History of sciences

Alexander von Humboldt and the hand-beast: A contribution to palaeontology from the last universal scholar

Fabien Knoll

Departamento de Paleobiología, Museo Nacional de Ciencias Naturales–CSIC, C/José Gutiérrez Abascal 2, 28006 Madrid, Spain

Received 3 April 2008; accepted after revision 2 December 2008
Available online 18 March 2009
Presented by Michel Durand-Delga

Abstract

Despite a certain interest in the discipline, Alexander von Humboldt did not personally contribute much to the progress of palaeozoology. His most remarkable input derived from a communication about hand-like archosaur footprints from the Buntsandstein at the very acme of the important controversy that the discovery of these fossils generated (1835). Humboldt thought that the tracks were probably from a possum-like marsupial, but he did not discount that they could be from a primate. This study is characterized by its superficiality: both the anatomical comparisons and the considerations of the functional morphology of locomotion are very poor. Its effect on the scientific community proved about nil, in both the short and the long run, and Humboldt may himself have doubted his initial conclusions in later years. Nevertheless, in contrast with some contemporaneous renowned geognosts, he had no hesitation from the beginning that the footprints were genuine. He also did not hesitate to weaken the belief of the time on the timing of the succession of organised beings in geological ages, naturally without lapsing into “antiprogressionism”.

Résumé

Alexander von Humboldt et la bête-main: une contribution du dernier savant universel à la paléontologie. Malgré un certain intérêt pour la discipline, Alexander von Humboldt ne s’est impliqué personnellement à faire progresser la paléozoologie que d’une manière modérée. Sa contribution la plus remarquable tire son origine d’un exposé sur des empreintes de pas d’archosaures, en forme de mains, du Buntsandstein, présenté à l’apogée (1835) de l’importante controverse que ces fossiles ont suscitée. Humboldt fut de l’avis que ces pistes étaient probablement celles d’un marsupial du groupe des phalangers, mais il ne rejeta pas qu’elles puissent se rapporter à un primate. L’étude qu’il fit publier est superficielle : les comparaisons anatomiques, tout comme les considérations de morphologie fonctionnelle, sont des plus sommaires. Son impact sur la communauté scientifique fut à peu près nul, à court aussi bien qu’à long terme, et il est tout à fait possible que Humboldt ait douté de ses premières conclusions dans les années qui suivirent. Néanmoins, à la différence de certains géognostes contemporains réputés, il n’hésita aucunement à reconnaitre dès l’abord que ces empreintes de pas étaient authentiques. Il n’eut pas non plus de réticences à remettre en cause les convictions de l’époque sur l’ordre de succession des êtres organisés au cours des temps géologiques, bien évidemment sans sombrer dans « l’antiprogressionisme ».


Keywords: Humboldt; History of science; Ichnology; Triassic; Germany

Mots clés : Humboldt ; Histoire des sciences ; Ichnologie ; Trias ; Allemagne

E-mail address: mcnfk854@mncn.csic.es.

1631-0683/$ – see front matter © 2008 Académie des sciences. Published by Elsevier Masson SAS. All rights reserved.
1. Introduction

Though somewhat inferior to the contributions that he provided to plant geography (e.g., reference [55]), the input of A. von Humboldt to historical geology and vertebrate zoology (e.g., references [58] and [62]) is still acknowledged as being as diverse as it is significant. One could therefore have expected his participation to the progress of vertebrate palaeozoology, a discipline at the interface between these two sciences, to be at least equally important. Yet this is not so.

Admittedly, Humboldt listed the study of fossils as one of the themes worthy of his attention in a letter to the poet F. Schiller in 1794 ([3], pp. 64–65), and he wrote nearly three decades later “l’étude approfondie des corps fossiles n’embrasse qu’une petite partie de la géognosie, mais une partie bien digne de l’attention du philosophe” ([62], p. 35). He indeed shared interest in miscellaneous issues related to palaeontology such as the preservation of large mammals in some parts of Siberia, and certainly numerous references to fossils are scattered throughout his works (e.g., in references [52, 62, 69, 70]).

However, it seems he was not inclined to produce more than exegeses or mere general considerations. This was not a result of the lack of worthy fossil specimens at his disposal. For instance, as early as 1789, while France sank even more in the revolution, he had the opportunity to have a look at the first pterosaur discovered [78]. Yet he did not seize it to challenge the description of C. Collini [17], a former secretary of Voltaire [18], and to reveal the very particular nature of the animal. Moreover, he himself made a number of interesting fossil discoveries in the course of his various activities and travels. He directed palaeontological excavations near Bogotá [54, 68, 72], a fairly precursor initiative in 1801. In fact, he repeatedly found fossils in the “New Continent”, particularly remains of proboscidians that he disposed of to the greatest benefit of the anatomist G. Cuvier, who called a “Mastodonte” after him (e.g., references [22, 23, 53, 54, 60]), but also “petrified” shells described by the geologist L. von Buch [15].

The sole exception to this apparent lack of sound personal involvement seems to be the case of the fossil footprints named Chirotherium (“hand-beast”) found near Hildburghausen (then Duchy of Saxe-Meiningen, today the Free State of Thuringia) in 1833, which justifies taking a close look at the issue.

2. Discovery

The narrative of Chirotherium has been told several times (e.g., in reference [103]), although with varying accuracy. It appears that these footprints were first noticed in the spring of 1833 by the director of the Hildburghausen high school, the archaeologist F. Sickler (who, incidentally, was previously preceptor of Wilhelm von Humboldt’s children in Italy [110]), on the slab used in the laying of the foundation wall of a small garden house. These specimens had been strongly damaged during the extraction of the sandstone panels and their transport from the quarry. Sickler promised the workers a small remuneration if they could provide him in the future with a well preserved specimen. This certainly had the desired effect because in the summer of 1834, the quarry men attentively isolated every stone that they thought could bear something of interest. The news of the discovery came rapidly to the ears of two local Hildburghausen personalities: C. Hohnbaum, a physician, and C. Barth, a copper engraver. Both brought home specimens. Through a Commissioner of Forests called H. Gleichmann, these tracks were made known to R. Bernhardi, professor of natural science at the Academy of Forestry at Dreissigacker (Meiningen), who wrote a letter on the subject (in which he interpreted the footprints as from an amphibious animal) in September 1834 [6]. In December of the same year, Sickler [107] published a brochure on the Hildburghausen footprints in which he provided not only details of the discovery but above all a plate well illustrating three types of footprints and their situation on a slab of sandstone. In this contribution, he wished that one of the most remarkable German “geognosts” of the time (and he specifically cited Humboldt as one of them) would offer a detailed investigation of the footprints of the Hildburghausen area.

3. Aftermath

Fossilised footprints have been known for centuries and the Hildburghausen examples were not even the first ones considered by the scientific community. More than 20 years earlier, dissimilar footprints were discovered in Scotland and later studied by the Reverend J. Grierson [36] and subsequent authors (Humboldt [65, 66] was well aware of this discovery). We also know that Chirotherium footprints were discovered in England by quarrymen a dozen years before 1833 and were thought to be the tracks left by sinners attempting to escape the universal Deluge [2, 93]. In fact, the commonness of Chirotherium in Europe and North America makes it probable that these footprints were noticed well before the 19th century, a hypothesis that may be supported by some artistic and folkloric evidence [77, 92].

The short booklet of Sickler [107] was presented as a sort of open letter to the anatomist J. Blumenbach.
(from whom Humboldt was given lectures at Göttingen) and was followed by a second, iconographically richer one [76] (see also references [45,49]). It provoked a tremendous reaction from savants. The Hildburghausen footprints were mentioned in numerous publications, especially in the year that saw planetary science marked by the perihelion of Halley’s comet (1835). As the number of articles published in newspapers shows (see reference [44], p. 523), the topic even attracted the attention of the general public. Although it was considerably less than, say, the interest caused by the poor K. Hauser sometime before, this should be stressed in a Europe ravaged by cholera and overwhelmed by strong social changes. E. Mörike even dedicated one of his numerous poems to the Chirotherium-problem [90].

The excitement originated from the uncanny resemblance of some of the footprints to the autopod of a “quadruman”, which questioned the knowledge then about faunal succession through time. Nowadays, we know that of the two species of Chirotherium found at Hildburghausen, the smaller was made by an animal similar to the enigmatic primitive archosaur Ctenosaurus [28] and the other, whose reconstruction has stood in the marketplace of Hildburghausen since 2004 (Fig. 1), by a creature close to (but much larger than) the even more primitive Osmolskina [12]. In fact, two main hypotheses were expressed regarding the large Hildburghausen track maker. What could be considered today as a conservative assumption, saw the responsible animal as an amphibian or a reptile. This hypothesis was first defended by R. Bernhardi [6] (see also reference [73]), the physiologist A. Berthold [7], the naturalist H. Link [83,84] (see also references [91,80]), one of the first teachers of Humboldt in “geognosy” at Göttingen, and the mining adviser J. Nögerath [94,95]. Others, such as the palaeontologist H. Bronn [13], the zoologists J. Kaup [74,75] (see also references [20] [47], p. 743, [50,51,109]) and A. Wiegmann [114,115] (see also reference [30]), and the naturalists F. Leuckart [82] and F. Voigt [111], conjectured that a mammal could be responsible. It should be remarked that all these communications, except those of Wiegmann [115] and Link [83,84], which were later, were possibly known to Humboldt when he dealt with the subject.

4. Humboldt’s communication

It is in this context, on 17 August 1835 (a little more than 4 months after the death of his brother, which so deeply affected him), at the age of nearly 66 (Figs. 2–4), that Humboldt read his note on the footprints from the Hildburghausen area to the Academy of Sciences of the Institute of France in Paris [65,66] (see also reference [81]).

Humboldt revealed immediately that he had no doubt that these footprints were actual tracks of a bygone animal. This is not a trivial point. In fact, in those days renowned savants, such as the palaeontologist H. von Meyer and, especially, Buch (who was considered the greatest “geognost” of his time by numerous col-

---

**Fig. 1.** Chirotherium monument (see [39]) in Hildburghausen: bronze reconstruction with footprint-bearing slabs in the background (2006, photograph B. Hutschenreuther).

**Fig. 1.** Monument au Chirotherium [39] à Hildburghausen: reconstitution en bronze avec des dalles portant des empreintes de pas au second plan (2006, photographe : B. Hutschenreuther).
leagues, including Humboldt [72]), did not believe that specimens of this kind could be true tracks (see e.g., [11,14,27,31,32,33,79,96,105,106]).

Humboldt also had no reservations that these footprints were made by a mammal. He said that the beast was probably a marsupial, but without giving any reasons for his statement. On the basis of toe configuration, he stressed that it was most likely not an opossum, a kangaroo, or a wombat. He said that the fossil recalls the possum (phalanger), but again he gave no details, and added that it also evokes in some respects the lorises (small arboreal primates). He indicated, nevertheless, that his opinion about the trackmaker was little more than suggestion: zoologists had to decide. Interestingly enough, the foot of possums has a powerful opposable great toe, which makes it indeed much more reminiscent of Chirotherium than the foot of opossums and other marsupials (see e.g., reference [26]).

On the basis of the fleshy form of the sole of the feet and what he knew of the gait of the crocodile from the numerous observations he made on the banks of the Orinoco, he rejected at the end of his note the idea that the fossil footprints were made by a reptile. It is puzzling that Humboldt did not justify his statement regarding the distinctiveness of the tracks from Hildburghausen relative to those left by modern crocodiles. In fact, Humboldt showed constant interest in crocodiles during his travels in Latin America. He wrote scientific works on their anatomy and physiology [57,59], but also reported a number of more trivial observations (e.g., references [54,56,60,61,63,64]). We know he also had the opportunity to examine Nile crocodiles in Italy [37] (p. 202). Yet he limited himself to evoking vague differences when he could have straightforwardly discarded any ideas of close affinities between Chirotherium and living crocodilians with ease, in view of, for instance, the functional pentadactyly of the pes and the obtrusive “great toe” (in fact, digit V) projecting strongly
l laterally in the former (see e.g., reference [98], fig. 20.10). At the end of World War II, the physician and amateur palaeontologist H. Rühle von Lilienstern [102] wrote that Humboldt [66] considered the fifth digit of the Chirotherium footprints as a fleshy appendage, but this is incorrect. This hypothesis was expressed by the part-time naturalist abbot Croizet [21] about 9 months after Humboldt’s communication. The text of Humboldt
[65,66] made it clear that the issue of digit identification was overlooked: Humboldt saw the polliciform fifth digit as a normal “thumb”.

5. Outcome

Curiously, the considerable prestige Humboldt enjoyed in the 1830s does not seem to have influenced measurably the debate on the origin of the Chirotherium footprints. His communication was echoed in a number of journals and popular magazines (e.g., references [1] [46], p. 695, [89]), but it seems that no scientist demonstrated enthusiasm for it. Some interest is visible in one of the end notes of the posthumous editions of A. Bertand’s Lettres sur les Révolutions du Globe (8) and seq.) and in H. Girard’s study [35]. But Humboldt’s conclusions are discarded in these latter works. Significantly, one looks in vain for Humboldt’s name in a paper by the geologist H. Geinitz [33] dedicated to the animal tracks from the past. In fact, after Humboldt’s [65,66] contribution, the mammalian hypothesis for the Chirotherium footprints steadily became obsolete (for a notable resurgence see Daubrée [24,25]).

Contrary to what was related by the scriptural geologist G. Fairholme [29], Humboldt was not involved in the discovery. By 1835, he had not even gone to the quarries close to Hildburghausen [10]. This is particularly worth mentioning because they were often visited by cultured persons at this time ([44], p. 523, [48], p. 302); several geognosts went to observe the phenomenon an Ort und Stelle (e.g., [83,84,112]). His lecture before the Academy was based on the observation of the large slab purchased by the Berlin Mineralogy Cabinet in 1835 and currently exhibited in the Natural History Museum that descends from it.

The work of the young anatomist R. Owen [99] and, especially, the influence of his attempted reconstruction of the animal (see e.g., reference [87], fig. 331)—as fantastic as it was—had a soothing effect on the controversy. Even if it did not snuff it out, it proved as influential as Humboldt’s report has been inconsequential. Although mistaken (but see reference [4]), Owen’s hypothesis indeed predominated until long after Humboldt passed away, especially outside the palaeontologists’ microcosm. But did that make Humboldt change his mind about the Chirotherium maker?

According to the writer H. Wendt [113], Humboldt afterwards had doubts about the real identity of the Hildburghausen footprints and, consequently, advised the use of the alternative name Chirosaurs if the animal proved to have been a reptile. The story that Humboldt revised his opinion has been told more recently by palaeontologists who also suggested that this resulted from further collaboration with Kaup [85,86]. Yet, the name Chirosaurs was introduced by Kaup [74] in a letter dated 2 February 1835, more than half a year before Humboldt’s communication in Paris. The origination of the fabled collaboration between Humboldt and Kaup, strange as it is, might originate with the palaeontologist W. Soergel ([108], p. 3), who mentioned that “Kaup und v. Humboldt” saw the Chirotherium traces as from marsupials (though naturally he referred to independent results). But why it is believed that Humboldt secondarily considered the Chirotherium-maker a reptile remains puzzling.

In fact, it seems that Humboldt showed very little interest in the Chirotherium problem after 1835. Admittedly, that was a period of his life during which the writing of the Kosmos allowed him less and less time for what he may have seen as accessory issues.

In 1836, Humboldt attended the 14th Versammlung der Gesellschaft deutscher Naturforscher und Ärzte in Jena. There he repeated that he had no doubt that what were found near Hildburghausen were true footprints, but it seems no consensus emerged at the end of the session as to the sort of animals that made such prints [97].

In 1838, in the name of the geologist and clergyman W. Buckland, he offered to the Academy of Sciences in Paris plates representing footprints of a quadruped said to be similar to those of Hildburghausen [67] (see also reference [34]), but he did not appear to have seized the occasion to discuss the matter further.

In 1839, the geologist C. Degenhardt wrote to A. von Humboldt a letter containing geological and meteorological notes [88]. He signalled therein the discovery of the first fossil footprints in South America. Nevertheless, Humboldt did not diffuse this news as it deserved and it quickly fell into oblivion.

In the Kosmos, Humboldt ([71], p. 285) settled for mentioning the existence of fossil tracks. He did not mention the footprints from Hildburghausen nor even the rich North American ichnofauna that had been made known shortly before (e.g., [40,41,42,43]). Besides, he mentioned ([71], p. 290) that the first mammals come from the Jurassic of the Stonesfield slate (England), whereas the “Saurians” begin with the Zechstein. This may reveal a change of opinion regarding the zoological affinity of the Chirotherium. However, Humboldt ([71], p. 290) cited the oldest birds as from the Lower Cretaceous, whereas we know that in 1847 he regarded the much older North American footprints as from a moa ([101], p. 368). Likewise, in an atlas originally planned as a complement of the Kosmos, the cartographer Berghaus ([5], Abt. 3, pl. 11) captioned “Didelphys”
and “Cheirotherium?” the same small sketch (dated 1841) of an opossum. Admittedly, this is an adaptation of the first plate from Buckland’s [16] contribution to the so-called “Bridgewater Treatises”, but still Humboldt’s agreement is suggested.

Some years later (1847), in a letter addressed to the geologist L. Elie de Beaumont, Humboldt evoked the traces of Hildburghausen as incontrovertible facts even when Buch saw them as chimeras ([101], pp. 367–368). Yet there is no evidence that he often mentioned the Chirotherium in his abundant correspondence, which is admittedly known only partially. Later on, in 1851, the physician L. Besser addressed a letter to Humboldt on the discovery of Chirotherium footprints near the Thuringian town of Kahla ([9]; see also [19], p. 51). The latter does not appear to have been very interested in the subject, absorbed as he was by the achievement of the Kosmos. Hence, it was in a letter to Bronn and not to Humboldt that the pharmacist S. Schwabe [104] wrote on the Kahla area footprints sometime later.

6. Conclusion

In conclusion, Humboldt’s contribution [65,66] to the study of the fossil footprints from Hildburghausen makes it clear that the Prussian naturalist was not reluctant to reassess knowledge that could be considered sound, such as the absence of mammals in old formations like those of the Buntsandstein. Yet, Humboldt’s survey was rather superficial and mistaken (though this was demonstrated much later). Its fallout on the scientific community has been nil and its effect on the public has been about its practical appearance, outside the German-speaking part of Europe. One could therefore assume that Humboldt openly wanted to catch the attention of scientists on an issue that was intently debated outside their homeland. One might, however, also consider that a universal scholar like Humboldt was not willing to stay outside a controversy that had involved less experienced personalities such as Kaup, Wiegmann, and Berthold.

Acknowledgments

This study was initiated by the reading of D. Botting’s book on Humboldt’s life, which is given to each Alexander von Humboldt Stiftung research stipendary at the end of their fellowship. M. Benton, R. López Antoñanzas, and K. Padian improved the manuscript through critical reading. For help in providing literature, I thank especially A. Butte, A. Fiebig, N. Guibout, H. Klein, I. Moron, C. Roolf, S. Sachs, S. Tolksdorf, and C. Velasco. C. Callou, S. Hackethal, P. Heurtel, M. Pastoureau, C. Pereira, C. Pouret, and F. Queyroux kindly tried to locate Humboldt’s plates at my request in Paris and Berlin. The author holds a “Ramón y Cajal” research contract from the Ministerio de Ciencia e Innovación (Madrid) and is supported by the research project CGL2008-05813-C02-01.

References


C. Collini, Mon Séjour auprès de Voltaire et Lettres inédites que m’écrivit cet Homme célèbre jusqu’à la dernière Année de sa vie, L. Collin, Paris, 1807, 373 (xvi) pp.


G. Fairholme, New and conclusive physical Demonstrations, both of the Fact and Period of the mosaic Deluge, and of its having been the only Event of the kind that has ever occurred upon the Earth, T. RIDGWAY & sons, London, 1837, 443 (xx) pp.

A. von Humboldt, Ueber die Hochebene von Bogota, Deutsche Vierteljahrschrift 1 (1839) 97–119.


J.J. Kaup, Thier-Führten von Hildburghausen: Chirotherium oder Chirosaurus, Neues Jahrbuch für Mineralogie, Geognosie, Geologie und Petrefaktenkunde 3 (1835) 327–328.


F.S. Leuckart, Ueber die Verbreitung der übriggebliebenen Reste einer vorweltlichen organisichen Schöpfung, insbesondere die geographische Verbreitung derselben in Vergleich mit der, der noch jetzt existirenden organischen Wesen, Groos, Freiburg, 1835, 82 ( xii ) pp.


H.F. Link, Note sur les traces de pattes d’animaux inconnus contre-épreuves dans le grès, près de Hildburghausen, Annales des Sciences naturelles–Zoologie 4 (1835) 139–141.


[112] F.S. Voigt, Thier-Fährten im Hildburghauser Sandsteine (Palaeopithecus), Neues Jahrbuch für Mineralogie, Geognosie, Geologie und Petrefaktenkunde 3 (1835) 322–326.

