



'Scenes from deep times': bones, travels, and memories in the cultures of nature in Brazil

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Abstract

This article examines the different roles played by field and non-field naturalists in constructing cultures of nature and in the dispute to construct scientific careers in the nineteenth century. Based on the concept of "threshold experience," it looks at little-explored aspects of Peter Wilhelm Lund's paleontological work (1801-1980) in Brazil and its international impact.

Keywords: history of the sciences, history of paleontology, communication in the sciences.

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Histories of Great Bones

The years from 1842 to 1859 were crucial for construction of the theories of Wallace and Darwin regarding the origin of the species and are admirably indicated in the most famous of Darwin's letters to Lyell.

To Charles Lyell, 18 [June 1858.]
Down, Bromley, Kent, 18
My dear Lyell

Some year or so ago, you recommended me to read a paper by Wallace in the *Annals*, which had interested you and as I was writing to him, I knew this would please him much, so I told him. He has today sent me the enclosed and asked me to forward it to you. It seems to me well worth reading. Your words have come true with a vengeance that I should be forestalled. You said this when I explained to you here very briefly my views of "Natural Selection" depending on the Struggle for existence. – I never saw a more striking coincidence. If Wallace had my M.S. sketch written out in 1842 he could not have made a better short abstract! Even his terms now stand as Heads of my Chapters. Please return to me the M.S. which he does not say he wishes me to publish, but I shall of course write at once and offer to send it to any Journal. So all my originality, whatever it might amount to, will be smashed. Though my Book, if it will ever have any value, will not be deteriorated; as all the labour consists in the application of the theory. I hope you will approve Wallace's sketch, that I may tell him what you say.

Yours most truly,
C. Darwin (Darwin, 2000)

Those were decades of intense debate. Letters like these are valuable testimony of witnesses to the negotiations, passions, sentiments and subjectivities that scientific publications have attempted to eliminate, namely publications increasingly invested with the ideals of 'communitarian objectivities' (Daston, 1999; Lopes, 2007), of practices that are organized around networks of international cooperation. The debates on the importance of fossils for explanations on the origin and transformation of life on Earth unfold in very diverse scientific cultural frameworks contained in letters, journals, scientific periodicals and literary and science publications.

Prior to the 1860s, the main currents of paleontology in these debates were still driven, albeit with important nuances, by the outstanding influence of Cuvier's theories concerning the invariability of the species. Brazilian territories traversed systematically by foreign naturalists formed part of these debates. Imbued with Humboltian ideas (Dettelbach, 1997), these naturalists incarnated not only Humboldt's trajectories, but also those of Bonpland. Participating in such debates were countless fossil collectors and classifiers, who expanded the reach of paleontology. Each new excavation added animals and plants to the paleontology culture that had never been imagined, whether in terms of their subtle differences or their discovery in unsuspected geographical regions.

At the center of these polemics, the bones from the coasts of South America that were obtained in London, thanks to Darwin's following in the footsteps of D'Orbigny, acquired a prestige (and market price) that preceded by decades the fame that the *Origin of the Species* would attain. The search for plants, animals, but also for bones and petrifications also marked the activities of naturalists, traders, and some foreign and even local ladies and gentlemen who traveled through the territories of Brazil and America. Like many plants, many animals, bones and petrifications – dense artifacts of cultural significance – also occupied center stage in palace, museological and periodical intrigues.

Emphasizing the search for plants, minerals and animals in Brazil, travelers discovered petrified bones, shells, plants and fish, making their contributions to the diverse areas of paleontology that were defined in the first half of the 19th century. The activities carried out by nationals or foreigners came to be more completely recorded in scientific articles, books and travel narratives, which began to mention Brazil in their indices in the 1830s. More than the history of great personalities, they are the history of great bones. They are replete with references to discoveries of bones and petrifications recording the most trivial daily activities and social practices of the inhabitants of the *sertão* (Brazil's dry interior highlands). A bone more than 30 paces long found in the excavation of a dam on the outskirts of Rio de Contas, a village in the province of Bahia, is mentioned in the *Corografia Brazilica ou Relação Historico-Geografica do Reino do Brazil*, by Ayres do Casal in 1817. Familiar with the existence of large bones, inhabitants of Minas Novas in the north of Minas gave Saint-Hillarie in 1817 a mastodon tooth from the nitrate lands of the *sertão*. Spix and Martius described the bones of tapirs, quatis and remains of what they identified (improperly) as *Megalonyx* found in Lapa Grande, close to Formiga. They also received from Manuel Inácio de Sampaio, Governor General of the province of Ceará, the fish fossils that figured in their work.

Found by chance, given as presents to please foreigners, simply destroyed by the lime factory or to obtain saltpeter, objects with market values that never reached the figures and proportions that this commerce attained in, for example, Argentina, these fossils assumed different meanings in the negotiation and translation processes that the implemented the cultures of paleontological science in Brazil. Lund in his *Primeira Memória sobre a Fauna das Cavernas* did not understand and considered off the ideas most local inhabitants had concerning his interest in the bones. 'The Brazilians', who never even speculated about the gigantic size of the bones, supposedly human, and did not appreciate such extremely common objects, whose sales prices did not compensate for the trouble of collecting them, thought his search for bones disguised his real interest in diamonds, gold and other riches.

The Brazilians consider these bones unworthy of study, although they are aware of their existence. According to their assertions, whose real worth I recognize based on numerous experiences, the appearance of bone piles in the grotto terrain is, in fact, an extremely frequent event.

I never noted that they tried in any way to explain the presence of notable deposits of such remains. They uniformly believed that the bone piles are those of humans to which they attributed giant size, without such a difference in body dimensions exciting their imagination.

It would surprise them a great deal to see someone occupied in collecting such bone remains, since they do not believe that their value in pharmacies might compensate for the expenses of their extraction. It is useless to try to convince them that they could have any other importance.

Most of the inhabitants of the place consider this question of bones to be a mere decoy, believing that diamonds, gold and other riches are the true purpose of our visits to the caves, which have served as the subject of the most foolish conjectures (Lund, 1950, p.119).

Among the well-known and not-so-well known 'nationals' or Europeans who settled here in search of bones, names almost unknown by the historiography of the sciences in Brazil, that of Peter Wilhelm Lund (1801-1880) constantly appears as a figure of international importance who is prominent in this process of searching for large 'lost species'.

The "succession of the same types in the same areas during the last Tertiary periods" (Darwin, 2006, p. 439) begins with the strong impression made on Darwin by the discoveries of eminent authors, still motivated by the outstanding influence of Cuvier's theories concerning the invariability of the species. Resurrecting the literature of the era, Darwin highlights, among the other contributions to his formulations, the wonderful collections put together by Peter W. Lund in Brazil. William Clift (1775-1849), curator of the collections of the Royal College of Surgeons' Hunterian Museum in England, had demonstrated that the mammal fossils found in Australian caves were closely associated with the marsupials that lived contemporaneously on that continent. In South America, a similar relationship was observed, apparent even to laymen, regarding how much the gigantic skulls seemed like those of present day armadillos found on various parts of the River Plate plain. Darwin himself had detected this similarity during his trip to South America when he was still a layman in paleontology. With his limited practice, he thought he had identified among the various bones, some that belonged to a *Megalonyx* or *Megatherium*. "In confirmation of this, I found in the same formation a large surface of polygonal bone plates that the 'latest observations' (what are they?) reveal to be those of the *Megatherium*. As soon as I saw them, I thought that they must belong to an enormous Armadillo, a living species whose genus is very abundant here" (Darwin, 2000, p.64).

Richard Owen (1804-1892) had demonstrated that most of the mammal fossils that were found there in such abundance were related to the present day types that inhabited the South American continent. "This relationship is even more clearly seen in the wonderful collection of fossil bones made by MM Lund and Clausen in the caves of Brazil. I was so much impressed with these facts that I strongly insisted in 1839 and 1845, in this 'law of the succession of types', 'on this wonderful relationship in the same continent between the dead and the living'." (Darwin, 2006, p.439).

Those same years, during which Darwin insisted on the existence of the law of the succession of types, marked the peak and end of the research of Peter Wilhelm Lund (1801-1880) in the caves found in the region of Lagoa Santa in Minas Gerais, culminating in the publication of his five memoirs (Paula Couto lists 20 publications), various letters and the sending of his excellent collections to Denmark.⁷

Cave Collections

Lund's collections, which resulted from the exploration of more than 250 caves in Minas Gerais⁸, would be stored in Denmark for more than 30 years without being completely studied. After Lund's death, these began to be carefully reviewed in 1884 during another moment of renewed interest in South American fossil fauna, when Florentino Ameghino – the well-known Argentine paleontologist – began to rival and surpass the works of Lund in terms of bone volume, the creation of new ancient animals, memoirs and theories, including American man. In this period the discussions regarding the migrations of successive fauna on the American continent, suspected by Lund, gained in importance, including the works of another recognized Argentine specialist, Francisco Pascasio Moreno, concerning Tertiary and Quaternary fossil fauna on the banks of the Rio Negro and in the deserts of Patagonia, recalled by Gorceix (Reinhardt) in his homage to Lund.

In the *Annaes da Escola de Minas de Ouro Preto* (v.3, 1884), in which Gorceix apologizes in the preface for the publication's lack of periodicity – due particularly to the lack of original works by school professors and students, as well as to the number of collaborators, which, although expanding, was still 'limited' – the memoirs of Lund were translated for the first time into Portuguese, preceded by the memoir *Lund e suas Obras no Brasil (segundo o Professor Reinhardt)* read by Gorceix on the occasion of the school's inauguration of Lund's portrait. In a context in which "the chain of the animal world in geological times had already been proven, the history of which was undertaken by one of the most knowledgeable French paleontologists, Mr. Gaudry", Gorceix (Reinhardt), without detracting from the merits of Lund's work, laments that he had not developed further his theories on the origin of the Lagoa Santa fauna, so characteristic of Brazil (Gorceix, 1884).⁹

From 1888 to 1915, Herluf Winge (1857-1923)¹⁰, a convinced Lamarckist and extraordinary connoisseur of bird calls whose life's work was performed at the Universitets Zoologiske Museum of Copenhagen, prepared the monumental work *E Museo Lundii*, in three volumes, 1,370 pages and 81 illustrated plates. In it, he systematized Lund's collections. Ameghino did not fail to mention the importance of these collections, confirming Darwin's impression, in *Los Mamíferos Fósiles de la América del Sud* in 1880, a work published with Henri Gervais in Paris: "the first collection, notable for the quantity of specimens that it contained and the number of species that they represented [and that was sent to Europe], was assembled in Brazil from 1838 to 1844 by the knowledgeable Dane Lund, who sent it to the Museum of Copenhagen, accompanied by interesting descriptive Memoirs" (Torcelli, 1915).

Such collections¹¹ were described in the letter that accompanied them in 1845, addressed to King Christian VIII of Denmark in terms of three principal sets: "Skeletons of present day animals to serve as a comparison with the pre-historic ones. This section is complete with respect to this region. Bone fragments and mineral samples to clarify the relationships and circumstances under which those animals were found and, finally, the fossil remains themselves, which make up the principal part of the collection" (Mattos, 1930).¹²

As it was impossible to complete the final organization of the bones in Lagoa Santa, Lund, who initially intended to organize them upon his return to Denmark, informed the king that unforeseen circumstances regarding his health prevented him from continuing

his plans. As soon as he had had an essential medical examination and organized a catalogue of the different objects, he promised to send his collections at the first opportunity. In exchange for the material, evaluated at 9,000 *rigsdalers*, 2,800 of which had already been paid to him, Lund received the Ingenio et Arti Medal from the King of Denmark. At the suggestion of Lund himself, the remainder of the payment would be bestowed upon the curatorship of the collections, entrusted to Joseph Reinhardt, who had just returned from Brazil.¹³

Gathered together between rainy seasons and communicated in the initial memoirs, subsequently rectified in several cases, these bones were initially organized and systematized in the five memoirs that Lund regularly sent during those years to the Royal Danish Academy of Sciences. Lund's works had an impact and considerable repercussions on the European paleontology world. In Lund's case, there was the question of language, not to be disdained regarding scientific communication¹⁴, but news of his works quickly circulated, especially thanks to French and German translations, however abbreviated, of his works in the French academy and one of the main specialized publications of the age, *Jahrbuch für Mineralogie, Geognosie, und Palaeontologie*, as well as various English periodicals.

From periodicals already established as scientific, manuals that became classics for study, to science magazines, news can be found regarding Lund's findings. For example, *The Magazine of Natural History* – one of the reading materials that fascinated Darwin (Sheets-Pyenson, 1981) – published an article in Volume 4, Number 37, of January 1840, with the title "View of the Fauna of Brazil, Previous to the Last Geological Revolution", an almost literal translation of the title of Lund's memoir. Considering that it dealt with a merely introductory text to the fauna of the caves, a better name would be "*An Account of the Limestone Caves in the Interior Highlands of Brazil; with a Description of the Mammalia now Occurring in that District*". The importance of this memoir was due to the fact that for the first time in a country very well traveled by European naturalists, Lund proved the abundant existence of limestone caves with organic remains from the period that preceded the 'last great revolution' that had modified the planet (Lund, 1950). His second published article, "*A Survey or Sketch of the Extinct Species of Mammalia which Inhabited the Highlands of Tropical Brazil, Previously to the Last Geological Revolution*", had also been a communication directed to the Society of Sciences of Copenhagen and printed in 1838. The article had been translated from Danish and communicated to *The Magazine* by the Reverend W. Bilton (Lund, 1840).

Bones – human or otherwise – were the essence of Lund's work, as Winge recognized:

When Lund began his research on the animal remains from the bone caves in Brazil, he was not trained for such a task. He had to carry out the work in isolated regions of Brazil's *sertão* interior, without sufficient material to assist in comparison or books. He extracted the material from the caves little by little, so that considerable time passed before it was possible for him to review them as a whole. The remains found were, in large part, only scarce incoherent fragments and the cave animals were, in part, singular creatures, very different from those of today. It would have been a miracle if Lund did not err frequently in his interpretation of the bones. What is almost a miracle is the fact that this did not occur to a greater degree than it did and principally that Lund himself, in general, corrected his own mistakes. From his manuscript [Paula Couto supposes that it relates to the manuscript that accompanied the collections sent to Denmark], it is clearly evident that he had at the end acquired great practice in determining

and interpreting the bones. Those who limit themselves to merely reading his printed memoirs can have no precise idea of his knowledge (Winge, 1915, cited in Lund, 1950, p.25).

Winge's commentaries clearly synthesize Lund's trajectory, which was no different from many of his contemporaries in these initial decades of paleontology's consolidation as a specific discipline. Martin Rudwick's concept of 'liminal experience' is illuminating for approaching a greater understanding of Lund's work. Many knowledge areas related to the geological sciences rely on the field as a central element to their practice, especially since many of the most significant geological forms are immovable, given their spatial-temporal dimensions. At least the geological expeditions undertaken in the past involved a two-way movement – from the familiar to the unfamiliar and back to the former –, not only regarding the forms identified and studied, but also in terms of the separation and reintegration into their countries of origin. (Rudwick,1996). But, regarding Lund, it is well known that he did not return home. However, let us dwell a little further on this matter. But we have advanced a little more in this sense.

Twisted Feet, Gigantic Forests, Small Bones, Giant Climbers

Lund's work identifying fossil bones in the frameworks of comparative anatomy was positioned midway between field work and laboratory science. And from there derive the specificities of the careers of several of those naturalists who dedicated themselves to such practices. It is true that the objects of Lund's study became mobile, despite their gigantesque proportions, whether through their two-dimensional reproductions or their simple transportation in the collections sent. Nevertheless, analysis of the terrain, the precise location of such fossils, the inferences that they enabled concerning the reconstruction of the geological past and the extinct fauna themselves also depended essentially on the specificities of their locations. *In situ* knowledge, the familiarity acquired after years of collection, undoubtedly constituted a priceless background for the paleontologist. But increasingly, the comparative analyses, the fantastic collections from all corners of the world that had accumulated in the museums of central Europe, the practice of publishing and communication science through associations and seminars, which grew vertiginously in this period, demanded a return to the European scientific community. And collecting and classifying were not enough. Theorizing within the context of large explanatory frameworks on the origin of life and the planet was fundamental.

In 1807, Cuvier had re-examined a field research report by Humboldt and clearly established two ways of structuring natural history, organized by the contrast between two approaches to appropriating space – those of the field and of the sedentary naturalists. They synthesized two contradictory ways of considering the cultures of nature and fighting for a place to construct a scientific career. Normally, says Cuvier:

The field naturalist travels through a large number of different areas and comes upon a large number of interesting objects and beings in their natural environment in the full flush of life. But he can only dedicate a few moments to each of them...he denies himself the possibility of comparison, of a rigorous description of their characteristics and is even frequently denied books that would tell him who had seen the same thing before him. As a result, his observations

are fragmented and fleeting, even if he possesses not only the courage and energy that are needed for this type of life, but also a more reliable memoir, as well as the high intelligence necessary to quickly understand the relationships between apparently distant things. The sedentary naturalist, it is true, only knows living beings of distant countries through reports subject to greater or lesser degrees of error, and through samples that experience greater or lesser degrees of damage. The grand scenario of nature cannot be experienced by him with the same intensity. He fails to perceive thousands of small habits and customs of living beings that would have astonished him if he had seen them in their own territory. But these disadvantages have their corresponding compensations. While the sedentary naturalist does not see nature alive, he can still investigate all of their products spread out before him. He can compare them among each other as often as necessary to reach reliable conclusions. He chooses and defines his own problems; he can examine them at his own convenience. He can assemble relevant facts from wherever he needs them. The traveler can only take one road, but it is, in fact, in the laboratory that we can travel freely throughout the universe, and for this a different type of courage is necessary. Courage that comes from unlimited devotion to the truth (cited in Outram, 1997, p.259).

Even for field naturalists, Humboldt would recognize, it was no longer sufficient merely to classify. In his 1805 *Essay on the Geography of Plants*, (published in Paris in 1807), the introductory volume to the results of his complete trip to the Americas, Humboldt contrasted the botanical classifier, interested only in the individual structures that distinguished species and genres from each other, with the “highest philosophical objectives” of the physical botanist, concerned with the geographic relationships of the plants among themselves and the geographical variation of other physical parameters. “The substitution by Humboldt of the nomenclaturist botanist for the physical botanist, the linear collector for the physical observer, represents the disappearance and the apotheosis of the naturalist in a nature constituted by dramatically conflicting forces, which impresses us profoundly with a sense, a sense of its grandeur, and speaks to us with all of its force” (Dettelbach, 1997, p.289). Humboldtian science illuminates the reorganization of knowledge and disciplines at the dawn of the 19th century, which define the emergence of the cultures of natural sciences based on natural philosophy (Podgorny, Schäffner 2000).

That differentiation of functions, abilities and recognitions comprises some of the diverse consolidating discourses on the new disciplines that became institutionalized with the unfolding of natural history that had a zoological orientation (Lopes, 2001). In his practice, Lund – a field naturalist – will try to go beyond the, to a certain extent contradictory, profiles that were expected of the paleontologists of his age, in light of which, according to different conveniences, his work was evaluated.

From the start of his career to the sending of his collections in 1845, Lund performed his functions as a naturalist, initially as a traveler in the molds characteristic of the first half of the 19th century.¹⁵ With an education in medicine and zoology, his own resources, some financing to collect animals and plants for the Royal Museum of Natural History of Copenhagen and instructions to take meteorological observations for the Academy of Sciences, Lund botanized, collected and traveled without leaving the areas surrounding Rio de Janeiro, Nova Friburgo and Campos for three years (1825-1828). He returned to Europe and published three works.¹⁶ He also visited the main scientific and naturalist centers in Berlin, Paris, Vienna, Rome, Naples and Palermo.

Back in Brazil in 1833, where he settled permanently, he focused on his botanical studies¹⁷, collecting for Daubeton and the museum in Copenhagen and accompanying the botanist Lüdwing Riedel (1790-1861) on his travels to the interior of the country. A casual encounter with the bone trader Peter Claussen in 1835, mentioned in all of the related literature, was allegedly responsible for his return to zoology and his interest in the cave bones in the Minas Gerais region. The bone fossils had certainly already aroused his curiosity in the surroundings of Palermo, when, in addition to collecting fish for the museum in Denmark, he discovered a large quantity of elephant bone fossils next to hippopotamus remains in the excavations undertaken in 1830, as he himself relates in his "Second Memoir on the Cave Fauna" of 1837 (Lund, 1950b, p.185, note 160) concerning the controversial subject of the hair-covered elephants and rhinoceroses of Siberia and the conclusions regarding climatic changes in different geological periods on the Old and New continents .

Like Darwin at the start of his career, Lund was similarly not trained in the classification of bones, particularly if we recall that in those years no such specific materials were disseminated in the formation of zoologists, doctors and geologists, not even in Europe. Hermann Burmeister, the director of the National Museum of Buenos Aires from 1862 to 1892, who found Lund to be an important reference for his initial paleontological works in Argentina, had no specific training in vertebrate paleontology either. His doctoral thesis at Halle concerned insects. Before settling in Argentina and dedicating himself to fossil vertebrates, he spent five months in Lund's company in Lagoa Santa, from 2 June 1851 until the end of that year, precisely to acquire such field training with the greatest local specialist in those specific fauna.

Lund's work methods would be more like those of the doctors, zoologists, botanists, naturalists and amateurs that became paleontologists in the 19th century. His work developed on the pillar of fossil study that had traditionally been an integral part of comparative anatomy. In Germany, Blumenbach used his classes in the College of Medicine to contribute to the study of the forms of living and extinct life. In France, the Cuvier work *Ossemens Fossiles...* figured as the logical successor to his *Leçons d'Anatomie Comparée*. In England, Hunter had inspired his students to combine the study of living and fossil species. Clift frequently called for his students to identify fossil bones and teeth. When all is said and done, Rupke would say (1985, p.245), without a systematic knowledge of living species, the fact of extinction itself could not be established, much less identifying the extinct species.

During a period of about 10 years, from 1836 to 1846, Lund was involved with the exploration of caves, the collection and classification of bones, the writing of his memoirs and the sketching of his plates, which were entrusted to his lifelong collaborator, the Norwegian Brandt. Lund involved himself or was involved in the discussion of several of the controversial topics that marked paleontology in the first half of the 19th century. Lund found his principal work reference in Cuvier, but he was fully informed about and participated in the debates surrounding paleontology in the 1830s and 1840s. And he had no problem in departing from it in certain classifications and even preferred a linear nomenclature when he considered it more adequate.¹⁸

As the practice of paleontology recommended, Lund created new ancient animals, such as the *Megatherium laurillardii* or the *Euryodon* (whose teeth differed from those of all living armadillos), based on his bone and tooth fragments: “it is true that I only discovered some fragments of the dental apparatus, but they are so special that they are sufficient to reveal the presence of extinct genus forms” (Lund, 1950a, p.136). And he insisted on stressing, “once and for all”, that the genus names that he was forced to create for animals of whose organization he knew only a very limited part were all provisional (as, in fact, would be the *Euryodon* itself, according to Winge). But, since the differential traces of these new genres might be found precisely in the skeleton parts that he had still not encountered, he justified that it was necessary to name them for the general study that he intended to carry out.

The origin and antiquity of the Lagoa Santa race was undoubtedly among the issues subsequently considered the most polemic and discussed of his work.¹⁹ As one of the age’s many examples of the wide-ranging consequences of his findings, which extended beyond the academic environment, *The Year Book of Facts Science and Art* informed through news disseminated by the Academy of Sciences of Paris, albeit slightly incredulously:

Fossil human bones

A letter was received by the Academy of Sciences of Paris from Dr. Lund, the celebrated Danish naturalist and geologist, to whom we already owe many interesting discoveries in Brazil, affirming that the Doctor has found in the province of Minas Gerais, a quantity of Human Bones, including some complete skeletons in a fossil state (?) [cf. original]. There are many skulls; and almost all of them present the main characteristics of those indigenous tribes alive in Brazil - except that, in many of them the incisor and molar teeth are exactly identical – a circumstance observed in some of the Egyptian mummies. The writer maintains that, since no human bone up to then had been discovered in a fossil state anywhere in the world, those bones found in Brazil seemed to indicate that America, or its meridional portion, was inhabited before any other part of the world. Dr. Lund also discovered in the same province a large quantity of horse bone and skeleton fossils – an animal that, as we know, did not exist in Brazil when the Portuguese disembarked there for the first time, and he also found the skeletons of 44 species of completely unknown mammals. The Doctor has promised to send a detailed report of this discovery to the Imperial Institute of History and Geography of Rio de Janeiro (Timbs, 1839, p.264).

Prior to sending these detailed reports, in 1840 Lund intermediated in an initiative of the Royal Society of Northern Antiquarians, of which he was a member, to carry out an archeological expedition that was organized to prove the existence of ruins and witnesses to the presence of Nordic people in Brazilian territory prior to the Portuguese. It was conducted by the Danish military men Svenson and Schultz and the naturalist Kruger. His action did not escape the attention of members of the Brazilian Institute of History and Geography (IHGB), the intellectual elite of the Court, who even applauded and supported with initial enthusiasm (subsequently restrained) Cônego Benigno’s expedition in 1841 to the mines of Sincorá in search of a lost city, great archaeological findings and a place for Brazil among the countries of America that had been home in some remote time to developed civilizations. That would legitimize Brazil’s past, support the Empire and bring prestige to the IHGB (Lagos, 1849; Oliveira, 1848).

The presence of Nordic people in Brazilian territory was not proven and the antiquity of humanity would, in fact, only begin to gain greater acceptance in European academic milieus from the 1850s onwards. In 1864, the now well-known scientific periodical *The Edinburgh New Philosophical Journal*, continuing to divulge the repercussions of Lund's works, referred to that discussion in the following terms:

There are, in fact, some alleged exceptions to this rule, but in no way sufficiently authenticated to prove that man coexisted with extinct mammal fauna, since the possibility should be considered that the human remains had become subsequently mixed with those of an older date, whether due to natural causes or to burial in the stalagmites or alluvia of the caves. In South America, no less than 800 caves were explored by those untiring naturalists, Lund and Clausen, and they obtained bones of 101 mammal species belonging to 50 genuses, a richer and more varied fauna than currently inhabits the same country. Among all of them, only one quadruped species can be identified as a recent species. After pillaging some hundreds of caves, they found human bones in only six of them and in only one were they mixed with extinct animal remains in a way that would seem to imply they belonged to the same age (The Edinburgh..., 1864, p.27)

Apart from the human skeletons – undoubtedly one of Lund's most controversial finds for the conceptual frameworks of the age – one of the greatest polemics of the age involved Richard Owen (1804-1892)²⁰ regarding various animals, particularly the *Scelidotherium*, the animal that Lund knew best.

Lund, in the Lagoa Santa field, and Owen, then sedentary at the peak of his fame in the period, undertook during those years to identify mammal fossils in South America from completely opposite situations and positions. Since 1836, Owen had been at the center of the British Empire, initially as the assistant curator of the Royal College of Surgeons' Hunterian Collections and, afterwards, as professor and conservator. In 1856, Owen became superintendent of the Natural History Departments at the British Museum, immediately beginning the campaign to separate these collections, which would be achieved in the 1880s with the creation of the British Museum (Natural History) in South Kensington.

Described by his biographers as envious, vindictive, vain and arrogant, the British Cuvier, as Owen was known, centered his fossil classification work on vertebrates, including those Darwin brought back from his trip. The concept of homology and the creation of the taxon *Dinosauria* are his. And in his works he would make innumerable references to Lund, mentioning him together with Darwin, when referring to the chapter on the *Solipedia* and more specifically the genus *Equus*²¹, to hyenas and his definition of the *Smilodon*²², and to monkeys.

Regarding 'quadrumans', Lund hoped to leave a definitive contribution to paleontology based on his studies on the family of monkeys, whose results were shown to be "fertile and unforeseen":

The important question of the existence of the highest family of mammals in the last geological age, up to now considered controversial, and which many naturalists intended to resolve negatively, can be, as I think, decided by my studies.

There is no doubt that this family existed here. The first fossil representative that I discovered presented the common traits of its contemporary living beings, but it was of giant size. Its size is much greater than the largest individuals known of the chimpanzee and orango species... (Lund, 1950b, p.175)

As the “notable form’ encountered deviated from all the genres of indigenous monkeys, he proposed to include it in the special group *Protopithecus* he created, adopting the specific designation of *P. brasiliensis*, recalling the name of the country in which the first representative of the group had been discovered. And, further on in the text, Lund makes an association between the similarities of the bones found and the features narrated by the local inhabitants in the myth of the Caipora – indicative of the other directions that his ideas followed:

I mention this legend less for its zoological interest than for the notable similarity that exists between many of the features attributed to the *caipora* and those that we know or suppose to exist in Pongo, Borneo. If such an animal does not exist in the places where the legend circulates, how to explain it. Will it by chance have been transmitted to the current indigenous people through a long series of generations? Will this fact perhaps be another proof of the Asiatic origin of the primitive inhabitants of America? (Lund, 1950b, p.176)

Owen, when including Lund’s monkeys, which he did not consider to be so gigantic, into his broader comparative framework²³, deprived Lund of the ‘decision’ regarding the fossil existence of the monkeys and the priority of his *P. brasiliensis*. Lund’s local findings were added to those previously located in the East Indies and the south of France, of which Lund was unaware, as Owen made sure to mention. And examples of this type of loss of priorities and the insertion of new animals in broader explanatory frameworks succeeded each other.

William Buckland (1784-1856), the influential Oxford professor of mineralogy and geology, in his commemorative *Address* on the anniversary of the Geological Society (Buckland, 1842) in 1840, reproduced in the 1841 volume of the *Edinburgh New Philosophical Journal*, considered that Lund’s recent discoveries ‘of extinct mammals attributed to the end of the Tertiary ages now formed a new and important chapter in Paleontology” (Buckland, 1841, p.69). But this *Address*, dedicated to a synthesis of the advances in paleontology in 1839, virtually centered on the work of Owen, such was the recognition of his work among his English colleagues. The comprehensive fossil collections put together by Owen and his dedication to the work of systematization constituted the basis for his numerous monographs, which became classics. And, among Owen’s works, the one that merited the most attention in that *Address* was the advance of Owen’s studies on the extinct fauna of South America – the ground sloths and armadillos. The previous year, Owen had demonstrated, closing the long debate, that the bony carapace, which various authors had attributed to the megathere, in fact belonged to the glyptodont (Podgorny, 2007).

In 1844, in a letter to the Danish Science Society, Lund (1950c) establishes some points demarcating his differences with Owen, referring to the advantageous conditions the field naturalist enjoys that enable him, particularly in the case of the *Scelidotherium*, the animal he knew best, to contest the least plausible of Owen’s hypotheses regarding the physiology, eating habits and the ability or lack thereof of these animals to climb trees.

I now request a little attention to a question that has already been the subject of lengthy considerations on my part in previous works, but which I again consider, due to the awakening of new interest resulting from a study of it that an authority in the science has just made; I refer to the capacity of these animals to climb. It is true that I still do not know the excellent work

by Owen on the *Mylodon robustus* in the original, but I have verified in an extract from it published in the "Annales des Sciences Naturelles" [to which Lund had also sent his translations] that this meticulous anatomist does not accept that the magateroid animals had that capacity. I seek, on the contrary, to demonstrate that these animals would have employed their formidable muscular strength and their powerful claws to the task of pulling up trees in the virgin forest in order to get at the foliage that, as I presume, would constitute their alimentation (Lund, 1950c, p.509).

Lund and Owen agreed that such animals fed on leaves; they only disagreed on how they obtained them. The idea that such animals had been climbers seemed so strange to Lund, that he himself called attention to the fact. But it was inadmissible to Owen. Lund, who knew of Owen's influence, considered that it was essential to refer

to an erroneous interpretation given to my idea [the dimension of the forests in the past] in Owen's monograph, mainly because the classic value of that work gives a completely special value to each affirmation set forth in it. Owen's words are in the French translation: "*Lund, qui avait une idée plus juste de la nature de la nourriture des animaux Mégathérioides, confesse que l'hypothèse qu'ils sont grimpeurs, ne peut être soutenue sans supposer qu'il existât alors des arbres dont la taille dépasserait celle des arbres de nos jours, autant que la taille du Magatherium dépasse celle du Paresseux*". The passage in which I expressed my point of view, to which Owen refers, is the following: "Probably the trees in which those monsters swung were not those that today cover the surface of these plateaus. In a previous memoir, which I had the honor to present to the Society, I tried to demonstrate that the trees that presently grow on these plateaus are only the atrophied descendents of the larger and more vigorous trees that grew there, and one is allowed to suppose that the vegetation of those times presented the same gigantic characteristics shown by the animal kingdom" (Lund, 1950c, p.520).

And here, not without a touch of irony, so familiarized was he with his animals, constructed based on dispersed bones (Lund never found a complete skeleton due to the depositional processes of the caves), Lund (1950c, p.518) positions himself as if he were in a scene of deep time: the difficulties presented by Owen's hypothesis are due in part to the natural organism of the animal and in part to the characteristics of the vegetation in which it would have lived; "This naturalist, so familiar with nature, allowed himself to be influenced so much by this aspect of the question that he thought it necessary to find another way out. As his hypothesis removes this difficulty, I have no doubt that he will be applauded by many authors who have not had the opportunity to observe in the fullness of nature all of the conditions relative to the animal that should be taken into consideration here" (Lund, 1950c, p.509).

Owen's hypothesis occasioned other, larger problems that Lund proceeded to expose, based on 'his' *Scelidotherium* and the aspects "relative to the twisted foot" – whose physiological importance seemed much greater than the little attention Owen gave to it. Concluding his detailed oppositions to Owen regarding this twisting being designed to protect the enormous claws of the animal, in an analogy to the armadillos, Lund affirms:

As this question revolves around, so to speak, the field of mechanics, perfectly allowing mathematical verification, I have no doubt it will be resolved in the future. Meanwhile, I have hopes that, with respect to *Scelidotherium*, the three following points will be considered as sufficiently demonstrated and proven by my prior well-detailed observations: 1) the hands of

this animal are constituted as a type of hook, which it uses as a means of traction to move; 2) the animal could not remain vertically erect, much less walk in such a position; 3) its rear paws are constituted exclusively for support purposes (Lund, 1950c, p.511-512).

Lund's collection was extraordinarily rich in the remains of this genus, coming from "more than 30 individuals of diverse ages from the most juvenile to the most senile, having given me an opportunity to observe the differences occasioned by age, as well as those of a strictly individual nature" (Lund, 1950c, p.508). Lund even mentioned the existence of fetuses among his *Scelidotherium Owenii* and *Scelidotherium Bucklandii* remains. And his entire letter is a comprehensive and fundamental defense against Owen's suppositions regarding the *Scelidotherium*, one based on his extensive field experience in the tropical forests and his analysis of the relationships and disposition of the fossils found in the field. But Lund lost priority to Owen regarding the animal he had created and with which he had lived most: "The genus so inseparable from the caves, *Scelidotherium* – the name proposed by Owen (1840), despite being less fortunate, must have priority, since I see that it has priority in publication over the *Platyonyx* proposed by me (1842)" (Lund, 1950c, p.507).

These brief examples suggest that perhaps more interesting than discussing the well known conclusion of this phase of his activities in Minas Gerais (Marchesotti, 2005²⁴), is the unveiling of aspects such as those we have just mentioned regarding the controversies in which Lund became embroiled and saw his work involved in the frameworks of paleontology that constituted a disciplinary field per se. And to this end we emphasize that, in addition to putting together and classifying excellent and notable collections, Lund theorized and polemicized, albeit in isolated aspects, with the established authorities within conceptual frameworks that, although they would quickly change, also contributed to a certain loss of interest in his work and collections²⁵ and were still strongly hegemonic in the period in which he produced his memoirs.

To seek a more productive line of reflection on Lund and his bone caves, Rudwick's concept of 'liminal experience' seems more promising to us. The discussion of this concept calls attention not only to the importance of returning to the European scientific community, but also to the importance of a knowledge acquisition process based on the field, based on the unfamiliar. Distancing from the community of origin would seem necessary because any new mode of perception that a field naturalist might develop, which might subsequently be accepted (foot traction) or not (forests having gigantic dimensions), when comparing new and unfamiliar forms with those that made up part of his 'in house' training (invariability of the species), would correspond to a conceptual structure that initially would be very fragile. Naturally, they would be harshly criticized, thereby stunting their growth. This is how the community functions, or, rather, as better defined by Knorr-Cetina, the epistemic arenas. Therefore, such distancing is not pure isolation – from which, in fact, Lund never suffered. It is because this process presupposes writing and answering letters, testing new ideas together with colleagues, but not with critics or the entire community.

This 'protective isolation' against premature criticism would be essential for the production of new knowledge, for its maturing and conquering of space to contest the

canons of orthodoxy. But it involves the risk of losing priorities. In the middle of the 19th century, paleontology, especially of vertebrates and, among them, mammals, was constituted in an area of knowledge extremely attractive to sectors of the scientific community interested in, among other topics (beyond professionalization itself) related to the origin of life and the species. The large mammal bones, which began to be replaced by those of the dinosaurs, had already caused a media impact since the end of the previous century. Scientific publications and science magazines multiplied, accompanying the race for priorities in discoveries, which was also a significant part of the professionalization of those who migrated to paleontology.

Lund began to collect and study cave bones in 1835. He delayed no more than a year before beginning to make his new modes of perceiving South American megafauna publicly available to the entire community, contributions that he hoped to be decisive for paleontology. And even so, he lost various priorities to Owen. In this sense, contrary to those who wish to see the Lund biographies written in the 19th and early 20th centuries prevail, we can say that Lund lacked isolation. He lacked protective isolation within the paleontological arenas, in which great names disputed for great bones.

NOTES

* Reference to the fundamental work of Rudwick (1992), who discusses the naturalization of the images constructed regarding 'scenes' of the geological past that no illustrator, museographer or paleontologist witnessed.

¹ On 24 November 1832, in a letter to Henslow, Darwin (1996, p.64) laments that the French collaborators had arrived before him at the Rio Negro (Black River) and possibly had collected the best there was for the Museum of Paris. In fact, he referred to d'Orbigny (Alcide Charles Victor Marie Dessalines d'Orbigny, 1802-1857), who traveled to South America from 1826 to 1834. His travel narratives – *Voyage dans l'Amérique Méridionale* – were published in 11 volumes from 1834 to 1847. In several of his works, d'Orbigny described an impressive quantity of material collected. He basically dedicated himself to fossil marine microfauna, coining the term 'foraminifera' (D'Orbigny, 1850-1852). Concerning this naturalist, see, among others, Laurent, 1995, and, especially for references to this work, Podgorny, 2008.

² For this discussion, see Podgorny, 2007, in large part the inspiration for this work.

³ The studies on the literature of travels to Brazil are countless, but for a useful listing of travelers in the 19th century in Brazil see Leite, 1995.

⁴ In these terms, Schibienger (2004) presents his histories of 'great plants'.

⁵ By way of example, Henrique Raymundo des Genettes, when conducting the geological explorations he started in 1844 in the provinces of Minas Gerais and Goiás and studying the hydrographic system and geological structure of the region's elevations, especially the Pirineus peak, included in his *Estudos Geológicos sobre a Província de Goyaz*, a manuscript finished in Uberaba on 11 October 1873 and deposited in the Imperial Library, a description of the bone remains of a skeleton found in sandstone rock on Grande da Bagagem Island in 1851, accompanied by a geological cut of the land. The relevance of the study was considered sufficient for Orville Derby to exhibit it in the geology, mineralogy and anthropology section of the South American Geographic Exposition held in Rio de Janeiro in February 1889 (Homem de Mello, 1889).

⁷ The innumerable biographies of Lund repeat Reinhardt, son of his professor and entrusted by Lund with the curatorship of his collections in Copenhagen. On 8 December 1883, Gorceix presented a conference on Lund's works in Brazil, based on the translation of a manuscript of Professor Reinhardt of Copenhagen, which the Emperor Pedro II had conferred upon him. See Gorceix, 1884. Paula Couto (1950) also repeats Reinhardt, but comments it had also been based on a 1945 article of the Danish zoologist Magnus Degerböl. I thank my colleagues, Professors Támaz Szmreczányi and Sílvia F. de M. Figueiróa, for access to this work by Paula Couto. Essential to any comment on Lund, it is a true 'solid within another solid',

to use a geology metaphor and paraphrasing the title of Steno's text. It contains the 5th Memoir written by Lund, which until then had not been translated in Brazil and was verified by Paula Couto, updating all of Lund's classifications in the 1950s, with innumerable notes.

⁸ Burmeister (1980, p.257) affirms: "Dr. Lund told me he knows more than a thousand of them, almost all of them visited by him personally".

⁹ This is the memoir in which Gorceix mentions Moreno's works, which, after an interval of 50 years since the studies of Darwin and Bravard (omitting, among others, the work of Germán Burmeister, the also well-know director of the Museum of Buenos Aires during the decades from 1860 to 1890), began to evidence the richness – by the number of species and the grandeur of the individuals – of the fauna of those regions, which presented the greatest affinity with those of the caves of Brazil. "Many facts support the ingenious hypothesis of Dr. Moreno, according to which those species, driven out at the end of the Tertiary age from the extremity of the American continent by cataclysm, when glaciers and volcanoes made these regions uninhabitable, came to Brazil seeking a more favorable climate and more clement nature. Later an emigration in the opposite direction took place, when the territories of the Argentine republic once again offered to the animal world of South America appropriate conditions for their organization" (p.51).

¹⁰ Paula Couto (1950) outlines a detailed bibliography of Winge, in homage to the researcher who he then considered relatively unknown in Brazil.

¹¹ Systematized in the "List of the Fossil and Current Mammals in the Rio das Velhas Valley", updated by Winge based on the works of Lund (Couto, 1950), the collections were described in terms of 100 fossil genres and 149 fossil species and 75 current genres and 103 current species in the caves of the region. Nineteen were extinct genres and 42, extinct fossils. The current species known only in a fossil state number 12 and, added to the extinct, encompassed 54 known species in a fossil state. Five genres and eight species were unknown in a fossil state.

¹² The letter is not dated, but the king's reply, indicated as being from the following year, is dated 11 August 1846. Paula Couto describes these collections in the following terms: 1) comprised of still living animal skeletons, containing all that was essential for studying the fauna of the Rio das Velhas basin and directed to the confrontation of living animals with fossils; the second is comprised of rifts with bones and rock fragments, serving to determine the geological nature of the lands where the fossil remains are found; the third, and most important, consists of animal remains located in the upper plateau of Minas Gerais (p.53).

¹³ Having returned to Brazil, Reinhardt would be accepted as a correspondent partner of the Velloziana Society, as is borne out by his diploma acceptance letter in 1851 (National Museum, folder 4, doc.12, sheet.05).

¹⁴ For a fundamental discussion on the question of language and translation, especially concerning South American paleontology, see Podgorny, 2005.

¹⁵ "For Lund, laboratory and office work were not enough. As with all great naturalists, he wished to personally study *in situ* the conditions of life and the development of beings, for which only the herbariums and collections enabled him to determine the organization.. Reasons of health, I believe, were not the only ones that urged him to pursue the idea of traveling to those distant countries that began to concern him in 1825" (Reinhardt, 1884, p.11).

¹⁶ Reinhardt mentions: the "Study on the Genus Eunoep" (birds without a crow), which earned him the title of Doctor of Philosophy from the University of Kiel when he was there; "Description of the Customs of Brazilian Ants" and a "Memoir on the Outer Covering of the Eggs of Gastropod Mollusks", all published in the *Annales des Sciences Naturelles* between 1831 and 1834.

¹⁷ In 1838 in Kreger's science magazine his memoir was published in full: "Notes on the Road Plants and Wild Herbs of Brazil" (Paula Couto, p.33).

¹⁸ In his "Second Memory..." (Lund, 1950b) – mammals –, when dealing with the "1st Order: BRUTE. Dumb animals", he clarified: "In my last memoir, I always employed the name given by Cuvier to this order: Edentata, animals lacking teeth. Despite the respect I accord the great man, creator of this title, and even though it is generally adopted, I cannot avoid here expressing my scruples that for some time I have regretted employing such an inappropriate name, since, of the large number of families encompassed within the order, only two have a complete lack of teeth" (p.131-132). He shared the opinion that the genus *Tatusia*, defined by Cuvier, could not be accepted as it referred to extremely dissimilar forms of the g. *Dasybus* of Lineus (p.134). Referring to the *Platyonyx* (*Scelidotherium*), which was very similar to the

Megatherium, he would use it for comparison purposes to “fulfill the pleasing duty of destroying an unmerited accusation hurled at this great name, so intimately linked with the notable genus of animal” (Lund, 1950 d, p.321).

¹⁹ For a discussion on Lund’s antiquity of the American race and its insertion in the European debate, see, among other works, Ferreira (2002), Guimarães (Jul-Sep 1994) and Almeida (2003).

²⁰ On Owen, the obligatory references are Rupke, 1983, 1994. See also Sloan, 1992.

²¹ Owen (1846, p.397) writes: “there are many specimens, however, that cannot be satisfactorily differentiated from the corresponding parts of the living species, *Equus caballus* and the wild ass can be the only survivors of numerous representatives of the genus *Equus* on the Euro-Asiatic continent during the Pliocene period. The species of *Equus* that had existed during that geological period both in North and South America seem to have been exterminated from the Fauna of those continents before the introduction of Man. The aborigines that the Spanish Conquistadors found occupying Peru and Mexico had no tradition or hieroglyphic indication of such a quadruped and the horses that the invaders imported were regarded with alarm and fear. The research of Mr. Darwin and Dr. Lund, meanwhile, have proven incontestably that the genus *Equus* was represented in South America during the Eocene period by a species (*E. curvidens*) that I demonstrated to be a species distinct from both the European fossils and living species... Mr. Darwin can well affirm: ‘It is a marvelous event in the history of animals, that a native type had disappeared, only to be succeeded in future epochs by the countless herds introduced by the Spanish colonists!’”.

²² When Owen (1846,) in the introduction to his work, expanded his comparison between living and extinct species of mammals on the South American continent, he comments in the first place that with the exception of some species of carnivores and *Cervídeos*, no representative of the genres of Old World mammals was ever found in South America. Buffon, cited in Lyell in *Principles of Geology*, (1837, vol.III, p.27), for some time had proposed a similar generalization regarding the living species and genres of mammals; and almost equally so concerning fossils. No remains of Elephant, Rhinoceros, Hippopotamus, Bison or Hyena” (Owen 1846, p.xxxix). Here Owen opens a note and mentions “Dr. Lund, (*Danish Transactions*, Oersted, Kiöbenj, 1842, p.16), discovered the remains of an extinct carnivore in a Brazilian cave, which initially he considered to be a species of *Hyena*, but later, recognizing very distinct dental characteristics, he attributed them to a new genus, which he denominated *Smilodon*. Based on the figures that he made of the canine and incisor teeth, they seem to belong to the same genus (*Machairodus*), as well as to the so-called *Ursus cultridens* of Europe and this must certainly be the case for parts of the cranium, jaw and teeth discovered in the Pampas of Buenos Aires and now in the British Museum”. See the discussion of Paula Couto on Lund considering the *Smilodon* as an intermediary form between the felines and hyenas. To the genus *Smilodon* belonged the enormous American “saber tooth tiger” of the Pleistocene. The species of Lagoa Santa would be the *S. neogaeus* (Lund, 1839).

²³ Concerning monkeys ('quadrumans', in Cuvier’s terminology) Owen writes: “As if it were intentional that the antiquity of the order of Quadrumans should be established beyond any doubt, the independent testimony of Dr. Lund, a Danish naturalist resident in Brazil, has been added to that of observers in the East Indies and the South of France. Shortly after the announcement of the Quadruman fossils in those countries, Dr. Lund, unaware of those discoveries, related to the Academy of Sciences of Copenhagen, the subject of his own paleontology research. In letters addressed to the Academy of Sciences, Dr. Lund affirms that the large Brazilian monkey fossil belongs to the *Platyrrhinhe* or the group of New World Quadrumans, whose species have three pre-molars on each side of the upper and lower jawbone and that it surpasses in size any known *Cebus* or *Mycetes*, since it must have measured four feet tall. These dimensions, however, did not exceed those of adult Chimpanzees and Orangs; but it is interesting to discover that the fossil *Semnopithecus* of India and the fossil *Protopithecus*, or the capuchin monkey of Brazil, are, like the less organized extinct associated mammals, of gigantic size compared with the closest analogies in the same localities.”(Owen, 1846, p.397)

²⁴ In this valuable dissertation, for access to which I thank Dr. Professor Betânia Figueiredo, the author argues convincingly in favor of the continuity of Lund’s scientific activities following this period, considering particularly the importance of the naturalists who continued to visit Lund in Lagoa Santa.

²⁵ The recognized paleontologist Zittel dedicated a line to Lund’s achievements in his classic work on the paleontological studies of the 19th century.

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