the Prussian was already publishing a major part of his American oeuvre. Therefore, it is only in the latter works of Humboldt that we can find references to the young Darwin; what the Prussian's possible reaction would have been to the publication of Darwin's work *On the origin of species* thus remains pure speculation, into which we are not going to enter at this point. We know that Humboldt mentioned some of his projects to Darwin, such as the *Examen critique*, where he examines the progress of geography and his advances in the work called *Asie Central*; and in spite of his advanced age he showed a certain pride in his rash courage at working on a new *Physique du monde*, or Physical Geography, which was supposed to cover the entire cosmos.

Humboldt gave a most favourable review in the *Journal of the Royal Geographical Society*, where he stated that Darwin's work was one of the most outstanding studies he had seen published during his long life, due to its perspicacity in the world of science and natural philosophy.

32 *Ibidem*, p. 62.

33 *Ibidem*, p. 175.

34 *Ibidem*, vol. II, p. 196.

35 *Ibidem*, p. 379.

36 *Ibidem*, p. 732.

Where Darwin does indeed appear as an important scientific authority in different contexts was in Humboldt's final work, the *Cosmos*, published a few years later[37]. These references were principally made in a geological context, relating to his research on various volcanoes as well as to his observations regarding the Galapagos archipelago. If we check the specific quotations from Darwin in this masterpiece of Humboldt, we find references to Darwin's *Voyages of the Adventure and Beagle, Journal of Researches into the Geology and Natural History of the various countries visited by H.M.S. Beagle, Geological Observations on the Volcanic Islands, Geological Observations on South America, The Structure and Distribution of Coral Reefs* and *Volcanic Islands*. With his quotations from these publications, as well as his detailed comments regarding their content, Humboldt showed an excellent knowledge of Darwin's works, which already reflects considerable interest in the work of the British naturalist.

In these references the Prussian scholar made no secret of the great esteem he felt for Darwin; he wrote about him in a very flattering way, he praised him on numerous occasions for his beautiful detailed descriptions, his talent and acuteness as an original scholar, as well as the elegance with which his diary was written[38]. He also made very favourable comments on the scientific content of Darwin's works, and presented him as a great specialist, as an excellent geologist[39] "the geologist of the expedition of Captain FitzRoy"[40]. He also made references to his important testimony on the activity of the volcanoes of Chile[41], his explanations of the peculiar formation of the fjord at the final point of the Southeast of America[42], his generalizing vision of the phenomena of earthquakes and the eruption of volcanoes[43] and his "delightful description of Tahiti"[44]. In general, Humboldt seemed to agree with Darwin's observations; he quoted him as a competent authority in his field of study, or referred to Darwin as a basis for his own conclusions. Nevertheless, on certain occasions, he also expressed his doubts, for instance when he said that he hesitated to agree with Darwin's explanations of central volcanoes, set out in his work *Geological Observations on the Volcanic Islands*[45].

The considerable number of references to Darwin's works in Humboldt's final publication reveals the importance which Darwin had already achieved by then in the international scientific community, prior to the publication of his key work *On the origin of species*. In his *Cosmos* Humboldt already seems to have had a certain sense that the idea of the balance and stability of species would be superseded by the new idea of the dynamic change of the natural world. The appearance of this book, published by Darwin in 1859, the year in which Humboldt died, marked the course of the new biology towards the present day, and the break with the former paradigm.

Personal contact between Humboldt and Darwin

So far we have only looked at the mutual references between the two personalities; but we are also interested in knowing more about the personal encounter between the two of them. It was on 29 January 1842 when they met each other, at a breakfast in the house of the geologist Sir Roderick Murchison (1792-1871), for the famous Berlin scholar was keen to meet the eminent Englishman. Nevertheless, contrary to what one would have expected – in view of the importance Humboldt held for the Englishman as a source of inspiration for his scientific work – this encounter appears not have been very successful. Unfortunately we have few details about the content of the conversation, which would have been of great interest to us. There only remains one eye witness account, a unilateral vision from Darwin's side, a short comment he makes in his autobiography, where he confesses that he felt disappointed because he expected too much of Humboldt, and he only remembered from this meeting that Humboldt talked a lot and was very animated:

> I once met at breakfast at Sir R. Murchison's house, the illustrious Humboldt, who honoured me by expressing a wish to see me. I was a little disappointed with the great man, but my anticipations probably were too high. I can remember nothing distinctly about our interview, except that Humboldt was very cheerful and talked much (…).[46]

37 The first edition of the *Kosmos* in German was published in 1845-1862, this analysis is based on the edition published in the year 2004.

38 Humboldt, Alexander von, *Kosmos. Entwurf einer physischen Weltbeschreibung.* (ed. Ottmar Ette und Oliver Lubrich). Frankfurt a. M.: Eichborn, 2004, vol. 1, p. 126.

39 *Ibidem*, vol. IV, p. 795, foot note p. 454.

40 *Ibidem*, vol. IV, p. 820.

41 *Ibidem*, vol. IV, p. 773.

42 *Ibidem*, vol. 1, p. 152, foot note p. 347.

43 *Ibidem*, vol. IV, p. 769, foot note p. 399.

44 *Ibidem*, vol. II, p. 223, foot note p. 103.

45 Darwin, Charles, *Geological Observations on the Volcanic Islands,* 1844, p. 127. *Ibidem*, vol. I, p. 124, foot note p. 226.

46 Darwin, 1997, p. 110-111.

Furthermore we know from a later letter of Darwin to Hooker that, among other things, during this London meeting he discussed with Humboldt the influence of the climate and the ground on the diversity of vegetation. Darwin recalled how Humboldt told him about the river Obi, in the northeast of Europe, on whose banks there appeared totally different flowers, in spite of the fact that the ground and the climate were the same; which seemed to indicate that there were still other causes for this variation[47].

Prior to this personal encounter there was an exchange of letters between the two prominent naturalists. It started with a letter from Darwin to Humboldt, which has unfortunately not been preserved. The answer from Humboldt dated on 18 September 1839 is still in existence[48], as is Darwin's reply sent on 1 November of the same year[49].

In the first preserved letter, Alexander von Humboldt addressed Darwin to congratulate him on the publication of the diary of his voyage aboard the *Beagle*. This letter has been known since 1972, and is incorporated as number 534 in the collection of Darwin's correspondence published by the University of Cambridge. Humboldt expressed his emotion after having read the text which Darwin qualified simply as the "diary of a naturalist". Furthermore, he confessed to feeling proud at being able to have some influence on this work, since in his opinion an *opus* could only be considered good if it inspired other and better works. As Humboldt stated, the same had happened to him with Charles Darwin's grandfather Erasmus, whose publication on *Zoonomia* had undoubtedly influenced him at the time when he was working on the excitation of nerve fibres through electric stimuli.

Regarding the specific scientific aspects which interested him in Darwin's work, Humboldt was unstinting in his praise of "the number of new and ingenious observations on the geographical distribution of organisms, the physiognomy of plants, the geological structure of the earth's crust; the ancient oscillations", on the "green and damp vegetation of the *páramos*" etc.; a great many observations, which amazed the Prussian scholar, who went so far as to compare this diary of the British naturalist with the personal annotations of the natural scientist Johann Reinhold Forster (1729-1798), praising particular pages of Darwin and the beautiful ending of the work, which according to Humboldt was the expression of moral calm in a pure and benevolent spirit. Humboldt shared some curious ideas, which Darwin presented in his excellent work, about the mixture of tropical and polar forms which appeared in South America. In the same way, Darwin's reflections on the possibility of the existence of great pachyderms in a non-continental but insular climate similar to that of South America were excellent, in the opinion of Humboldt, who had lived a considerable time in those high plateaus where the temperature stayed continuously between 4º and 12º Reaumur. When he commented to Darwin that it was a pity that Henslow had not yet managed to describe the botanical collection, he stated: "La vegetation offre le caractere fondamental d'un pays. En le traçant, même a grands traits, on donne une image qui se fixe, c'est presque de la stereotypie", though Humboldt showed his wisdom when he exclaimed: "Que de choses nous ignorons encore!"

Another topic of this letter between the two learned men was the cold current along the coasts of Peru which, Humboldt thought, considerably modified the climate of the American seaboard. He therefore asked Darwin if his assessments were consistent with Darwin's and Captain FitzRoy's experience, a question which Darwin answered in his letter of 1 November of the same year.

Darwin's reply differs considerably from the very extensive and flattering letter Humboldt had sent him. He makes hardly any reference to the points mentioned by the Prussian scholar; this may be thought a rather surprising attitude, after having received such a personal and detailed letter from a personality of such scientific prestige. It seems even more astonishing if we take into account that at that moment Darwin was intensively studying the works of Humboldt. The British naturalist did not take advantage of the opportunity to discuss his impressions, present his own theories, compare them to those of the Prussian author, raise doubts etc. Darwin limited his interaction with Humboldt to sending him a series of measurements taken in the sea off the Galapagos, in the South Pacific as well as in the Abrojos islands.

The only words of a more personal or flattering nature can be found at the end of this letter, where he expresses the joy he felt when he received Humboldt's letter, and where he admits that he had copied over and over again the descriptions from Humboldt's work *Voyage aux régions équinoxiales du Nouveau Continent*, and that he always kept them in his mind.

In conclusion, we may say that there was mutual admiration in the exchange of looks between these two

47 Letter 789, Charles Darwin to J. D. Hooker, 10 November 1844. See also Letter 791, Hooker to Darwin, 14 November 1844.

48 See this letter is published in its original French version: http://www.darwinproject.ac.uk/entry-534. An English translation is offered in the Humboldt Digital Library, http://avhumboldt.net/index.php?page=154#correspondence.)

49 This letter is published on http://www.darwinproject.ac.uk/entry-545 as well as in the Humboldt Digital Library, http://avhumboldt.net/index.php?page=154#correspondence.

learned men, though in their personal contact there was less than we might have expected. Maybe Humboldt's strongest influence was in Darwin's way of describing nature in the Humboldtian style, a perfect system from the literary point of view, which was followed for many years by naturalist travellers. Furthermore, Humboldt had a clear influence on the young Darwin in several scientific questions which the Prussian had satisfactorily resolved, such as the geographic distribution of living beings, though there were already signs of the break between the theory which saw Nature in perfect balance and the one Darwin was beginning to glimpse at the time. This vision saw the natural world in a great process of evolution, guided blindly by mechanisms such as natural selection, and with no specific purpose, and as a consequence, giving rise to a theory which led to the passage from classical natural history to the new science of biology.

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