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Building *Baluchitherium* and *Indricotherium*: Imperial and International Networks in Early-Twentieth Century Paleontology

CHRIS MANIAS
Department of History
University of Manchester
Oxford Road
Manchester M13 9PL
UK
E-mail: chris.manias@manchester.ac.uk

Abstract. Over the first decades of the twentieth century, the fragmentary remains of a huge prehistoric ungulate were unearthed in scientific expeditions in India, Turkestan and Mongolia. Following channels of formal and informal empire, these were transported to collections in Britain, Russia and the United States. While striking and of immense size, the bones proved extremely difficult to interpret. Alternately naming the creature *Paraceratherium*, *Baluchitherium* and *Indricotherium*, paleontologists Clive Forster-Cooper, Alexei Borissiak and Henry Fairfield Osborn struggled over the reconstruction of this gigantic fossil mammal. However, despite these problems, shared work on the creature served as a focus for collaboration and exchange rather than rivalry between these three scientific communities. Not only did the initial interpretation and analysis depend on pre-existing connections between British and American paleontological institutions, but the need for comparative material, recognition and contacts brought British and American scholars into communication and exchange with their counterparts in the Soviet Union. This article examines these processes. It first uses these excavations as a comparative case-study of different manifestations of colonial science in this period, examining how scholars in the Britain, the Russian Empire and the United States used formal and informal colonial links to Asia to pursue new research. It then moves to examine how the common problem of reconstructing this giant animal drew metropolitan scientific communities together, at least for a time. The construction of the *Baluchitherium* and *Indricotherium* illustrates the drives to expand research both imperially and internationally in the early-twentieth century, but also the continual problems in resources, institutionalization, transport and communication that could run up against scientific work.

Keywords: Paleontology, Empire, Evolution, Museums, Expeditions, Colonialism

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Introduction

At the end of the 1930s, the fossil mammal galleries in the largest paleontological museums in the USA and the Soviet Union were dominated by reconstructions of an enormous prehistoric quadruped. In the Tertiary Extension Hall of the American Museum of Natural History in New York was a concrete relief of a heavy-set rhinoceros-like beast, over five meters high. This was *Baluchitherium* ('the beast of Baluchistan'), whose remains had been found in India and Mongolia over the preceding decades. Meanwhile, in the Museum of the Paleontological Institute in Moscow stood a full skeletal mounting of *Indricotherium* ('the Indrik Beast'), unearthed in Russian, and then Soviet, Central Asia from the 1910s onwards. This was just under five meters tall and stood with its head aloft in a more equine posture. Both were billed in the same manner: a gigantic hornless rhinoceros from the Oligocene and Miocene of Central Asia, and the largest mammal to ever walk the earth – whose bones had been brought back to the metropole by self-consciously intrepid explorers to distant regions. Yet they differed in name, size and pose.

On first sight, these differences, and the fact that they show a Soviet and an American example, would almost intuitively indicate a tale of imperial and scientific rivalries, as two centers of research attempted to construct related creatures. Yet looking deeper into these exhibits, something else becomes apparent. As was usually the case in paleontological reconstructions, both were composites, and the bones had in fact been brought together through extensive international exchange. The skull of the Moscow exhibit was a wooden copy of a *Baluchitherium* sent from New York as a gift in the early 1920s, and the American *Baluchitherium* was based on an extensive comparison of all related specimens from the world's collections, in which a quarter of the bones were from Russian *Indricotherium* collections. Behind the scenes, American and Soviet scientists (along with an earlier British co-discoverer, who did not have the resources to arrange such a large display) had engaged in continuous exchanges of material and information, trying to resolve issues of reconstruction, classification and priority, and even discussing possible joint work in central Asia. Rather than be an indication of national and ideological rivalries in modern science, these two displays and the creature they sought to reconstruct illustrate some important issues in the discipline of paleontology, and science more generally, during the first half of the twentieth century.

This paper examines the construction of the *Baluchitherium* and *Indricotherium* in terms of two major issues linking early-twentieth century scientific work to wider political and ideological commitments. The first is that of science and imperialism. This is a lively historiographical area, particularly for the early modern period and nineteenth century, where scientific work in extra-European regions has been conceptualized as deeply implicated within colonial governance, but also dependant upon interactions with indigenous systems of knowledge and constructed as much in ‘contact zones’ as in the metropole (Secord, 2004; Raj, 2007; Safier, 2010; Lightman et al., 2013). The reconstruction of the *Baluchitherium* and *Indricotherium* – whose remains were discovered first in British India, in Russian Turkestan, and then in more informal areas of American influence in China and central Asia in the 1910s and 1920s, offers a productive case-study of the shifting dynamics of colonial science in this period, and allows a comparative examination of how similar scientific research was conducted in different colonial regions, and an investigation of different ‘styles’ of work.

This case-study also shows how scientists based within distinct imperial systems cooperated extensively, which connects it with an additional, highly complementary, area: the history of international exchange, and commitments to scientific internationalism. Recent work in this area has gone some way beyond earlier trends which simply presented science as intrinsically internationalist and universal, but sometimes ‘misdirected’ into ideological or nationalist ends when disrupted by world wars and political conflict. Particularly relevant are the arguments of Nikolai Krementsov (Doel et al., 2005; Krementsov, 2005) and Paul Forman (1973), who have noted how commitments to internationalism often reinforced local, political and national ideologies, operated differently in different disciplines, and were used by particular groups of scientists to bolster their own standing. More broadly, much work beyond the history of science on interwar internationalism has examined how imperial and internationalist ideology often fed into one another in the early-twentieth century. Studies of international humanitarian organizations, technological exchange and voluntarist associations in the 1920s and 1930s have shown that wider internationalist commitments were often conceptualized as extensions of older imperial projects (Laqua, 2011; Beers and Thomas, 2011; McCarthy, 2011; Baughan, 2013). However, these internationalist drives also often faced difficulties of access, ideological differences, the exclusion of important countries – such as the USA and USSR – from international bodies, and the fractures resulting from the world wars. Examining scientific exchanges illustrates another layer of these processes, and also allows a focused investigation of the drives and blockages that international work could run up against.

In these areas, the history of paleontology offers an interesting potential avenues. The existing literature has shown that this discipline depended on imperial and international exchange, and was at the interface of a range of approaches in the biological and the earth sciences (Buffetaut, 1987; Bowler, 1996; O'Connor, 2007; Brinkman, 2010; Cohen, 2011; Rieppel, 2012). This work has shown the discipline to have been deeply involved in international and imperial currents in scientific research, with Irina Podgorny (2013) examining the role of fossil dealership within Britain's 'informal empire' in early-nineteenth century South America, Thomas Anderson (2013) illustrating how the comparison of giant flightless birds from New Zealand and Madagascar depended on global exchange, and Ilja Nieuwland (2010) discussing the international circulation of the Carnegie *Diplodocus* in the 1900s. However, gaps remain in this literature, particularly that most has focused on the period prior to the First World War, and much less on the potentially more unstable and disrupted period after 1918. Additionally, the history of paleontology has often been told as the story of rivalry, on levels which are either: personal, such as the conflict between Edward Drinker Cope and Othniel Charles Marsh in the US 'Bone Wars' from the 1870s; institutional, as in the 'second Dinosaur rush' discussed by Paul Brinkman (2010); or national and imperial, seen in the rivalry between British and German dinosaur excavation in South-East Africa (Maier, 2003). While conflict and rivalry can certainly be identified in these episodes, the reconstruction of the *Baluchitherium* and *Indricotherium* shows something different – that collaboration and exchange could be just as important, even between countries and imperial systems that regarded one another as rivals.

This paper will examine the early research on this giant hornless rhinoceros across these two areas. In the first three sections, it will follow the excavation projects and initial reconstructions of the *Baluchitherium* and *Indricotherium* to present a comparative study of paleontological science in three distinct national and imperial contexts. This will show how paleontology in the British and Russian empires, and areas of US influence in Asia, followed similar courses of expansion into extra-European regions (often in the wake of geological surveys), but was always beset by uneven institutionalization and funding in these different countries. In the final section, it will examine the links between the main metropolitan collections in Britain, the USSR and USA, as scientists interacted to analyze and reconstruct the animal. In doing so, it will investigate the disciplinary and national configurations of paleontological study, showing how scientists sought to take advantage of the expansive opportunities offered by colonial and international science, and how these were closed off over the course of the 1930s and 1940s. Difficulties and obstacles in exchange persistently existed, in the physical transport of objects, access to publications, material and sites, and political troubles. However, these constantly interacted with a persistent need for collaboration, both within wider colonial systems and between them.

Clive Forster-Cooper and Paleontology in the British Empire

While American and Soviet institutions were to eventually be the focal points for research on this animal, its reconstruction began within a different set of connections: those around the British Empire in the years before the First World War. Given the wide extent of British imperial networks (and the prominent position of the Victorian period in the history of science), British colonial science has often served as the ideal type in the secondary literature. The manners in which networks within the empire gathered and ordered a massive amount of material from across its territory, relying on both local systems of knowledge and its translation, but also large metropolitan consolidation, has been widely examined (Endersby, 2008; Pietsch, 2013; Mcaleer, 2013). Paleontology has been partly examined in this context (Podgorny, 2013; Anderson, 2013), but most prior research in this area has tended to focus on great authorities like Richard Owen and Thomas Henry Huxley, and the field's extensive public impact in the mid-nineteenth century (Desmond, 1979; Rudwick, 2005, 2008). This literature has tended to emphasize its entanglement with popular culture and changing conventions of scientific organization. However, it is important to note that despite the growth of large metropolitan museum collections in London, Manchester, Glasgow and other major cities, it remained a discipline which relied on personal initiative and local contacts, and was often conducted in rather ad-hoc and low-key manners, with minimal funding, publicity and support.

The early career of Clive Forster-Cooper (1880–1947), the namer of the *Baluchitherium*, shows how these trends could manifest, and also the interplay between metropolitan, colonial and international networks (See Figure 1). Forster-Cooper had studied Zoology, Natural History and Geology at Trinity College Cambridge, and initially specialized in marine biology, working in Sri Lanka and the Maldives. However, he became increasingly involved in paleontological work through personal interests and connections, conducting field projects in the United Kingdom and working on specimens in London and Cambridge (building up credibility and contacts in the metropolitan context). Following this, he was invited by Charles William Andrews (1866–1924), a vertebrate paleontologist based at the British Museum of Natural History, to participate in what was probably the largest British paleontological project prior to the First World War, the expedition to the Fayûm in Egypt in the 1900s. This unearthed a range of new mammals from the Miocene, most notably an ancestral proboscidean, *Palaeomastodon*, and a large horned ungulate, *Arsinoitherium*, both of which were reconstructed and proudly displayed in London (Andrews, 1906).

However, despite taking place within a British colony, the excavations in the Fayûm were not solely a British enterprise. Paleontologists from a range of countries were active in Egypt in these years, taking advantage of geological surveying and the networks established through the long western involvement in Egyptian archeology. Among these were a team of paleontologists from New York's American Museum of Natural History (AMNH). These included Henry Fairfield Osborn (1857–1935), who was to become the museum's president in 1908, and Walter Granger (1872–1941), one of its leading field paleontologists (Morgan and Lucas, 2002). The American and British scholars cooperated in the field, and Forster-Cooper developed a close working relationship with Osborn and Granger. This was an important connection, as US scientists were fast becoming global leaders in paleontology, partly due to their ability to attract large-scale philanthropic funding, and partly through their excavation, reconstruction and publicization of large and dramatic displays of fossil mammals and dinosaurs (to be discussed further in a following section, but see Brinkman, 2010; Rieppel, 2012; Rainger, 1991). Following these contacts, Forster-Cooper was invited to visit New York in 1908–1909, where he studied under Osborn at the AMNH and conducted fieldwork with Granger in the American West. As such, Forster-Cooper gained the patronage of one of the discipline's leading authorities, and learnt excavation techniques vital to the conduct of major projects. International connections were therefore essential to developing credibility and expertise.

This work and training inspired Forster-Cooper to organize his own expedition in 1911 – traveling to British India. This grew from his developing interests, but also colonial initiatives in geological prospecting. The Indian Geological Survey had been established in 1851, based on the British Geological Survey and aiming to geologically map the subcontinent and search for mineral resources. However, fossils were frequently unearthed in the course of this more economically directed work, with the prehistoric mammals from the Siwalik hills of northern India being particularly intriguing (Nair, 2005; van der Geer et al., 2008). As imperial control consolidated, surveying and exploitation stretched further across the Indian empire. Especially significant here was an expedition by Guy Pilgrim (1875–1943) in 1907–1908 to the Bugti Hills in Baluchistan. The remains reported by Pilgirm (1908, 1910, 1912) consisted of teeth and skull fragments from over thirty species of animals, including a range of mammals. Pilgrim thought it necessary 'to draw attention to the gigantic size of many of the animals, whose remains are found in these deposits' (Pilgrim, 1912, p. 5) – in particular one classed as *Aceratherium bugtiense* ('The horned faced beast of the Bugti'), placed as a new species within a fairly generic and widespread genus of primitive rhinoceros.

Despite having had little prior contact with Indian affairs, Forster-Cooper followed this lead, organizing his own expedition to Baluchistan in 1910–1911. On arriving in the territory, Forster-Cooper hired a small team of local workmen, who did the digging, and a camel-team to haul specimens. This followed quite conventional methods in contemporary paleontological expeditions, which depended on often unacknowledged local assistance for manpower in excavations, and also for locating fossils (as will be discussed below). While he was in the field, Forster-Cooper also kept up a continuous correspondence with Henry Fairfield Osborn back at the AMNH. This is significant not only for providing a general account of the expedition, but also illustrating the persistence of international networks of authority even while research was taking on an explicitly colonial dynamic. The narrative Forster-Cooper constructed around the expedition – both in his letters to Osborn and his later publications – was in the idiom of the long-suffering colonial explorer. He wrote to Osborn that 'my work in Baluchistan was a struggle against time, heat and native opinion,'[1] and complained about the obstructionism of 'native rulers,' particularly the local Nawab who thought 'the idea that I was really after fossil bones was an idea too absurd to be

[1] Clive Forster-Cooper to Henry Fairfield Osborn, 18 November 1932 in Box 24, Folder 39: Cooper, Clive Forster I (1909–1929), American Museum of Natural History: Department of Vertebrate Paleontology Archives [hereafter DVP].

considered and I was obviously an officer in the Indian political department.'[2] While totally reliant on his indigenous workmen for transportation and manual labor, he largely wrote them out of the narrative as untrustworthy and unreliable. He reported that he had 'dismissed three of my native diggers for idleness and insubordination… at this moment I have three good diggers and one very inferior old man who acts as me "bearer" and can be trusted to break up any good teeth he may come across while digging. Of course all work in the way of developing or hardening I must do myself but following the teaching I received with you I do as little of the former as possible.'[3] In this way, a clear hierarchy was set up, between the expert (and greatly inconvenienced) western colonial scientist, and his subordinates, who were either incompetent or at best suited for relatively menial tasks. However, he did recognize one 'improveable' worker in his team, 'my little native interpreter' who was cited as 'a very intelligent man [who] can help me in many ways; a stout femur or astagalus I can leave almost entirely in his charge,'[4] and who apparently continued prospecting for fossils in the region after Forster-Cooper had left.[5] This seems to indicate that Forster-Cooper conceptualized this activity as an 'improving' or civilizing project, which could elevate and educate the higher echelons of the indigenous population.

The material excavated by the expedition was extensive but problematic. The main identified site, Chur Lando, was an ancient Miocene riverbed, where bones had been 'gnawed and broken by contemporary crocodiles and to some extent dislocated by the subsequent faulting of small earthquakes, which are still a common occurrence in these parts of Baluchistan' (Forster-Cooper, 1923b, p. 370). While field techniques learned in the USA were indispensable, the size of the bones posed serious difficulties. The fate of 'a pelvis of large size' (see Figure 2) was used to illustrate these problems. 'It was apparently in good condition as far as the external surface was concerned, and was carefully hardened and plastered for transport.' However, when loaded on a camel and taken on a three day journey to Jacobabad, due 'to the peculiar gait of these animals the specimen became cracked, and finally was ground to powder and reluctantly had to be abandoned' (Forster-Cooper, 1923b, p. 370). As a result,

[2] Forster-Cooper to Osborn, 18 November 1932 in Box 24, Folder 40: Cooper, Clive Forster II (1931–1946), DVP.

[3] Forster-Cooper to Osborn, 11 February 1912 in Box 24, Folder 39: Cooper, Clive Forster I (1909–1929), DVP.

[4] Forster-Cooper to Osborn, 11 February 1912 in Box 24, Folder 39: Cooper, Clive Forster I (1909–1929), DVP.

[5] Forster-Cooper to Osborn, 28 March 1913 in Box 24, Folder 39: Cooper, Clive Forster I (1909–1929), DVP.

Figure 1. Clive Forster-Cooper (1880–1947). DF5004/10: Forster-Cooper, Sir Clive: scrapbook, c. 1850–1950, third volume. Courtesy of the Natural History Museum (London) Picture Library

Forster-Cooper added inadequate transportation to his list of woes. The struggles of the paleontologist in colonial regions against the environment, condition of the fossil material and local obstructionism was an important part of the disciplinary narrative, with science being an arduous (and often frustrating) endeavor.

The material that did survive was transported back to Britain, as disciplinary conventions needed it to be prepared and analyzed in a metropolitan context. The most striking specimens were: a 'moderately complete lower jaw' 72 cm long, with 5.8 cm incisors; and leg bones and vertebrae, which were absolutely colossal, including 'a strong pillar-like' femur 114 cm long and an atlas 47.5 cm wide. All of these were found in the same locality and judged as being rhinoceros like, if highly unusual. Upon comparing the specimens, Forster-Cooper concluded the jaw was too small to belong to the same animal as the vertebrae, and the worn molars indicated that it belonged to a fully-grown adult rather than a juvenile. Therefore, the jaw was judged to be from a different genus of creature to the leg bones and neck vertebrae. It was also easier to prepare, and was published on first in the *The Annals and Magazine of Natural History* in 1911 (Forster-Cooper, 1911). Forster-Cooper noted that the jaw had strong similarities to Pilgrim's *Aceratherium bugtiense*, but was distinct enough from other *Aceratherium* specimens to require a new genus. This was therefore reclassified with the rather unwieldy name, *Paraceratherium bugtiense* ('Alongside the horned-faced beast of the Bugti').

The gigantic leg-bones and vertebrae meanwhile required more preparation, and were published on two years later as a completely new genus (Forster-Cooper, 1913a). Discovering such a huge animal was a major achievement, and much more effort and symbolism went into naming it. In this, Forster-Cooper followed his patronage networks. He wrote to Osborn for permission to name the animal after him, writing how 'it is a poor, but the only, way in which I can make a public acknowledgement of my debt to you and I often regret that such an interval has elapsed.'[6] Osborn accepted graciously: 'I shall be very pleased indeed to have you name the large new quadruped after me. An animal of such generous mould will offset in the public mind the zeal of some of my friends who have recently named scorpions and tsetse flies after me.'[7] Naming became an important part of scientific network-building and honoring patrons. However, again, other issues could cause problems in this. Forster-Cooper's initially-suggested name, *Thaumastotherium osborni* – 'Osborn's Wonder Beast' – needed to be rescinded when it was found that there was already an Australian beetle named *Thaumastotherium* (Forster-Cooper, 1913b). The genus was therefore renamed after the general location, becoming *Baluchitherium osborni* – 'Osborn's Beast of Baluchistan' (a name which Osborn stated he preferred).

Despite this cordiality, and the apparent ease with which a limited number of bones had been transformed into two new genera, working out the wider relationships of these creatures was more tricky. The bones were too unlike any modern animal for either Forster-Cooper or Arthur Smith-Woodward (1864–1944) at the Natural History Museum in London to clearly place them within any family – with the closest possibilities being rhinoceroses. However, the size and resulting morphological peculiarities of the bones made analysis difficult: the atlas was more than four times the size of a modern rhinoceros, and was judged as more like that of an early 'primitive' rhinoceros than more recent forms. Osborn meanwhile muddied the waters somewhat by suggesting that the animal was not an extinct rhinoceros at all, but in fact 'a gigantic Titanothere,'[8] referring to an extinct family of quadrupeds from the Eocene and Oligocene of the United States that he himself

[6] Forster-Cooper to Osborn, 28 January 1913 in Box 24, Folder 39: Cooper, Clive Forster I (1909–1929), DVP.

[7] Osborn to Forster-Cooper, 15 February 1913 in Box 24, Folder 39: Cooper, Clive Forster I (1909–1929), DVP.

[8] Osborn to Forster-Cooper, 15 February 1913 in Box 24, Folder 39: Cooper, Clive Forster I (1909–1929), DVP.

was working into a large monograph (Osborn, 1929; Rainger, 1991). The perplexing nature of the specimens was not the only barrier to work, with the First World War putting a stop on research. Forster-Cooper was enlisted into the war-effort, first conducting munitions testing, and then, like many trained natural historians, working in tropical medicine. This ensured that 'private paleontological work has to go to the wall to my great regret because my Baluchistan collections are very interesting.'[9] In this way, paleontology, a subject very much dependent upon leisure time and personal interest, was restricted by state needs.

Alexei Borissiak and Paleontology in the Russian Empire

These earlier researches were conducted within established Anglo-American networks. However, unknown to both Forster-Cooper and Osborn, similar projects were being undertaken in a different context – that of the Russian empire. Here, paleontological research was also reaching into colonial regions, and was tied with other sciences, in particular geography and geology. Russian imperial expansion into Siberia and central Asia was often accompanied by geographical surveys, exploration teams and natural historical expeditions, seeking to know and order the territory and its products. Some of this was organized by the state, but it was also conducted by private individuals and voluntarist associations such as the Imperial Russian Geographical Society, which aimed to use exploration of the empire to promote imperial identities and spread public knowledge (Bradley, 2009, pp. 86–168). However, while Russian institutions aimed to collate and compare material in similar ways to their British counterparts, they also faced a great array of difficulties, in particular, transporting material and communicating across a vast land empire. Additionally, while the Russian state supported science to some degree, and Russian civil society organizations were established in fields like medicine and natural history, the Russian scholarly establishment lacked the same resources and extensive networks of expertise as were found in Britain, the USA and states of western Europe. Russian science often relied on links with scientists in other countries, particularly France and Germany, and scientific works tended to be published in French and German, despite occasional Russification efforts within scientific periodicals. This en-

[9] Forster-Cooper to Osborn, n.d. November 1915 in Box 24, Folder 39: Cooper, Clive Forster I (1909–1929), DVP.

sured that the Russian field sciences were marked by expansiveness, but also limitations in what could be undertaken, and needed to be highly targeted due to the difficulties in transport and limits of expertise.

These trends can be seen in the development of paleontology in the Russian empire. Notably, the history of the Russian earth sciences is largely historiographical *terra incognita*, with literature on the subject consisting of a few articles in paleontological texts (for example, Benton et al., 2000), some sections in general works on Russian science (Vucinich, 1970, pp. 397–423), and a few studies on geology in the later USSR (Bolotova, 2004). This is a major gap, as not only were the Russian earth sciences conducted on a huge scale, but Russian territories were of great importance for paleontology and geology. From the end of the eighteenth century, the Russian empire had been a prime location for the unearthing of mammoths and other Pleistocene megafauna (Cohen, 2004, pp. 115–133), and western geologists, most notably the British surveyor Roderick Impey Murchison (1792–1871), conducted extensive work in the Russian empire, naming key periods, such as the Permian, after Russian regions. By the end of the nineteenth century, Russian scientists conducted their own researches with often dramatic results, most prominently Vladimir Amalitskii's (1860–1917) excavations in the North Dvina, which located a range of therapsids and other exotic forms from the end of the Paleozoic (Ochev and Surkov, 2000).

As in British colonial paleontology, connections with geology were essential, and if anything even more marked. As Vucinich (1970) has illustrated, geology in Russia was largely undertaken by non-Russian experts in the earlier nineteenth century, but became rapidly expanded in domestic institutions by the end of the century, linked with state drives for modernization and industrialization, and private mining and prospecting enterprises. This should indicate that – as in British India – paleontology in Russia often occurred in the wake of economic exploitation through geology. A Geological Committee was established in 1882 in the Mining Department of the Ministry of State Lands, which expanded to 27 members by the 1900s, and while the Russian geological community tended to be orientated towards the practical business of mining, prospecting and railway-building, this still offered opportunities to undertake paleontological investigations. This shifting importance of geological institutions, and the increasing domestication of research, is demonstrated in the changing personnel of Russian paleontology. The first generations of Russian paleontologists tended to be trained abroad, particularly in France and Germany. For example, Vladimir Kovalevsky (1842–1883) studied in Jena and Paris to become an authority on ungulate evolution, but then committed suicide after failing to establish a paleontological institute in Moscow. Meanwhile, Maria Pavlova (1854–1938) studied with Albert Gaudry in Paris, before returning to Russia in the 1890s to focus on fossil mammals and work at the Geological Cabinet at Moscow University. However, in the next generation, Alexei Borissiak (1872–1944), developed his career within the new Russian geological institutions. He initially worked at the Geological Institute in Saint Petersburg, and then in the Crimean Geological Committee, becoming more and more interested in paleontological discoveries in southern Russia and central Asia.

The close links between geology and paleontology (and also the difficulties in communication and exchange across the Russian empire) are demonstrated in the Russian discoveries of the *Indricotherium*. In 1912, mining geologists working near Kara Turgai in Turkestan discovered huge fossil bones. The following year, two expeditions were sent to the region by the Geological Museum of the Imperial Academy of Sciences to unearth fossils to bring back to Saint Petersburg. These were analyzed by Borissiak, as the leading metropolitan interpreter, who very much controlled the analysis of specimens and account of the expedition, but was also subjected to the autonomy of his subordinates and the influence of local collaborators. He would later recall that Gailit, the leader of the expedition, abandoned the original site after he was 'enraptured' by a report 'from the wandering Kirghiz that there were rich stores of great bones near lake Shalkar: ''there had been fights between giants there, and the bones of the vanquished lay about,'' and instead went to a completely new location' (Borissiak, 1929, p. 6). This narrative demonstrates the conception of paleontological research held by an elite, metropolitan scholar. On the one hand, colonial paleontology was – as for Forster-Cooper – a struggle against harsh conditions, impetuous subordinates, and the deficiencies of the colonial infrastructure. Yet this was also connected with a degree of romanticism, and Orientalist conventions which frequently developed within Russian accounts of central Asia (Tolz, 2005). The motif of fossil bones being known to indigenous peoples, and linked with myths of terrifying monsters, is a common one in paleontological accounts of this period (van der Geer et al., 2008; Mayor, 2011), and the above description is quite conventional in this respect. As well as utilizing indigenous knowledge within contemporary science, this highlighted the romantic nature of the regions ventured into, with their exotic nomads and picturesque legends. It also showed how modern science could take mythological monsters and transform them into reconstructions of life in the past.

A further issue in the Russian accounts is the disparity of expertise and division of labour. This work was organized in a centralized manner, which owed both to the nature of the state, with its clear lines of power emanating from Saint Petersburg, but also the small number of trained paleontologists in Russian scientific institutions. While in the British context, Forster-Cooper would conduct the excavation, scientific preparation and publication himself, in Russia, the excavation was conducted by the geological explorer, and the material analyzed and published on by the metropolitan expert. In this system, expertise was presented as highly unequal, and Borissiak filled his account with assertions of the ignorance of his subordinate. He noted how his 'disappointment was great,' when Gailit reported that he had just found the skeleton of a large 'mammoth' on his expedition, which was almost useless given the vast numbers of mammoth remains already held in Saint Petersburg. Nevertheless, his own analysis of the specimen could turn the impetuousness of his subordinate to his advantage:

> I selected the thigh as the first object to prepare – a colossal bone that was mostly intact, for the bones from this location were very badly preserved. Gradually the middle part of the bone was restored, and how great was my joy and excitement, when I found the presence of a small, but evident, third trochanter on the right position. That was proof, that we were not dealing with a mammoth, but a totally unknown giant (Borissiak, 1929, p. 6).

The skills of the metropolitan expert, and the slow and steady examination of the material, were crucial to realizing the ambitions of discovering new and spectacular animals.

The expeditions to central Asia brought back a very large amount of material judged to belong to this 'unknown giant' – over a hundred fragmentary pieces of bone and teeth, from five different sites, and thought to be from at least eleven different individuals. They were also of comparable size to the remains found by Forster-Cooper: incisors 12 cm long, an 86 cm tibia and 93 cm humerus. Borissiak classed these within a single genus of gigantic rhinoceros, but recognized that this was potentially problematic. The comparative anatomy collections in Saint Petersburg were relatively limited, particularly as far as fossil mammals were concerned. They held skeletons of a tapir, horse and modern rhinoceros (which had been acquired through exploration and exchange), but only a few specimens of common fossil ungulates, such as the early horse *Hipparion* and the primitive rhinoceros *Aceratherium* (Borissiak, 1916, p. 3). Any other fossil remains needed to be deduced from textual accounts.

As in Forster-Cooper's researches, naming this new animal in a suitably impressive way was a key issue. However, Borissiak did not connect it to any patron or supporter. Instead, he christened it *Indriochotherium* – 'the Indrik beast.' This name had highly poetic resonances, referring to a character from an ancient Russian folktale 'The Book of the Dove' called Indrik, 'the father of the beasts,' a giant burrowing unicorn-like creature who lived in 'Holy Mountain' and released water from subterranean caverns to nourish humanity. This reflects something of a trend in paleontology from the late-nineteenth century onwards, of using local languages, rather than just Greek and Latin, in the nomenclature, simultaneously localizing and nationalizing the creatures. For example, many of the mammals discovered in the Siwalik hills – such as *Sivatherium* – were named after Hindu gods, and one of the most dramatic discoveries of the Fayûm expeditions, the horned ungulate *Arsinoitherium*, was named after Arsinoe, a Ptolemaic princess associated with the region. However, rather than name his animal after any central Asian myths, Borissiak instead marked it out as decidedly and archaically Russian. This follows the mix of motifs in his account: dry, expert and scientific on the surface, but acknowledging the imagination required to construct a fossil creature.

Borissiak's work was in many respects analogous to that conducted by Forster-Cooper, taking advantage of formal imperial control to undertake difficult expeditions to distant territories and using metropolitan expertise to construct dramatic and unknown animals. Yet, as well as being marked by differences in the institutionalization and organization of paleontological research within the two empires, the two projects were not in contact with one another. Partly this was a consequence of pre-existing links. Russian scholars had primarily interacted with their counterparts in central Europe and France, rather than the Anglophone networks around the British Empire and United States. Knowledge was asymmetric though: Borissiak was able to give a brief sketch of Pilgrim and Forster-Cooper's discoveries at the beginning of his monograph on the *Indricotherium* (Borissiak, 1916, pp. 2–3; although mislabeling the creature as '*Beluchitherium*'), and also cited Osborn's earlier work on fossil rhinoceroses. However, while Borissiak wrote summaries of his finds in French and German periodicals, and in English in a Russian journal, his two main monographs, on the bones and teeth of the animal, were in Russian, which made them inaccessible to foreign readers (Borissiak, 1916, 1923). Forster-Cooper and the scientists at the AMNH only learned about Borissiak's researches in 1920, and then needed to wait over a year before they could organize their own translations.

Of course, linguistic difficulties were not the only ones which affected Russian scholars at this time, with the onset of war and revolution being rather more significant in cutting links. As has been shown in the literature on science in revolutionary Russia (Krementsov, 1997; Josephson, 1991; Kojevnikov, 2008), the revolution, civil war and early years of the Bolshevik regime had an ambiguous effect on scientific work. On the one hand, political instability, lack of funding and the cutting of international links through the isolation of the Soviet government caused significant problems for scientists in Russia. However, they were able to maintain themselves, and often appealed to the Bolshevik government's drives for modernization, industrialization and public enlightenment to entrench and extend. Here, paleontology faced specific issues, being a discipline which relied on international exchange networks for knowledge of specimens and had some difficulty explaining its practical utility. However, the Russian paleontological networks nevertheless managed to maintain themselves, undoubtedly helped by the Soviet government's continued commitment to funding theoretical and abstract science, and paleontology's close connections with geology. Geological research, which had been the key umbrella for paleontological work in the Russian empire, expanded massively in the Soviet period, being of crucial importance for drives for industrialization and economic self-sufficiency, and also with the geologists being presented as almost archetypal Soviet scientists, working in conjunction with proletarian miners and engineers, to tame the territory and render it useful (Bolotova, 2004). As a result, paleontological institutions and their personnel could remain in place, even while specific support was limited, and international links were blocked. Borissiak maintained his leading position in Saint Petersburg, and Maria Pavlova even gained a professorship at Moscow State University (and was elected to the Soviet Academy of Sciences in 1930).

Meanwhile in Britain, the end of the war permitted Forster-Cooper to resume studies of his specimens. Close work with scientists at the AMNH continued – although marked as much by confusion and frustration as excitement. Funds were also lacking, with Forster-Cooper writing to Osborn in 1922 that 'I am afraid that vertebrate paleontology in the British Museum is got into a backwater … the appalling taxation to pay off the war acts as a wet blanket on people who otherwise would come forward and help.'[10] Nevertheless, still eager to maintain links with American scientists, he arranged for casts of the *Baluchitherium* bones to be made up and sent to the AMNH – where they apparently took 'place of honor opposite the elevator.'[11] In exchange, New York sent titanothere foot bones to compare with the *Baluchitherium* material. However, the specimens remained difficult to analyze, and the relationship between *Paraceratherium* and *Baluchitherium* was particularly perplexing. Forster-Cooper wrote privately to William Diller Matthew (1870–1930), Curator of Vertebrate Paleontology at the AMNH, asking whether sexual dimorphism within the same species could account for the size difference. However, both were doubtful, as this would imply a female half the size of a male. And even if it were a separate genus, the gigantic *Baluchitherium* remained difficult to place within any family. Forster-Cooper wrote that he was becoming 'more and more sure that it is a queer rhino,'[12] while Osborn was apparently 'inclined to think that the animal never really existed and that we are all having a bad dream!'[13] In the meantime, news of the Russian specimens slowly percolated through, and was greeted with excitement. In 1920, Forster-Cooper wrote to Matthew (displaying a lack of knowledge of both the geography of the Russian empire and the chronology of the *Indricotherium* finds), that 'some fragments of this beast turned up in Siberia sometime in 1914 by a Russian show that it is an aberrant Rhinoceros! He got a toe bone, metacarpal identical with one of mine in all respects and with it a tooth typically Rhino (*Aceratherea*) 100 mm across! I have some pretty big Rhino teeth in my collection but nothing that size.'[14] Matthew likewise responded how he 'came across a review recently of the Russian find of your *Baluchitherium*. If it be the same beast, and I don't see how to get away from the evidence, it must be after all a big rhinoceros. But what an extraordinary one!'[15]

[10] Forster-Cooper to William Diller Matthew, 23 October 1922 in Box 24, Folder 39: Cooper, Clive Forster I: (1909–1929), DVP.

[11] Matthew to Forster-Cooper, 12 June 1922 in Box 24, Folder 39: Cooper, Clive Forster I (1909–1929), DVP.

[12] Forster-Cooper to Walter Granger, 7 November 1920 in Box 24, Folder 39: Cooper, Clive Forster I (1909–1929), DVP.

[13] Forster-Cooper to Matthew, 30 July 1921 in Box 24, Folder 39: Cooper, Clive Forster I (1909–1929), DVP.

[14] Forster-Cooper to Matthew, 15 April 1920 in Box 24, Folder 39: Cooper, Clive Forster I (1909–1929), DVP.

[15] Matthew to Forster-Cooper, 23 March 1921 in Box 24, Folder 39: Cooper, Clive Forster I (1909–1929), DVP.

The Central Asiatic Expeditions: Bombarding the Public

The final set of institutions involved in work on the *Baluchitherium*/*Indricotherium* were based in the United States. These operated within quite a different context to Russian and British paleontologists, which had formal colonial empires in which to conduct research, but were wracked by limitations in funding and support. As has been widely demonstrated in the secondary literature, paleontology in the United States developed on a massive scale across this period, facilitated both by the geology of the United States itself and developing drives of museum establishment. As geological prospecting, mining expeditions and railway building expanded into the American West, connected with ideologies of western expansion and manifest destiny, the fossil remains of large extinct animals were discovered, and scientists based in east coast institutions organized large-scale research expeditions of their own. Here, the famous Cope and Marsh feud in the 1870s and 1880s placed paleontology, fossil mammals and dinosaurs in the public eye, and the 'Second Jurassic Dinosaur rush' of the 1890s and 1900s saw museums funded by large-scale philanthropy compete to expand their collections and unearth mountable skeletons of huge sauropod dinosaurs (Brinkman, 2010). Dramatic specimens like these were displayed in American museums, and became key to the discipline's profile (Rieppel, 2012; Rainger, 1991). Linked with debates on the nature of evolution and development, and also the spectacle of unknown dramatic creatures, American paleontology became tied to an appreciation of scale and commercial culture. While – as has already been seen – British and Russian paleontologists were also driven to collect specimens of large new creatures and expand their collections, and there were frequent attempts to present paleontology to wider audiences, the commercial imperatives and close connections to media sensationalism were lacking, as was the same level of funding as that available to American museums.

These trends continued into the post-World War One era. As the cases of Forster-Cooper and Borissiak demonstrate, European institutions, already operating on a smaller scale than their American equivalents, suffered significantly in this period. However, American collections continued to grow over the 1920s, still able to rely on philanthropy and public subscription to fund research. This period also saw a significant expansion of American scientific work beyond the continental United States. American explorers and natural historians became increasing active overseas, often following the increasing political influence of the USA overseas. This was particularly marked in South America and east Asia, as American commercial companies, diplomatic representatives, expatriates and missionary organizations provided basic infrastructure for scientific work (Jacobson, 2000). A whole series of expeditions combining natural historical, archaeological, ethnographic and paleontological research were organized from the late-nineteenth century onwards, with Chicago's Field Museum undertaking numerous projects in South and Central America, and the American Museum of Natural History conducting a natural historical and anthropological expedition in China in 1900–1904. These American expeditions were in some respects more flexible than their counterparts in Britain and Russia, which tended to draw on work already conducted through state-supported scientific surveys in formal colonial territories, and relied on more informal but widespread influence.

The American Museum of Natural History under Henry Fairfield Osborn was here at the forefront. Its domestic expansion has been traced by Ronald Rainger and Paul Brinkman, who discuss how Osborn's strategic alliances with New York philanthropists, business owners and other influential interest groups allowed him to consolidate the museum's collections and expand its profile (Rainger, 1991), and attract and retain a large team of skilled and experienced staff (Brinkman, 2010, pp. 16–26). This cemented the AMNH's position as a crucial center of paleontology, and meant that the scope of its collecting could become global. This is seen in its most extensive project, and possibly the largest natural scientific expedition of the early-twentieth century: the Central Asiatic Expeditions of the American Museum to northern China and Mongolia (1921–1930). These aimed to follow Osborn's 'Prophetic Vision' (Osborn, 1926) that Central Asia was the site of human evolution, and their rationale, media presentation and funding agenda have been traced in several works (Rainger, 1991; Regal, 2002; Gallenkramp, 2001; Kjærgaard, 2012; Sommer, 2007). What needs to be emphasized here is how the Central Asiatic Expeditions took the existing traditions of American paleontology – large, expansive, and connected with commercial culture and the media – and drove them to new heights in a new international context. While the main aim of the CAE was the hunt for human ancestors, it was more broadly engaged in a combination of geological, natural historical, ethnographic and paleontological research. It was also conducted on a large scale. Unlike Forster-Cooper and the Russian expeditions, which consisted of lone western scientists, small teams of local labourers and pack animals, this American expedition was much larger, consisting of a team of 15–20

American specialists from all branches of scientific knowledge, 30–40 Mongol and Chinese assistants, a large camel train and a fleet of motorcars donated by the Dodge Motor Company. The expeditions as a whole cost $600,000, raised through large-scale philanthropy, private subscription, magazine and product sponsorship, and publication sales. Their scientific research therefore depended on thrusting discoveries into the public eye, through magazines, newspaper deals and books.

The CAE's leader and public-face, Roy Chapman Andrews (1884–1960), followed this agenda with some gusto, creating his own explorer-hero persona within this media apparatus. His public image can be well-judged from his declarations in *On The Trail Of Ancient Man*, one of the numerous books produced to document the Central Asiatic Expeditions, that he was able to offset death-defying exploits through organization and planning: 'in the fifteen years I can remember just ten times when I have really narrow escapes from death … I don't believe in hardships; they are a great nuisance. Eat well, dress well, sleep well, whenever it is possible is a pretty good rule for everyday use' (Andrews, 1926, pp. 20–21). Andrews' works, which provided the official narrative of the expeditions, showed an intrepid journey into the unknown made light of by a well-equipped and adventurous team. This was carried through in the publicity, which persistently attempted to maintain a place in the news – both in the US and internationally. A narrative was built up taking 'struggles against time, heat and native opinion,' but – far from presenting them as a barrier – using them to show how dynamic and effective the research actually was.

With human ancestors being unforthcoming, the CAE reported back on any interesting finds. In the early days, Andrews presented a series of stories to the press, describing his hunting of Ibex, onagers and mountain goats, and on-the-spot accounts of cultural and political affairs, particularly encounters with Chinese warlords, Mongolian chieftains, corrupt Lamas and communist officials. Almost unexpectedly though, some of the most dramatic stories turned out to be the paleontological ones, as the expeditions discovered the fossils of numerous unknown dinosaur and mammal species. Walter Granger served as the expedition's head paleontologist and Andrews' second-in-command. As a very skilled field excavator, Granger (along with a large team of again largely unacknowledged Chinese excavators) supervised the extraction of much material and arranged its transportation back to the United States. The first big discovery was made in the summer of 1922, and was told in appropriately dramatic terms by Andrews. After he healed the gangrenous finger of the daughter of a Mongol chieftain, he was told of 'bones as large as a man's body' in the nearby badlands. As in Borissiak's account, paleontological study was shown to draw on local knowledge and indigenous myths. The team went on to excavate the site, and Andrews recalled recognizing the specimen almost immediately:

> Suddenly my fingers struck a huge block. Shackelford followed it down and found the other end; then he produced a tooth. My dream had come true! We had discovered the skull of a *Baluchitherium*! One end of the block was loose and easily removed; the remainder appeared to extend indefinitely back into the earth.
>
> … Even though we had realized that the *Baluchitherium* was a colossal beast, the size of the bones left us absolutely astounded. The largest known rhinoceros was dwarfed in comparison; for the head of this animal was five feet long and his neck must have been of pillar-like proportions.
>
> Early in the morning Colgate, Granger, Shackelford, Wang and I set merrily forth in one of the Fulton trucks for the scene of the great find. Shackelford and Walter lay back in camp-chairs, singing at the top of their voices. I suppose that fossils never were collected under happier circumstances (Andrews, 1926, pp. 159–160).

This narrative followed the branding of the expedition. Andrews presented himself as the intrepid leader, although scientific activity was conducted as teamwork, with a band of experts jointly overcoming difficulties and sharing in research. Science was both an adventure and an exercise in camaraderie.

The specimen was quickly packed up and sent back to New York, and a great deal of excitement was raised behind the scenes at the AMNH: William King Gregory (1876–1970), one of the museum's fossil mammal experts, wrote back to the field team that 'The Professor' (meaning Osborn) 'lives in a state of permanent exultation as a result of your discoveries.'[16] Osborn himself congratulated Granger on the discovery of what he claimed was a completely new species of '*Baluchitherium*, which becomes one of the nine paleontological wonders of the world. I take the greatest pleasure in naming it after you:

[16] Gregory to Granger, 25 January 1923. Central Asiatic Expeditions Collection, C446, Box 2, Folder 24. Central Archives, American Museum of Natural History (hereafter AMNH).

Baluchitherium grangeri. I am sure it lived on friendly terms with its first cousin, *B. osborni*!'[17] Again, naming the creature built into the networks of scientific work, being used to reward the work of a subordinate. This enthusiasm was not simply – or even primarily – due to the scientific importance of the find, but owed to hopes of using it for publicity. William Diller Matthew wrote to Granger:

> It is hard to say which of your new fossil horizons is the most important, but clearly every one of them needs to be worked next summer and as thoroughly as we can manage. The *Baluchitherium* will perhaps make the biggest impression on the dear public, who are, I suspect, too much fed up with dinosaurs for anything short of a *Brontosaurus* skeleton to make much impression.[18]

Osborn congratulated Andrews in a similar tone: 'Nothing could have been more timely than the arrival of this wonderful specimen … I have already some hope of clearing up the ten thousand dollar deficiency' in the expedition's funding.'[19]

Following this, efforts were made towards bombarding the 'dear public.' *Asia Magazine*, one of the sponsors of the expeditions, ran a number of stories featuring the *Baluchitherium* heavily, and extensive reports were made in the daily and periodical press. As the skull was fragmentary, there was a long wait while it was reconstructed. Yet far from posing problems for the presentation, fossil preparation was shown as an evocative unveiling of mysteries. *Asia Magazine* encapsulated the suspense and excitement in one of its reports:

> Up in the workroom on the top floor of the American Museum of Natural History, New York, modelers have for months been filling out with plaster of Paris, scraping and fitting together the upper and lower jaws of the *Baluchitherium* skull – the greatest discovery thus far that Roy Chapman Andrews has made in Mongolia. One day, President Osborn, who has been devoting himself for months to this huge creature, pointed out how the great beast would tower to the skylight of the room, twenty feet high. Not least among the interesting things having to do with the reconstruction of this animal is the intense enthusiasm it has brought out among the staff of the museum, the scientists of course, but also the men who have been doing the actual remodeling – Charles Lang and Otto Fal-

[17] Osborn to Granger, 15 January 23, C446, Box 4, Folder 3, AMNH.

[18] Matthew to Granger, 6 November 1922, C446, Box 3, Folder 20, AMNH.

[19] Osborn to Andrews, 12 January 1923, C446, Box 4, Folder 3, AMNH.

> kenbach, chief among them. They treat the Baluchitherium more like their very special pet dog than a museum monster (Asia Magazine, 1923).

The reconstruction process showed the meticulousness and devotion of the scientific team, and the power of modern technology. This was followed through in reports in the scientific literature. The beast was reconstructed by Osborn in *American Museum Novitates* in May 1923, as a fairly gracile, long-necked, tusked animal, which 'probably browsed on the herbage of the lofty branches of trees, as do the elephants and giraffes… They were amply defended by their powerful tusks … these animals attained a greater height, when the neck was elevated and stretched, than 14 feet, nearer 15 and possibly 16′ (Osborn, 1923, p. 14). While Osborn acknowledged his reconstruction was tentative, it lacked the frustration which marred Borissiak and Forster-Cooper's accounts. This was instead a new, gigantic animal, rendered into life by the whole team of specialists at the museum, under Osborn's supervision. Osborn himself also became involved in the publicity, giving his first personal interview in eight years to the *New York Times* when the skull was finally unveiled at the Museum, accompanied by a painting of the living animal browsing on a tree by the artist Charles R. Knight (in one of his last commissions for the AMNH) (see Figure 3), and a photograph of the gigantic skull with Otto Falkenbach, one of the preparators (see Figure 4). The team congratulated themselves on how the *Baluchitherium* was 'reproduced a thousand-fold in still photographs and by the moving-pictures of Mr. Shackelford, and thus distributed in this country and all over the world… within nine months of its discovery this animal will be known to millions of people!' (Osborn in Andrews, 1926, p. 627).

The work at the AMNH was simultaneously more confident and on a larger scale to that in Britain and Russia. Forster-Cooper and Borissiak had great difficulty defining their animal taxonomically, and conducted virtually all of the activity – fossil preparation, analysis, and writing – themselves, rather than follow the complex division of labour which was possible at the larger and better equipped American museum. They also lacked the resources and media connections to present their finds so dramatically (and indeed, the very concept of doing so does not appear to have occurred to them, at least at this point). However, there was a flip-side to this. The AMNH, building an entire research expedition around sponsorship and commercial appeal, required dramatic and evocative finds like the skulls of unknown gigantic mammals to gain attention and secure resources. This was also not necessarily a benefit for research on the animal, as can be seen from the relative fate of the

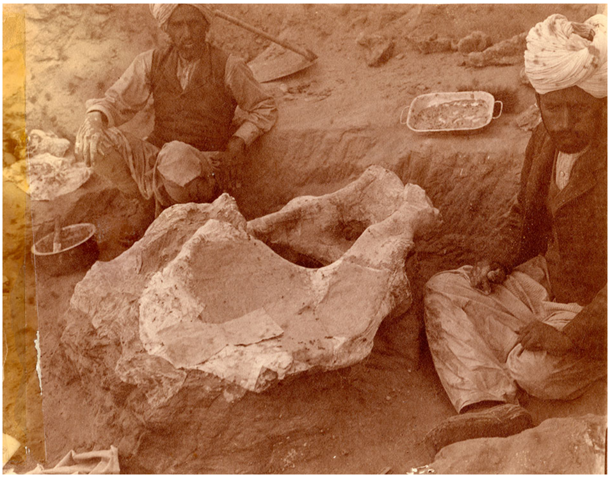

Figure 2. Unnamed local workers with fossil pelvis, broken on transportation. DF5004/10: Forster-Cooper, Sir Clive: scrapbook, c. 1850-1950, third volume. Courtesy of the Natural History Museum (London) Picture Library

Baluchitherium in the AMNH's promotional material once the skull had been unveiled. Far from being fed up with dinosaurs, the 'dear public' were overtaken by something even more dramatic that very summer, when the expedition discovered dinosaur eggs (Kjærgaard, 2012; Gallenkramp, 2001, pp. 181–182). These formed the basis of an even greater publicity campaign, involving media deals with not only *Asia*, but the *New York Times*, *New York Illustrated Times*, *Illustrated London News*, *London Times* and *L'Illustration* and the ill-fated attempt to sell an egg at auction (stoking outrage in China). While this drummed up publicity, it also threatened to drown out other news. Andrews would recall of his 1923 lecturing tour: 'Dinosaur eggs! Dinosaur eggs! That was all I heard during eight months in America … Vainly did I try to tell of the other, vastly more important discoveries of the expedition. No one was interested' (Andrews, 1945, p. 225). The *Baluchitherium* soon became relegated to second-billing compared to the dinosaur discoveries and Andrews' tales of death-defying adventure, which seemed to be more effective at gaining news-space and interest.

Connections between the Metropoles

By the early-1920s, paleontologists in New York, Cambridge and Saint Petersburg had assembled material belonging to a huge fossil rhinoceros

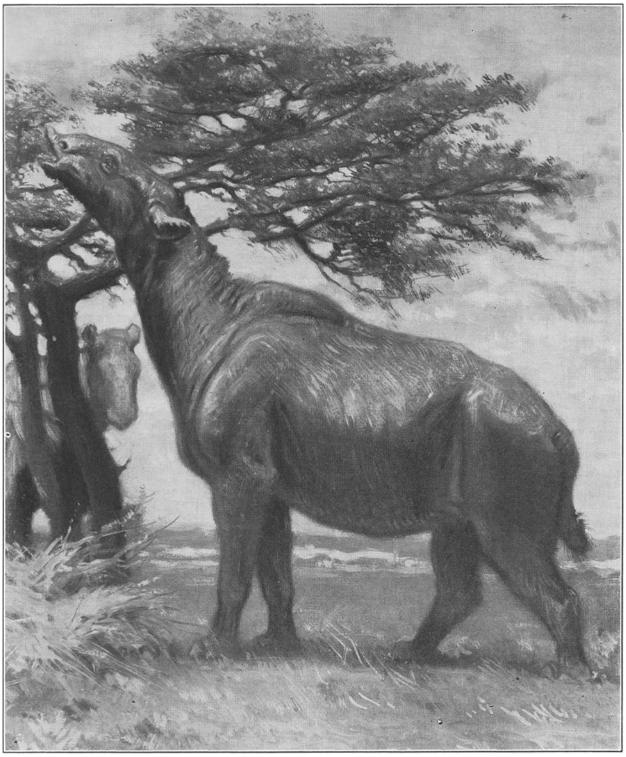

Figure 3. The Reconstruction of the *Baluchitherium* by Charles R. Knight (Andrews, 1926) Author's own collection

from inner Asia. Their research expeditions were also not conducted in isolation. The fragmentary fossil evidence of the *Baluchitherium* and *Indricotherium*, and the international culture around paleontology, led these scholars into contact with one another. The final section of this paper will examine the ways in which the three metropolitan centers – in the United States, Britain and the Soviet Union – interacted once work on the material had begun. As has already been discussed, Anglo-American links had persistently been close, while connections between these and Russian institutions were rather less so. Even though the Russian revolution would seem to raise the possibility of ideological rivalry and further isolation, in fact almost the opposite occurred. Rather than be cut-off from these researches, the recognition of joint work on the animal in fact became an important way of reforging links between western and Soviet scientists, which had been cut by the war and revolution.

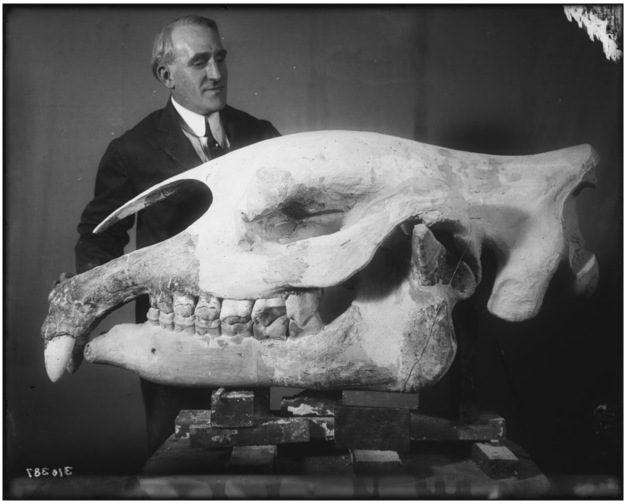

Figure 4. The *Baluchitherium* Skull, with Otto Falkenbach, 1922. Image #310387, American Museum of Natural History Library

Collaborative scientific work therefore served to rebuild international connections in the traumatic period following the First World War. The importance of internationalism in the interwar period, within science but also in cultural, political and economic relations, is presently a lively subject of research. This has tended to examine how state- and non-state institutions, based around organizations like the League of Nations, philanthropic institutions such as the Carnegie and Rockefeller Foundation, and scientific congresses, fostered a sense of internationalized community. Notably, this internationalism did not necessarily seek to wholly overcome national and imperial difference, but often sought to use these as the basis for a new international order – in many respects reinforcing older hierarchies of authority, assumed 'civilization' and metropolitan importance. British internationalists frequently regarded the networks around the British Empire as a foundation for any future internationalist organization (Baughan, 2013), while their American counterparts saw looser networks of US commercial and economic influence as more significant – and also tended to pursue any internationalist projects through non-state enterprises, owing to domestic support for isolationism and the USA's abstention from the League of Nations (Rietzler, 2011). The Soviet Union meanwhile followed its own brand of proletarian and socialist internationalism somewhat opposed to the 'liberal internationalism' which has absorbed most attention in the recent literature. However, its scientific elite were able to participate in more general internationalist collaboration. As Kojevnikov (2002, 2008) and Krementsov (2005) have illustrated, Soviet scientists in the 1920s keenly felt their isolation, and made strenuous efforts to overcome it, primarily through participating in international congresses and renewing pre-war links. This was something tacitly supported by the Soviet state, which saw scientific cooperation as a means of overcoming diplomatic isolation and accusations of barbarism. Relating to this latter point, scientific internationalism often worked in ambiguous ways with feelings of potential threat and inferiority. As Grace Shen has noted in her study of the participation of Chinese geological institutions within international congresses, commitments to internationalist organization was frequently felt to be a necessity for particular communities in need of gaining wider credibility and acceptance (Shen, 2013). This can be seen to a degree in Russian and British participation in this paleontological project, which was undertaken to maintain, and potentially promote, the importance of scientific communities which were in danger of being overshadowed by the huge American institutions.

Interpreting the *Baluchitherium* and *Indricotherium* once the fossils had been removed from the Asian context and placed within metropolitan museums in Europe and the United States became enmeshed in these wider issues. Its reconstruction was something of an international puzzle, and need for comparative material drew the institutions together: the American Museum had the skull, Forster-Cooper had complete leg bones and vertebrae, and Borissiak had the largest collection of remains, but not very well preserved. As noted above, Borissiak was already aware of Forster-Cooper's research by the 1910s, and both Forster-Cooper and Osborn had heard of Borissiak's work on the *Indricotherium* around 1920, and arranged translations of his Russian-language monographs. However, the real spur to international discussion was the discovery of the skull, and the resulting intense discussion in the international and scientific press. The promotion of the specimen by the AMNH could spread beyond the institution itself, and had a particularly strong impact in Britain. Forster-Cooper's discoveries had been fairly obscure for a decade, but now the publicity emanating from New York made the bones in Cambridge much more newsworthy and interesting. He was able to present his research to high-level scientific audiences, publishing an article in *Nature* (Forster-Cooper, 1923c) and his papers were read to the Royal Society (he would not be elected as a fellow until 1936) (Forster-Cooper, 1923a, b). Forster-Cooper's description of the animal broadly followed Osborn's reconstruction, although in more loaded terms, describing the animal as extremely ponderous and massive, and that 'from a consideration of *Baluchitherium* as a whole it is obvious that it is ultra-specialised in gigantism and fast approaching that condition when extinction becomes inevitable' (Forster-Cooper, 1923a, pp. 57–58).

While the AMNH had greater profile and more resources at its disposal than its British and Soviet counterparts, it still needed to operate within established conventions of scientific exchange when it worked with international partners. Despite being extremely resource-driven in its domestic strategy, it could not afford to be overbearing when interacting with foreign institutions. As such, connections were built through older traditions of the transfer of material and information, particularly through letters, publications and (most importantly) casts of specimens. Following the close early links between British and American scholars, the AMNH sent Forster-Cooper a copy of the famous skull almost as soon as it was constructed. Forster-Cooper likewise congratulated the team, saying that 'next to having found it myself I would rather have it found by one of you, and by Granger no means the least.' He also noted, with some relief, that the size of the skull - 'FIVE FEET (what a nightmare!)' - seemed to support the separation of *Paraceratherium* and *Baluchitherium*.[20] However, Forster-Cooper was much less effusive about Roy Chapman Andrews' publicity seeking, writing to Matthew that:

> strictly '*entre nous*' someone ought to edit Andrews (Roy C.). In one of his articles he talks of Osborn's 'epoch making discoveries in the Fayûm' and not a word of C.W. Andrews who was by many years first in the field. To a person like myself who knows them all and likes them all this does not matter but abroad people like Abel, Stehlin, Depéret, etc. also know the facts would think it rather odd and after all Osborn has done too much good work and his reputation is too soundly made to need butter – least of all from one of his own men.[21]

Despite admiration for Osborn and recognition of his importance, Forster-Cooper still urged that credit for paleontological research

[20] Forster-Cooper to Matthew, 23 October 1922, in Box 24, Folder 39: Cooper, Clive Forster I (1909–1929), DVP.

[21] Forster-Cooper to Matthew, 23 October 1922 in in 24, Folder 39: Cooper, Clive Forster I (1909–1929), DVP.

should be shared as equitably and widely as possible. This need to maintain friendly international relations was generally followed through, and in the AMNH's subsequent reports, the initial discoveries of Forster-Cooper and Borissiak would always be mentioned. The AMNH also sent out casts more widely, with copies of the *Baluchitherium* skull being given to the natural history museum in Urga (Mongolia) and to the Geological Society of China in Peking, to maintain good relations and permission for the conduct of the Central Asiatic Expeditions. In addition, news was fed to Osborn's most prominent ally in central Europe, the Austrian paleontologist Othenio Abel, who wrote two papers in *Die Naturwissenschaften*, publicizing the discovery of the animal by Forster-Cooper, Borissiak and the AMNH. Notably in these, Granger was given far more credit for the discovery than Andrews (Abel, 1923, 1924).

Relations with Borissiak in the Soviet Union were also promoted, but more carefully. Given the political difficulties and the Russian Civil War, physical transport of material was difficult, and restrictions on communication between the Soviet Union and the USA and Britain (which did not formally recognized the regime) made institutional contact problematic. A cast of the *Baluchitherium* skull was nevertheless sent to Petrograd, making the difficult journey overland via Latvia. In exchange, the Soviet scientists sent casts of its *Indricotherium* specimens, as well as several crates of other material – including one of Amalitskii's original therapsids. However, again, limitations on resources posed difficulties – Shushkin, a junior Russian paleontologist, wrote to Matthew that 'I am sorry to say, that financial difficulties of the Geological Museum, as also the embarrassments concerning the technical materials, the staff and so on, are quite enormous,'[22] and asked that the American Museum pay for the packing and transportation of the Russian material. This was not only obliged, but the AMNH placed a cash-value of $2,000 on the therapsid. While this in some respects transformed the specimen into a commercial commodity, with a very clear monetary value, this worked strongly to the Soviet institution's advantage. It not only paid for the packaging of the material, but there was enough left over to allow the purchase casts of the most important specimens from the Central Asiatic Expedition (including dinosaur eggs and Mesozoic mammals), and more comparative therapsid material. This ensured that the Russian collections were able to build themselves up even further through these new connections.

[22] Shushkin to Matthew, 10 February 1924, in Box 11, Folder 18: Borissiak, A.D. (1923–1947), DVP.

Following this, Borissiak also sent casts of *Indricotherium* teeth and bones to Britain in exchange for copies of Forster-Cooper's specimens. While there were delays in transporting these from London, Borissiak highlighted the American exchange to spur the British on, noting how 'I have received already a very fragile cast, of the skull of *Baluchitherium*, from Prof. Osborn, which has been mailed via Reval, and it reached me quite safely, so I think, that your case could also be sent this way.'[23] Following this, a triangular system of relations developed, with the Soviet paleontological community corresponding with their counterparts in Britain and the United States with a great deal of cordiality. This was followed by personal connections with Soviet scientists. Shushkin traveled to New York to be trained at the AMNH, and Borissiak himself visited Britain (after fairly complex visa negotiations) in the summer of 1926, where he met Forster-Cooper, examined the original *Baluchitherium* material, and learned new fossil preparation techniques. Through these contacts, it was also noted that publication exchanges between the Soviet and American and British museums had lapsed, and these were then resumed. In all of this, the political differences between the Soviet and western scientists were largely avoided, with relations seeming to following the trends mentioned in Krementsov (2005), of scientists strategically using the technical neutrality of their science to evade ideological problems between their states. As such, work on this creature expanded links between Soviet and western scientists, and built an informal network of collaboration and exchange. In doing so, the scientists in each national community were able to evade formal political difficulties, expand their international influence and gain important material to bolster their collections. This was something doubly important for the British and Soviet institutions, whose financial straits meant that they were unable to undertake large expeditions, and so exchange with other collections was crucial for gaining new material.

Their cooperation was all the more striking in that there were still some disagreements in interpretating the animal. Each community had slightly different views on its reconstruction, and also kept their own names (even if recognizing in their private correspondence and many scientific publications that the relationships between *Baluchitherium* and *Indricotherium* was a taxonomic problem to sort out, and that some of the names were probably synonymous). Broadly, all agreed that *Paraceratherium*, *Baluchitherium* and *Indricotherium* were related and at least belonged in the same family (*Indricotheriinae* to Borissiak, and

[23] Alexeii Borissiak, 19 February 1926 in PAL/100/84/25: A Borissiak, Natural History Museum, London.

Baluchitheriinae to Osborn). However, their exact relationships were unclear. This was especially because body parts of differing sizes were continually discovered, raising the possibility that differences in size or morphology could reflect age or sexual dimorphism rather than genus and species. Interpretations also varied. Forster-Cooper maintained they were all quite different species and should be separated as far as possible. Borissiak initially suggested that the forms were all quite similar. However, on returning from London he analyzed their dentition to place them in an evolutionary series, noting that 'the teeth of all the three forms of *Indricotheriinae* present successive stages in the differentiation of the teeth in one single type. The most primitive stage is represented by the dentition of *B. grangeri*; then follows that of *I. asiaticum*, while the dentition of *P. bugtiense* … proves to be the most advanced in this series' (Borissiak, 1927, p. 2). This was an interesting shift, presenting an evolving series of creatures, which could potentially allow all the names to be kept.

Behind these debates over nomenclature however was the issue of priority. The names had been given in the order *Paraceratherium bugtiense* (1910), *Baluchitherium osborni* (1912), *Indricotherium asiaticum* (1915) and *Baluchitherium grangeri* (1922). Forster-Cooper and Borissiak were quite committed to separating the creatures and keeping their names. However, at the American Museum, the division of labour and increasing study of the collected remains was throwing up problems. William Diller Matthew was coming to regard Forster-Cooper's two specimens as belonging to the same species, and suspected that *Indricotherium asiaticum* and *Baluchitherium grangeri* were also identical – writing this to Borissiak in 1927.[24] If this were the case, the name *Paraceratherium* would have generic priority for Forster-Cooper's specimens, and *Indricotherium asiaticum* would have priority over *Baluchitherium grangeri*. This would mean that the genus *Baluchitherium* would disappear completely. This was potentially very worrying, given that this name had been worked into the AMNH's publicity. By the early-1930s, with evidence mounting, Granger wrote to Forster-Cooper that 'Professor Osborn is much agitated these days over the possibility of losing the good old name *Baluchitherium*. There ought to be some way we can hold it and perhaps you can suggest just what that way is.'[25] Again, naming was proving crucial for the discipline and its structures.

[24] Matthew to Borissiak, 11 April 1927, in Box 11, Folder 18: Borissiak, A.D. (1923–1947), DVP.

[25] Granger to Forster-Cooper, 8 April 1931 in Box 24, Folder 40: Cooper, Clive Forster II (1931–1946), DVP.

Not only were the scientists attached to these for personal reasons, but terms for iconic creatures were crucial for publicizing scientific work.

Further difficulties occurred in the research itself, with the expanding networks of the 1920s became difficult to maintain in the face of a changing international situation. By the end of the decade, as scientific communities outside Europe and the US became more active in resisting the export of cultural and scientific objects. While much of this was directed against the export of artworks and archaeological antiquities, fossils also increasingly became subjects of protection, with states in South America, Egypt and China passing legislation and forming government and voluntary bodies dedicated to the protection of national heritage (Fan, 2013). The Central Asiatic Expeditions faced a major crisis in 1928 when, corresponding with the establishment of the Guomindang government, Chinese heritage organizations impounded all the material from that year's field season (including the remains of a new specimen of *Baluchitherium*). These were eventually released after a heavy diplomatic onslaught from Osborn, but it became obvious that the expeditions would no longer receive easy access to reach Mongolia through China. Notably, Osborn defended his expeditions in terms of scientific internationalism, describing this action as 'a very serious setback to the cause of science and of civilization' which threatened to place China 'in the column of backward, reactionary and non-progressive nations' (Osborn, 1931, p. 142). Tense negotiations over keeping paleontological material in China and increasing the Chinese scientific component on the expeditions were completely ruined when Andrews entered negotiations with Japanese scientists over using Manchuria as a base from which to reach Mongolia – which was unsurprisingly regarded as an affront to Chinese sovereignty, and destroyed any future possibility of working in China.

However, this did not end searches for other routes to Mongolia. Interestingly in the light of the above networks, negotiations were begun with institutions in the USSR in 1933, simultaneously taking advantage of the USA's recognition of the Soviet Union in that year and the links forged through the reconstruction of the *Baluchitherium*. Andrews himself traveled to Moscow to meet Borissiak, and attempted to persuade George Sherwood, the AMNH's then Director, of the benefits of such a mission – while being very careful to depoliticize these links by noting of the Russian paleontologists that 'that none of these gentlemen are Bolsheviks.'[26] Yet this came to nothing. Once cooperation moved beyond informal exchanges between scientists towards activity which

[26] Andrews to Sherwood, 14 September 1933, A51, Box 4, Folder 30, AMNH.

required collaboration with state structures, the gears of exchange ground to a halt. The changing political situation in USSR was hinted at, with Andrews writing that 'unless we got the active cooperation of Stalin or one of three or four other men it would be absolutely impossible to work effectively.'[27] However, the prime reason was economic, as Soviet authorities insisted that any expedition buy all supplies and equipment in the USSR at the official ruble exchange rate – which would inordinately increase the cost of the project, and ensure that commercial sponsorship was impossible. Nevertheless, Borissiak wrote back to Osborn, how he was 'very sorry not to work with Dr. Andrews this summer. I hope to be more successful in future: the present cordial relations between our Countries will favour our joint friendly work in paleozoology,' and then, like a proud parent, included a photograph of his latest piece, 'my essay [*sic*] to reconstruct the head of this *Indricotherium* baby. Do you like it?'[28]

The two mounted displays therefore represented the culmination, but also the closure, of this international expansion. In Leningrad, an *Indricotherium* skeleton was erected in the Geological Gallery of the Russian Academy of Sciences for its bicentennial celebrations in 1925 (see Figure 5). This followed Borissiak's reconstruction, and was accompanied by a mural of two *Indricotherium* by a lake, with a smaller extinct rhinoceros, *Epiaceratherium*, to provide a sense of scale – although Borissiak admitted this 'was made by an artist who unfortunately has not reached the level of Osborn's Charles R. Knight' (Borissiak, 1929, p. 7), recognizing the higher quality of the American reconstructions. However, while international presentations were still a feature of work in the 1920s (with the bicentennial of the Academy of Sciences intended as a showcase for Soviet science, and the *Indricotherium* forming the centrepiece of Borissiak's presentation on the progress of Russian paleontology at the *Russischen Naturforscherwoche* in Berlin in 1927), by the 1930s this become much less of a priority. The pre-Revolution generation of paleontologists continued to be in the driving seat even through the growth of a more hierarchical and controlled system of scientific research after Stalin's consolidation of power (Krementsov, 1997). However, their international contacts were increasingly blocked off. An attempt by the young George Gaylord Simpson to follow Borissiak's invitation to reach Mongolia via the USSR in 1934 came to nothing, and the flow of correspondence to American and British

[27] Andrews to Sherwood, 14 September 1933, A51, Box 4, Folder 30, AMNH.

[28] Borissiak to Osborn, 14 May 1934, in Box 11, Folder 18: Borissiak, A.D. (1923–1947), DVP.

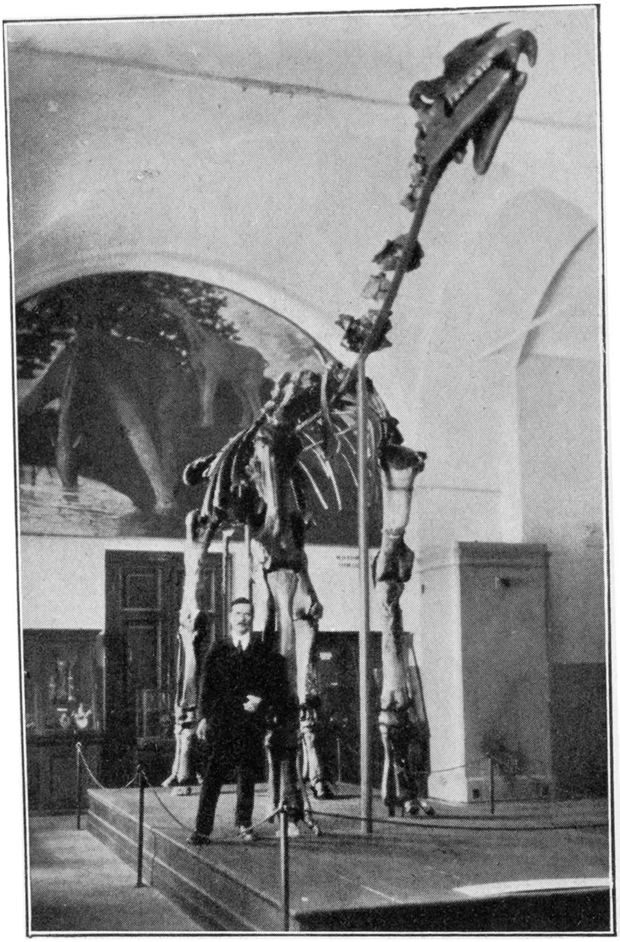

Figure 5. Borissiak's reconstructed *Indricotherium* (Borissiak 1929, p. 9) Courtesy of the Natural History Museum (London) Picture Library

institutions dried up over the latter part of the 1930s. The mounted *Indricotherium* was moved to Moscow in 1938 to form the centerpiece of the new Museum of the Paleontological Institute.[29] While the mounting was regarded as spectacular by those foreign scientists who heard about it (Matthew wrote 'I have been greatly interested in the photograph of

[29] The collections were to suffer severely from the lack of heating and humidity control during the siege of Moscow during the Second World War, as its staff were conscripted to dig trenches (Bodylevskaya, 2007).

your mount of *Indricotherium*, which is truly most impressive'[30]), it does not seem to have been widely known outside of the USSR, with the few foreign visitors in the late-1940s and 1950s commenting on it as a complete surprise. This seems to even more demonstrate how contact and exchange between Soviet and western institutions had broken down.

American scientists also faced problems, with access to central Asia having been cut off by the 1930s. However, the extensive collection of bones and casts at the AMNH enabled study of the animal to continue. The AMNH never acquired a full *Baluchitherium* skeleton, but a composite reconstruction was attempted in the early-1930s by Granger and Gregory (see Figure 6). This was an incredibly difficult exercise, given the size differences in the available bones and incompleteness of the specimens. To solve this, all remains were divided into four size categories, with 'I' being the largest ('super-giant'), and 'IV' being the smallest (at about half the size of a size 'I' animal). This enabled the bones to be scaled up and down proportionally, and used to depict complete creatures at each scale (Granger and Gregory, 1935). While this made up for the lack of a complete specimen, the reconstruction has been regarded as highly problematic, particularly in terms of its enormous size (Fortelius and Kappelman, 1993): a size I animal was 17′3″ high at the shoulder, reaching in its normal posture the maximum stretching height of Osborn's more gracile reconstruction. In this, it is possible to see the need to protect the creature's status as 'the largest mammal to ever walk the earth,' and accentuate its bulk accordingly. While never built as a standing skeleton, an enormous concrete relief of a 'Size I' *Baluchitherium* was erected in the museum's Tertiary Extension Hall in 1936, which led to something of a second wave of publicity. *The New York Times* informed its readers that 'in a few weeks the public will be able to see a restoration of an animal of such size … that a six-foot man can walk beneath it without even removing his hat' (*New York Times*, 6 July 1936).

However, this reconstruction was beginning to unravel interpretations. Granger specifically wrote to Forster-Cooper that 'we are not taking up the taxonomic side of the question. We want to keep the name *Baluchitherium* and we might have to abandon it if we went into the matter very deeply.'[31] Indeed, the Size IV *Baluchitherium* was approximately the same size as Forster-Cooper's *Paraceratherium*, which again

[30] Matthew to Borissiak, 11 April 1927 in Box 11, Folder 18: Borissiak, A.D. (1923–1947), DVP.

[31] Granger to Forster-Cooper, 25 May 1934, in Box 24, Folder 40: Cooper, Clive Forster II (1931–1946), DVP.

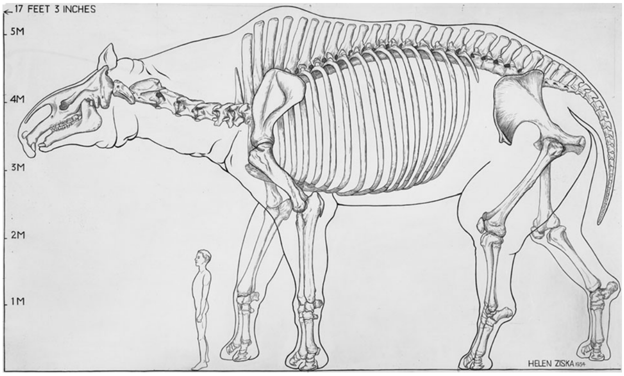

Figure 6. The Granger–Gregory Reconstruction, (1935). Image #314519, American Museum of Natural History Library

raised doubts over the differentiation of the animals. In this way, a key problem – around the name – was avoided. However, as the generation of scientists committed to the term and the creature passed away, both the public profile and name *Baluchitherium* steadily trailed. In the postwar period, more specimens were described by Soviet and Chinese scientists (particularly Gromova, 1959; Chow and Xu, 1959), who tended to use *Indricotherium*, which took steady precedence in the scientific literature. The name *Baluchitherium* did echo in American popular culture somewhat: a John Updike short-story of 1971 subverted the main resonance of the animal – of a ponderous creature too oversized and moronic to survive – by having a disorientated time-traveler to the Oligocene being greeted by an educated *Baluchitherium* with an 'Oxonian accent' pondering upon 'how curious it is… that you primates should blunder upon my five-foot skull without deducing my hundred-kilogram brain' (Updike, 1972); and in 1995 'Baluchitherium' served as the title for a suitably lumbering Van Halen instrumental. However, following this, the term continued to sink into taxonomic obscurity.

Conclusion

The excavation, analysis and reconstruction of the *Baluchitherium* and *Indricotherium* worked at the junction of a range of processes, drawing off established colonial networks within formal and informal systems of influence, and also the changing international dynamics of early-twentieth century science. Paleontology depended upon the extraction and comparison of material on a global scale, but frequently faced significant variations in its level of institutionalization and ability to gather resources. To deal with these issues, we can see at least two distinct styles of scientific work. In the case of the Russian and the British researches, paleontological fieldwork was conducted on quite a small-scale, either pursued by individuals with private resources or as an accessory to more economically productive activities such as geological exploration. This led to focused work in areas of formal control, following in the tracks of other field sciences, which were penetrating colonial regions, and making new observations on palaeontological matters. Following this limited fieldwork, scientific activity became confined to the metropole, both owing to the lack of resources for more extensive field research, but also because the discipline depended upon large collections and concentrations of expertise to assert its authority. Meanwhile, the more capitalistic and public activities of the AMNH show something of a different research trajectory. This worked with popular culture, advertising and the mass-media to draw off wider engagement with dramatic forms of scientific work, tied to ideas of dynamic exploration and exciting prehistoric creatures. Building on national traditions of philanthropic funding and public museum science, and the USA's more informal influence overseas, this was able to build up a varied research system in the metropole and expand across a large territory. However, this very informality posed significant problems later, as it was more reliant on the tacit approval – or at least acquiescence – of local institutions to conduct work, and its high profile nature could aggravate scientists in the host country.

These different approaches were however attempting to solve similar problems: how to pursue a science which required expeditions to distant regions, had no direct economic products of its own, but could build publicly resonant narratives of the development of life. This ensured that there were common motifs across all the accounts. Paleontology was presented in terms of western explorers (or teams of scientists) overcoming a range of environmental and infrastructural problems in inhospitable territories. However, whether these were presented as a nuisance to the paleontologist, as they were for Forster-Cooper, difficulties to be overcome by the more educated metropolitan scientist as for Borissiak, or as opportunities to demonstrate the power of organization and technology, as they were for Andrews, depended on the 'persona' being adopted by the scientist themselves, and the institutionalization of paleontology in the country. Additionally, while these researches were dependent on indigenous labor and knowledge, this tended to be obscured, or at most highlighted as picturesque details within the narrative accounts (and the role of indigenous collaboration within scientific fieldwork remains an important area of further study). A further important issue that has been drawn out is the importance of names, even while issues of priority and comparison of specimens caused terms to unravel. The case of *Baluchitherium* and *Indricotherium* show how names were inscribed with particular meanings based on locality and patronage, and naming formed a key aspect of scientific sociability, public presentation, and national styles of research (although notably, this did not prevent wider acknowledgements of the relatedness of specimens). Names were not only connected with internationally agreed standards in the biological sciences, but publicization efforts and alliance building between scientists.

Beyond this, there was always a strong dynamic of metropolitan control in paleontology, with clear centers claiming responsibility for gathering, storing, interpreting and displaying material. However, these could only become authoritative if they operated within wider systems of exchange. The large museum collections with their patriarchal masters were dependent not only on colonial links to gather material, but also their relations with their counterparts abroad. There were of course definite imbalances between them, with the AMNH in particular being able to extend its influence far afield while its Russian and British counterparts even started to contract in the post-First World War period. Nevertheless, all these institutions needed to rely on scientific sociability and exchange (at least between the metropolitan peers) to gain access to vital material and transfer knowledge. The degree of interaction between the British, American and Russian/Soviet paleontological communities indicates that the period between the 1900s and the end of the 1920s could be highly expansive, both in terms of global research and the building of links across national, imperial and ideological boundaries. While connections were blocked at varying points – particularly in the period around the First World War and from the 1930s – the drive to overcome these blockages was always present. Imperial and ideological rivalries, and differences in national styles of research and reconstruction, were often downplayed, and played much less of a role in preventing interaction between these scientific communities than might be initially assumed. When difficulties did arise, they seem to have been over more prosaic matters, such as money, language and transport. Paleontology, as a science which depended upon comparison, access and exchange constantly needed to follow strategies of both metropolitan consolidation and wider expansion.

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