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

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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". ***To cite this article: F. Knoll, C. R. Palevol 8 (2009).***
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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 reconnaître 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 ». ***Pour citer cet article : F. Knoll, C. R. Palevol 8 (2009).***
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Keywords: Humboldt; History of science; Ichnology; Triassic; Germany

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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 *Ctenosauriscus* [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. Nöggerath [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-

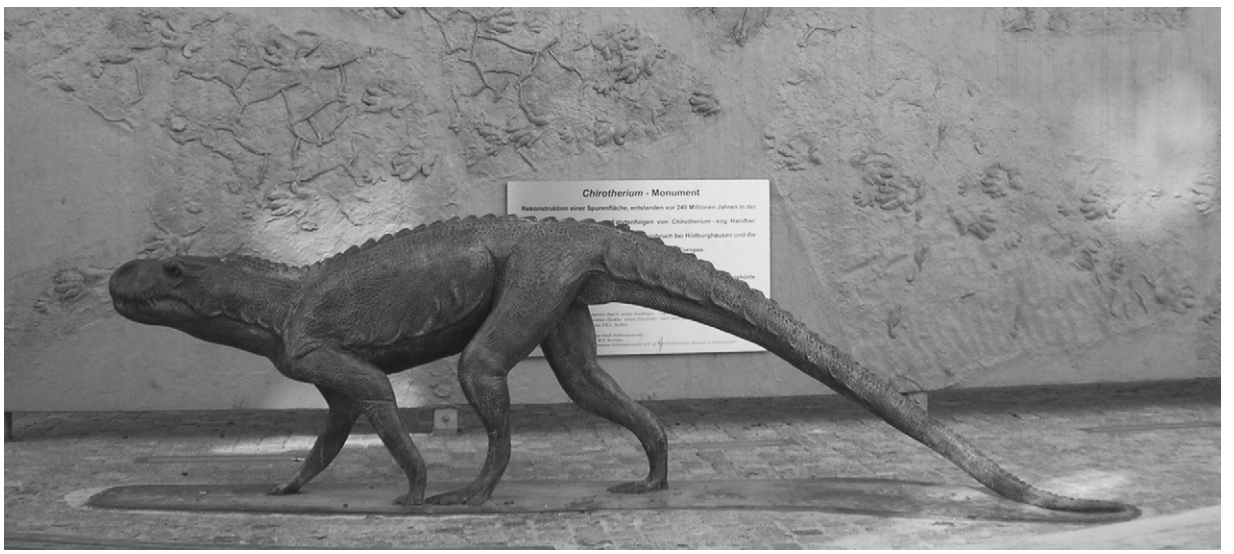
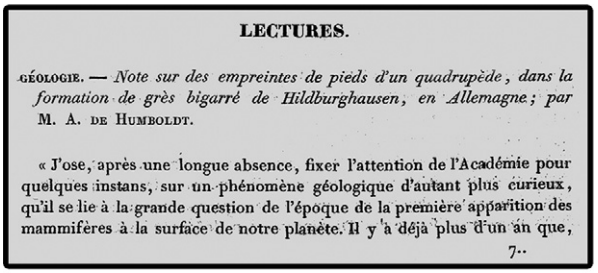


Fig. 1. Chirotherium monument (see [39]) in Hildburghausen: bronze reconstruction with footprint-bearing slabs in the background (2006, photograph B. Hutschenreuther).
Fig. 1. Monument au Chirotherium [39] à Hildburghausen: reconstitution en bronze avec des dalles portant des empreintes de pas au second plan (2006, photographe : B. Hutschenreuther).

Fig. 2. Portrait of A. von Humboldt by H. Lehmann at about the time of his communication on the footprints of Hildburghausen (oil on canvas, private collection).
Fig. 2. Portrait de A. von Humboldt par H. Lehmann à l'époque de sa communication sur les empreintes de pas de Hildburghausen (huile sur toile, collection privée).



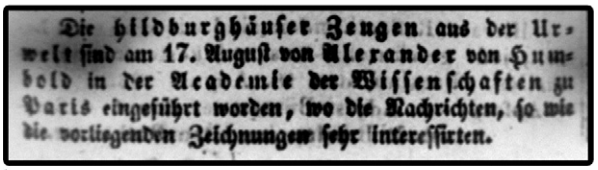
LECTURES.

géologie. — *Note sur des empreintes de pieds d'un quadrupède, dans la formation de grès bigarré de Hildburghausen, en Allemagne; par* M. A. de Humboldt.

« J'ose, après une longue absence, fixer l'attention de l'Académie pour quelques instans, sur un phénomène géologique d'autant plus curieux, qu'il se lie à la grande question de l'époque de la première apparition des mammifères à la surface de notre planète. Il y a déjà plus d'un an que,

7..

a



Die hildburghäuser Zeugen aus der Urwelt sind am 17. August von Alexander von Humboldt in der Academie der Wissenschaften zu Paris eingeführt worden, wo die Nachrichten, so wie die vorliegenden Zeichnungen sehr interessirten.

b

Fig. 3. **a**: heading of the publication of the talk of Humboldt [65] at the Academy of Sciences of the Institute of France. The first phrase reads "I dare, after a long absence, captivate the attention of the Academy for a moment, on a geological phenomenon all the more odd that it is tied to the great issue of the epoch of the first appearance of mammals on the surface of our planet". In the other, slightly different, version of the same report [66], the adjective "odd" is replaced with "important"; **b**: extract from a Hildburghausener newspaper of 2 September 1835 ([46], p. 695). The sentence can be translated as follows: "On August 17th, the Hildburghausener witnesses of the primeval world were introduced by Alexander von Humboldt at the Academy of Sciences in Paris, where the information, as well as the present drawings, interested much".
Fig. 3. **a** : titre de la publication de l'exposé de Humboldt [65] à l'Académie des sciences de l'Institut de France. Dans l'autre version, légèrement différente, du même compte rendu [66], l'adjectif « curieux » est remplacé par « important » ; **b** : extrait d'un journal hildburghausenois du 2 septembre 1835 ([46], p. 695). La phrase peut être traduite ainsi : « Le 17 août, les témoins hildburghausenois du monde primitif ont été présentés par Alexander von Humboldt à l'Académie des Sciences à Paris, où les informations, tout comme les dessins présents, ont beaucoup intéressé ».

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

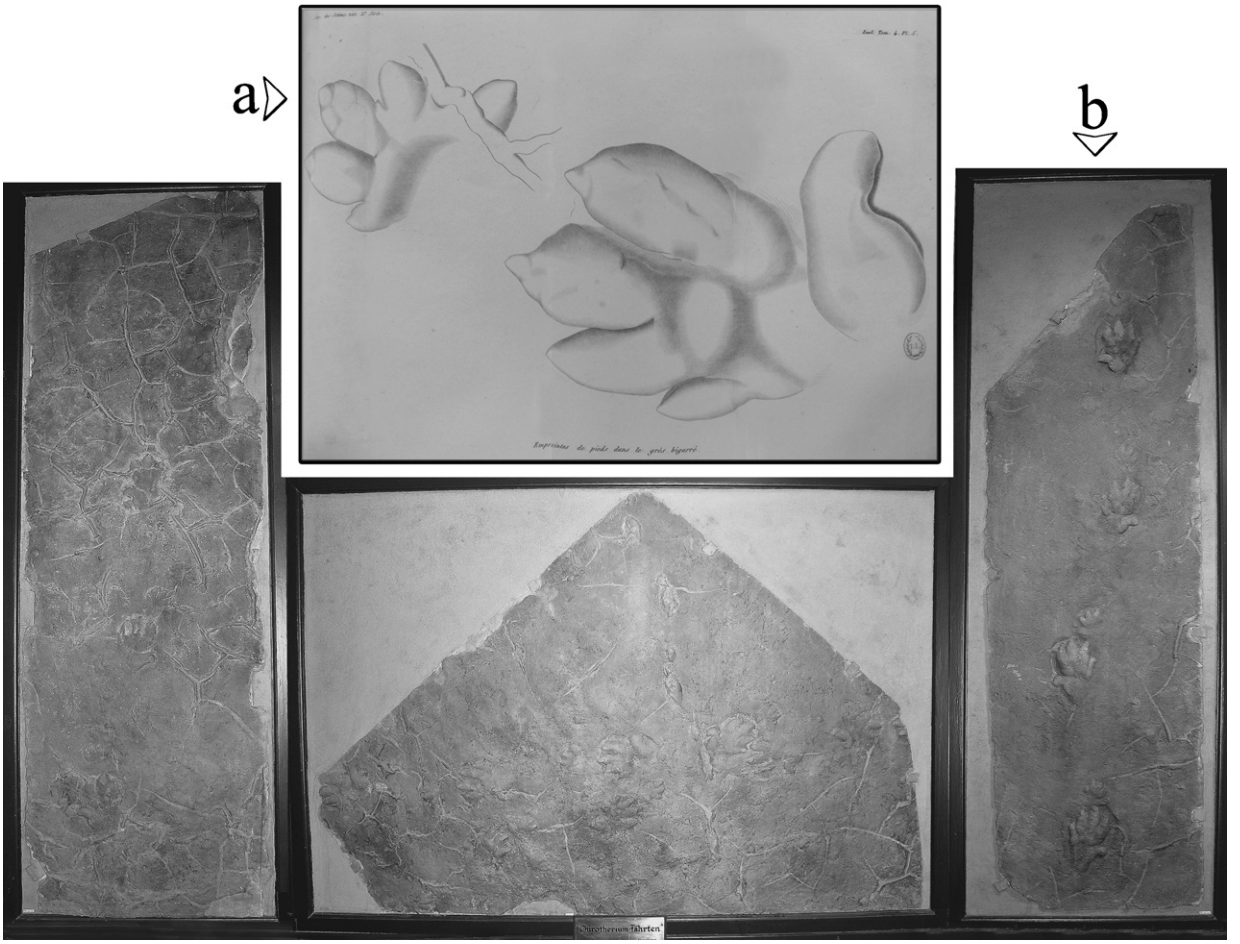


Fig. 4. **a**: plate from the paper by Humboldt [66] ; **b**: footprints from Hildburghausen exhibited in the Natural History Museum of the Humboldt University of Berlin (2006; photomontage F. K.). Humboldt [65,66] mentioned two drawings of footprints from Hildburghausen (housed at the Cabinet of Mineralogy of Berlin), carefully executed under the direction of C. Weiss. He offered them to the Academy of Sciences in Paris, suggesting that it would be interesting that they are kept at the Museum in the Plant Garden. The receipt of these drawings was acknowledged by the Museum ([38], p. 26), but their present whereabouts in Paris are unknown and attempts at locating copies in the Museum in Berlin have also proved vain. The plate of the paper by Humboldt [66] is a portion of one of these drawings, which showed several footprints forming a track. Contrary to what believed Rühle von Lilienstern ([102], p. 369), the large slab in the natural history museum in Paris (currently displayed in the main stairs in the building of comparative anatomy and palaeontology) was unavailable to Humboldt at the time of his speech as it was sent to Paris several months after its removal from the quarry that occurred in midsummer 1835. For an account of the dispatching of the *Chirotherium*-bearing slabs from Hildburghausen, see Regteren Altena [100] and Haubold [39].

Fig. 4. **a** : planche extraite de l'article de Humboldt [66] ; **b** : empreintes de pas de Hildburghausen exposées au Muséum d'Histoire naturelle de l'Université Humbolt de Berlin (2006; photomontage : F. K.). Humboldt [65,66] mentionna deux dessins d'empreintes de pas de Hildburghausen (conservées au Cabinet de Minéralogie de Berlin), soigneusement réalisés sous la direction de C. Weiss. Il les offrit à l'Académie des sciences à Paris, en suggérant qu'il serait intéressant qu'ils soient gardés au Muséum au Jardin des Plantes. Ces dessins ont bien été reçus par le Muséum ([38], p. 26), mais leur localisation actuelle à Paris est inconnue et des tentatives pour retrouver des copies à Berlin se sont révélées vaines. La planche de l'article de Humboldt [66] est une partie de l'un de ces dessins, lequel montrait plusieurs empreintes de pas formant une piste. Contrairement à ce que croyait Rühle von Lilienstern ([102], p. 369), la grande dalle au Muséum national d'Histoire naturelle à Paris (actuellement exposé dans l'escalier principal du bâtiment d'anatomie comparée et de paléontologie) n'était pas accessible à Humboldt quand il fit son exposé, puisque celle-ci fut envoyée à Paris plusieurs mois après son extraction de la carrière, laquelle eu lieu vers le milieu de l'été 1835. Regteren Altena [100] et Haubold [39] ont donné un compte rendu des divers envois de dalles à empreintes de pas depuis Hildburghausen.

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] *et 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 *Chirosaurus* 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 *Chirosaurus* 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 equally so. Humboldt himself did not show particular interest in fossil footprints afterwards and never cited his work about. After Owen's [99] contradictory hypothesis, he did not show any ardour in defending his own and he was possibly unconfident as to the mammalian origin of the "hand-beast", after having been unconvincing.

Because Humboldt could not provide a definitive judgment, his motivation for giving a talk on this topic is not clear. The matter was trendy, but not new in August 1835. However, it is also true that it had not been brought up in any learned society or academy, nor had it practically appeared in print, 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.

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