

Swedish vertebrate palaeontology in China: A history of the Lagrelius Collection

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The Lagrelius Collection in Uppsala, Sweden is one of the largest collections of Chinese fossil vertebrates outside China. It was collected from eastern China by J.G. Andersson between 1916 and 1926 and O. Zdansky between 1920 and 1923. The collection consists mostly of late Tertiary mammals, but also includes some early Tertiary mammals, Mesozoic reptiles and fishes and late Palaeozoic plants. The collecting enterprise was jointly sponsored by the Geological Survey of China and the Swedish Government (under the auspices of A. Lagrelius). The fossil specimens were sent to Sweden (the plants to Stockholm and the vertebrates to Uppsala), and duplicate specimens were returned to China as well as material belonging to Chinese institutions. A new monographic series, *Palaeontologia Sinica*, was started for the description of this material. Andersson's early collecting led him to Zhoukoudian, a locality which he entreated Zdansky to excavate. Zdansky found the first hominid remains discovered there and described much of the accompanying mammalian fauna. Bohlin resumed the excavation at Zhoukoudian in 1927, then joined the Hedin expedition to northwestern China, thus continuing Sino-Swedish cooperation in palaeontology until 1933.

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Introduction

The Axel Lagrelius Collection in the Palaeontological Museum of the University of Uppsala in Uppsala, Sweden is one of the largest collections of Chinese fossil vertebrates outside China and has formed the basis for numerous scientific monographs and papers. The specimens in this collection were collected between 1916 and 1926 by J. Gunnar Andersson and between 1920 and 1923 by O. Zdansky, and their numerous assistants. A large part of the collection was described by Zdansky (1924a, 1924b, 1925a, 1925b, 1926, 1927a, 1927b, 1927c, 1928, 1930, 1935), Bohlin (1926, 1935), Ringström (1924, 1927), Sefve (1927) and Wiman (1929, 1930) shortly after the collection arrived in Uppsala. Although some palaeontologists have studied specimens pertinent to their research, the Lagrelius Collection has not been thoroughly analysed since the 1930's. Kurtén (1952, 1953), Forstén (1968) and Anderson (1970) are the principal works since the 1930's that describe parts of the collection, and these, as well as other authors, have written several shorter papers on parts of it.

Although the above authors have greatly contributed to our knowledge of the fossil vertebrates in

the Lagrelius Collection, some of the original work is now in need of revision, and the collection needs to be more widely recognized.

Histories of the great fossil collections have usually been published, but the Lagrelius Collection has not received this honour, despite the considerable impact it has had on Chinese vertebrate palaeontology. Indeed, references to the collecting expeditions are few (Andersson, 1934) is one of the few examples). The correspondence between Wiman and Andersson in the archives of the Palaeontological Institute in Uppsala are the most revealing source of the history of this collection. This paper is based largely on these letters and reports (most of which are in Swedish) and on the personal memories of Zdansky and Bohlin, who are currently living in Uppsala. Interviews with both of them proved invaluable in the elucidation of what actually happened during the expeditions and in filling in details to which the correspondence and reports only alluded. We have followed the Pinyin romanization of Chinese placenames in the text, and the quotations from letters were translated from Swedish by the senior author. Biographies of the major participants in the history of the Lagrelius Collection are in the appendix to this paper.

Before Andersson

The history of vertebrate palaeontology in China began in 527 A.D. when Daoyuan argued that some fossil fish represented once-living organisms (Needham 1959). Needham also cites older Chinese references to fossil-tetrapod remains as “dragon bones”. However, modern vertebrate palaeontological studies in China did not commence until the latter part of the Nineteenth Century when vertebrate fossils found their way to Europe and were briefly described by Davidson (1853), Adams (1868), Owen (1870) (see Fig. 1), Gaudry (1872),

Lyddeker (1881, 1883, 1891, 1901), Koken (1885), Obruchev (1899) and others. The first palaeontological fieldwork, *sensu lato*, apparently was undertaken by Mushketov who, during 1874–1875, reconnoitered the Dian Shan mountains in northern Xinjiang and collected invertebrate and plant fossils from the Devonian-Cretaceous rocks. An American geologist, Pumpelly, worked for the Chinese government as a coal-mining engineer and examined much of the geology of eastern China. His work (Pumpelly 1866) was published about a decade prior to that of von Richthofen (1877–1912), who undertook the first scientific exploration on a grand scale of China and Central Asia. Koken (1885) described the fossil vertebrates collected by Richthofen. Although various other geologists and naturalists visited parts of China during the remaining years of the Nineteenth Century, the fossil vertebrates forthcoming were few and far between. One of the most successful was the Hungarian Lóczy (1899), who described fossil bones and invertebrates collected in Gansu during 1877–1880.

The first expedition primarily devoted to geological and palaeontological survey in China was sent from the Carnegie Institution by Walcott and led by Bailey Willis (Blackwelder and Hirth, 1907; Willis 1907; Willis et al., 1907). However, publication of the famous monograph by Schlosser (1903) predated publication of the results of this expedition. Schlosser described Chinese fossil vertebrates sent to him by the German naturalist K. Haberer. In the aftermath of the Boxer Rebellion of 1899, Haberer was unable to travel to the Chinese interior and limited his collecting to pharmaceutical shops in the eastern cities of China. Among the many fossils of proboscideans, camels, hipparionids, giraffes and carnivores that Haberer purchased was a single anthropoid tooth (Fig. 2). Schlosser’s (1903) description of these specimens (most evidently were of

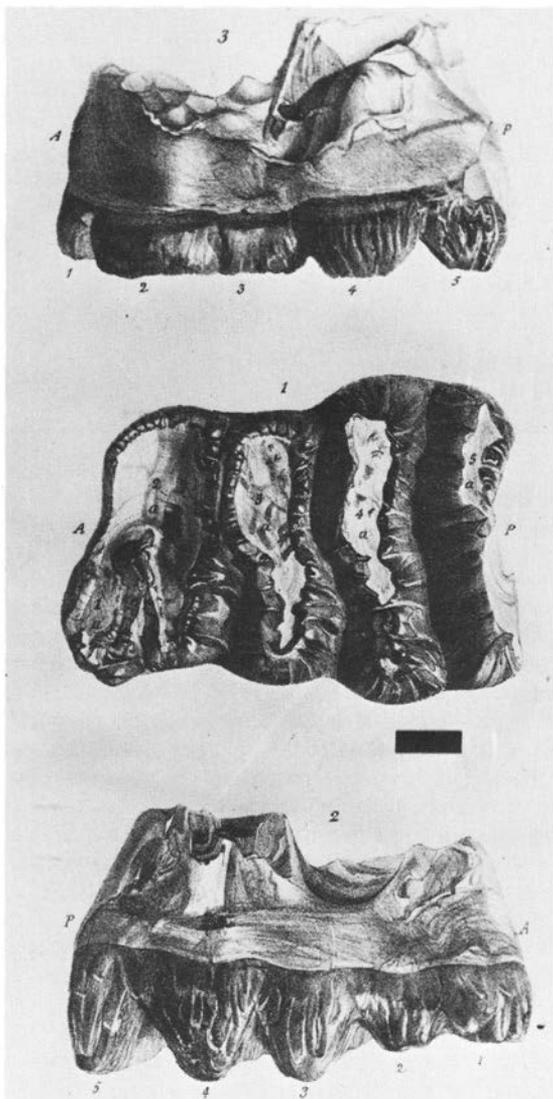


Fig. 1. The M² of *Stegodon sinensis* Owen, 1870, internal (top), occlusal (middle) and external (bottom) views. The black bar is 1-cm-long. From Owen (1870).

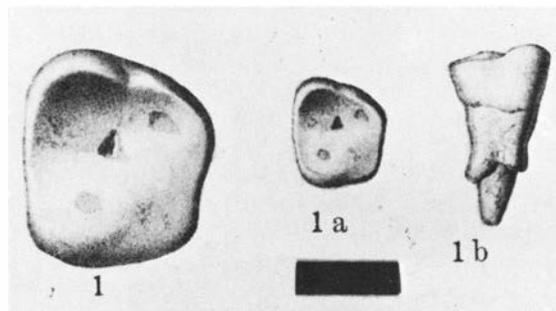


Fig. 2. The upper molar collected by Haberer and identified by Schlosser (1903) as ?*Homo* sp., occlusal (1. 1a) and posterior (1b) views. The black bar is a 1-cm-long scale for 1a and 1b; 1 is twice as large as 1a. From Schlosser (1903).

Pleistocene age) attracted a great amount of scientific attention. The anthropoid tooth formed the nucleus of Schlosser's proposal that the primates originated in Asia. Osborn, at the American Museum of Natural History, was intrigued by Schlosser's assertion and further argued that all mammals originated in Asia from which they spread throughout the World (Osborn 1910). Matthew (1915) developed this idea at great length, thus lending greater authority to Schlosser's proposal.

Andersson in China

In the early years of this century, Osborn sent one of his employees, Roy Chapman Andrews (Fig. 4) to China to collect Recent mammals. It soon became Andrews' mission to confirm the ideas of Schlosser, Osborn and Matthew. However, Andrews was a zoologist-cum-adventurer, not a palaeontologist, so little palaeontological work was undertaken by him in the early years of this century. Instead, palaeontological activity in China was started in an unlikely quarter, namely by a Swedish mining geologist and advisor to the Chinese Government, J. Gunnar Andersson (or "Kina Gunnar" as he became known affectionately in Sweden) (Fig. 3a).

In the second decade of this century, China was unstable politically. The Ching Dynasty had fallen and, after the brief reign of Sun Yatsen (one month), Yuan Shihkai came to power in 1912. In 1913 the Kuomintang tried without success to suppress Yan. The start of the First World War in Europe in 1914 saw Japan annex all German-held territories in China (Moseley, 1968). Into this atmosphere, Andersson came to China in 1914 after having been Director of the Swedish Geological Survey and having participated in Swedish expeditions to the Arctic and Antarctic. Part of his responsibility to the Chinese Government as mining advisor was to travel through the provinces and inspect mining operations, especially coal mines. During these travels, Andersson observed numerous fossil localities and thick deposits of "loess", primarily in central China. In 1916, while visiting some copper deposits in southern Shanxi, Andersson made a small collection of vertebrate fossils on the banks of the Huang He (Yellow River) at Yuanjuxian (Andersson, 1923, p. 1). Although these first observations and collections impressed upon Andersson the great palaeontological potential of China, his initial palaeontological efforts were very limited in scope.

The Sino-Swedish palaeontological enterprise began with fossil plants, not with fossil vertebrates. Dr. V. Ting, then director of the Geological Survey of China, was advised by Andersson to send a large

collection of fossil plants to T.G. Halle, a palaeobotanist at the Swedish Museum of Natural History in Stockholm. Primarily from Yunnan and Sichuan, this collection was of considerable interest to palaeobotanists; at that time, little was known of the history of the Asian flora, and it was thought that the Asian flora was peculiar biogeographically.

During the summer of 1916, Andersson visited Henan and discovered large quantities of fossil mammals in the Chang Jiang (Yangtze River) Valley. During this trip, Andersson's curiosity about the age and stratigraphic nature of the extensive "loess deposits" was provoked. Richthofen (1877–1912) originally identified these "loess deposits", but Andersson recognized that they actually are a thick, complex and fossiliferous sequence of Tertiary deposits:

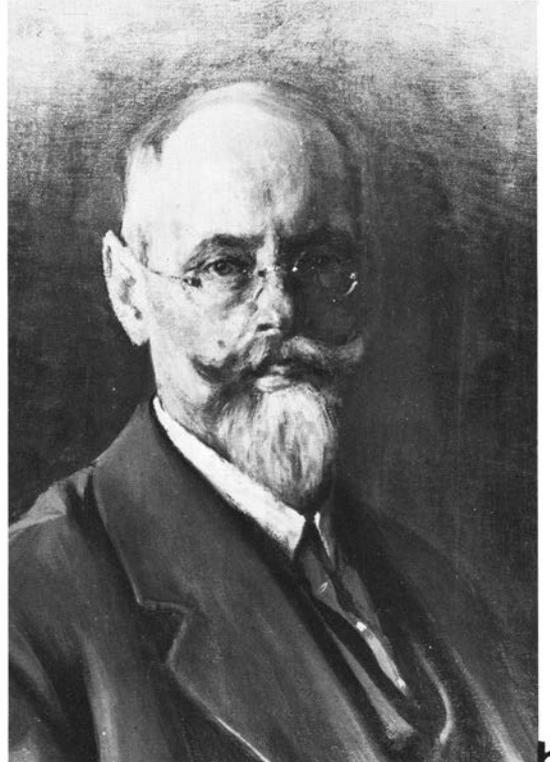
I got interested in this matter in 1916 when I, in crossing the Yellow River between Honan and Shansi, found a highly instructive section exhibiting underneath the loess series of fossiliferous beds, probably young pliocene [sic], we did not know before. The investigations thus made it imperative to me [sic] to try to settle the ages and the climatic conditions of the formation of the loess. This could evidently be done only by studying the fossils contained in the loess and so I set out to collect such. These researches soon brought me to a full understanding of the fact that much of what has earlier been called loess is in fact red clays containing pliocene [sic] *Hippa- rion* fauna described by Schlosser (J.G. Andersson to R. Chapman Andrews, 19 January 1919).

Andersson contacted his old friend in Uppsala, the palaeontologist Carl Wiman (Fig. 3b), regarding the possibility of using the fossil vertebrates to determine the age of the deposits. After a positive response from Wiman, Andersson contacted a second friend in Sweden, Axel Lagrelius, and asked for funding to support the collection of Chinese fossil vertebrates. He received 45000 Swedish Crowns.¹ This sum was intended to cover Andersson's expenses in the field and to supplement funds from H. Wallenberg (Swedish Envoy to China and Japan) allocated to Halle for the collection of fossil

¹ According to the *New York Times*, in January 1916 one Swedish Crown (Krona) was equivalent to about 0,27 U.S. Dollars (4,80 U.S. Dollars were then equivalent to one U.K. Pound). By January 1917 the Crown gained on the Dollar; one Crown was worth about 0,29 Dollars, although about 4,90 Dollars still was equivalent to one Pound. The Crown continued to gain against the Dollar, and in January 1918 one Crown was equivalent to about 0,34 Dollars (4,80 Dollars still bought one Pound). At present (August 1983) the Crown is about 0,13 Dollars, and one Dollar is about 0,66 Pounds.



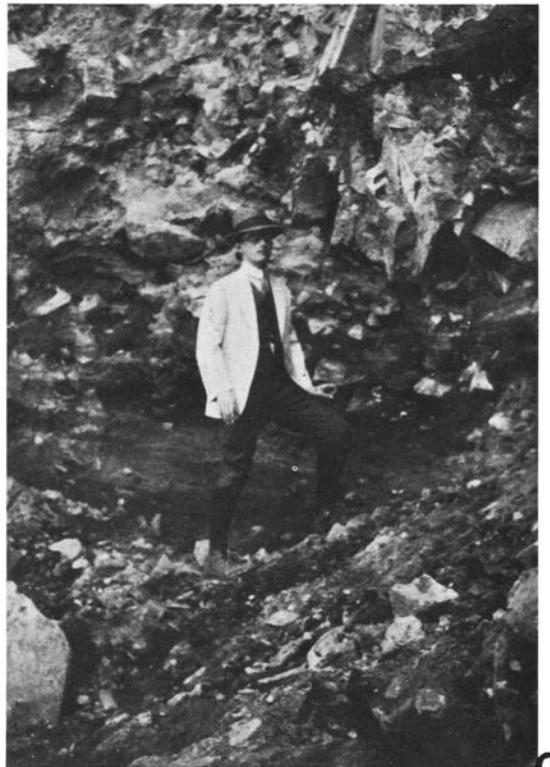
a



b



c



d

plants in southwestern China during 1916–1917. A young Chinese geologist, Chow, working for the Geological Survey of China, was directed by Ting to join Halle in the field and to eventually go to Sweden with Halle to learn palaeobotany, as nobody with such expertise existed in China at that time. A collaborative enterprise had now been started between China and Sweden, albeit on a small scale.

Meanwhile, on the political front, Yuan died in 1916 and was succeeded by Li Yuanhung, who lacked the power to control a turbulent country. The years 1917–1928 were to be critical for Andersson; unfortunately, these were the “war-lord years”, characterized by continual fighting among various factions throughout China. Andersson was thus forced to maintain the Sino-Swedish palaeontological venture with a Chinese government undergoing virtual collapse.

After another field season in Henan during the summer of 1917, Andersson quickly realised that he could secure a large collection of vertebrate fossils there if he had the necessary funding. So, he again wrote to Lagrelius and once again received money, to wit, 25000 Swedish Crowns. It should be remembered that this was a large sum, especially when one considers that Europe was in the middle of World War I.

Andersson had also begun to contact European missionaries in China via a printed circular that asked them to forward information to him about fossil, or “dragon-bone”, localities. Following a short trip to the Mongolian border in the Spring of 1918 where he collected fossils as well as Recent plants and vertebrates, Andersson spent the Summer in Henan following up the leads given in the missionaries’ responses. Andersson returned to Beijing in December with the firm conviction that, through his collections, a reasonably comprehensive understanding of the late Tertiary and Quaternary history of central and northern China could be elucidated; the possibility of discovering fossil-hominids was very much on his mind.

In the spring of the following year, Andersson asked Wiman to assume responsibility for the description of the fossil vertebrates from China, but also suggested that the specimens be deposited in the Swedish Museum of Natural History in Stockholm. The Palaeontological Institute in Uppsala

was not completed until 1931, so in 1919 Wiman had no storage or exhibition space for this collection. By this time, Andersson had spent 5700 of the 13727 Swedish Crowns allocated to him by the newly formed *Kinafond* (China Fund).²

During January and February of 1919 Andersson made brief trips in the vicinity of Beijing and found numerous Jurassic plant localities which proved critical for understanding the geological history of the rocks west of Beijing. In March he inspected the coal-mines in Shandong, where he found additional Jurassic plants. Andersson also developed a clearer picture of the Tertiary strata and loess deposits; his Chinese collector Yao made a substantial collection of fossil plants from this area.

The summer of 1919 saw Andersson at Hallong Obo, approximately 130 km north of Zhangjiakou (Kalgan) in Nei Monggol (Inner Mongolia). With his secretary, Elsa Rosenius, and greatly helped by the missionary Joel Eriksson and the itinerant Dane, F.A. Larson, he discovered Ertemte, a very prolific fossil-mammal locality (Ertemte means “place of valuable things” in Mongolian). Andersson left Eriksson to continue excavating at Ertemte.

While Andersson worked in Nei Monggol, his Chinese collectors Yao and Chang were at Baodezhao in Shanxi following up reports of rich “dragon-bone” finds. Baodezhao produced “dragon bones” that were quarried on a large scale by people of the area for sale to the local pharmaceutical industry. However, during the Summer, agricultural work took pride of place so the “dragon-bone” quarries sat idle and manual labour to work them was unavailable. Yao and Chang therefore limited their collecting to some fossil plants for Halle. In July, they continued to Xuanhua Xian in Hebei where they made significant collections of Pliocene and Pleistocene mammals, including *Mastodon*.

A major part of Halle’s fossil-plant collection, in addition to a smaller and less significant collection of fossil mammals, was lost after being sent on the Swedish ship *Peking*, which sank in a typhoon. This was the first major shipment (82 crates) to Sweden, and its loss was a severe blow to both Andersson and Halle. It happened while Andersson was preparing to leave for Henan in November 1919. Instead of going himself, he sent a Chinese assistant, Chu, to investigate a report of fossil plants and bones in the Fushun coal-mining district. Chu re-

² The Swedish China Research Committee (*Kinafond*) was organised by Lagrelius to aid Andersson’s venture and was headed by Lagrelius and Admiral Palander until Palander’s death in 1919, when he was succeeded by the Swedish Crown Prince. Andersson, Gavelin, Halle, Tegengren and Wiman acted as advisors to the Committee.

Fig. 3. The principal researchers of the Sino-Swedish venture in palaeontology, 1914–1927. a, Johan Gunnar Andersson. b, Carl Wiman. c, Otto Zdansky. d, Birger Bohlin. a–c courtesy of the Palaeontological Institute, Uppsala; d courtesy of Birger Bohlin.

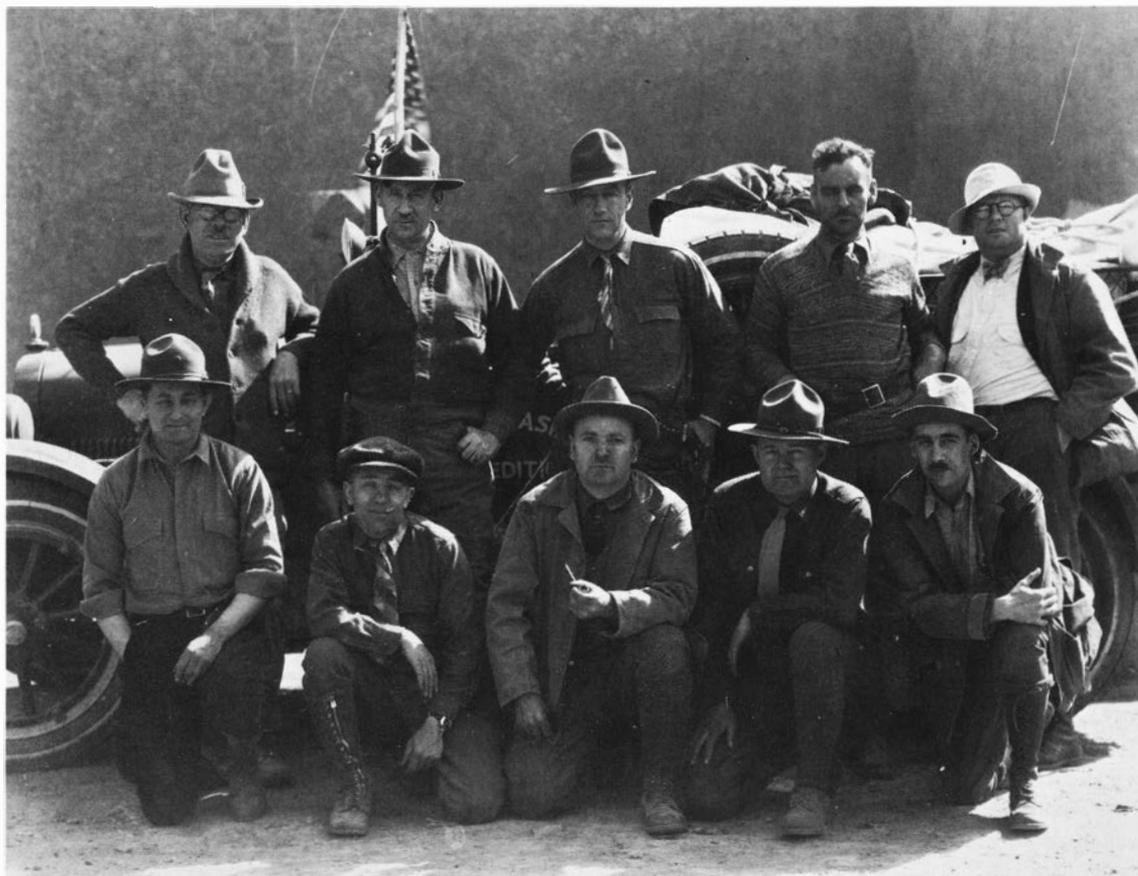


Fig. 4. Field party of the Central Asiatic Expeditions of the American Museum of Natural History. Roy Chapman Andrews, leader of the expeditions, is standing in the centre of the second row. Walter Granger, chief palaeontologist of the expeditions, is on Andrews' immediate right. Courtesy of the American Museum of Natural History.

turned with a large collection of Miocene plants, mammals and arthropods. He also found fossil plants and arthropods in a Jurassic lithographic limestone, not unlike the famous lithographic limestones of Europe. And, much to Andersson's delight, Chu collected some Neolithic artifacts.

Earlier that year, in January of 1919, Andersson had his first contact with Roy Chapman Andrews. This took place in Beijing while Andrews was in China collecting Recent mammals for the American Museum of Natural History. It appears that the two men got along well; Andrews even suggested that he could provide ample funding for Andersson if he would turn the fossils he and his assistants collected over to the American Museum. But, this was not something Andersson wanted to do. In fact, Andersson regarded Andrews' presence in Beijing

as something of a threat to the Swedish enterprise, even though Andrews was not then talking of mounting a palaeontological collecting expedition. The suggestion to members of the *Kinafond* that American competition was in the offing quickly secured additional funds (through the good offices of Lagrelius).

At this time, other collecting, apart from fossil plants and vertebrates, was being undertaken. Andersson's ethnographical and archaeological studies were already taking up a significant amount of his time. During the summer of 1919, an energetic young Swedish geologist, Erik Norin, went to western Shanxi to study volcanic rocks, working from Nystrom's scientific research institute in Taiyuanfu in Shanxi (Andersson, 1922). At the end of 1920, Norin came to Beijing to visit the Geological Sur-

vey of China having already made a substantial study of the alkaline extrusives of western Shanxi. When he met Andersson, the latter suggested that Norin make a systematic study of the coalbearing formations of Shanxi and of the exceptional plant fossils in these rocks, especially those from Zhenjiayu. This proved to be a very successful and profitable project for Norin, despite the fact that he was neither a stratigrapher nor a palaeontologist. Norin's exceptional flexibility and broad competence later served him well during his *lone* geological exploration of Tibet under Sven Hedin in the 1930's.

In December of 1919, Andersson and a Chinese assistant, Chen, returned to the Chang Jiang Valley while Chang returned to Baodezhao to make a collection of fossil vertebrates now that the quarries there were in operation. Chang returned from Baodezhao with 27 crates of fossil mammals, mostly rhinoceroses, artiodactyls and carnivores. This locality thus appeared to be considerably richer than the localities in Henan. After a short rest, Chang again went to Baodezhao and returned to Beijing in April 1920 with 47 crates of fossil mammals. These were promptly sent to Wiman in Sweden.

Liu, another of Andersson's Chinese assistants, was busy during the early part of 1920 in southern Shanxi (Shangyingou) collecting fossil cervids. For a short time in the early Spring, both Liu and Chang collected in Henan, but without great success. Since the loss of Halle's collection of fossil plants with the sinking of the *Peking*, a new collection had been assembled (47 crates) and was sent to Sweden in April 1920.

In June 1920, Andersson left Beijing for a Summer season (until 24 August) in Nei Monggol where he hoped to travel into the eastern Gobi Desert. However, civil warfare prevented this, although Andersson did return to Ertemte where Eriksson had been continuing the excavations since Andersson's first visit. For his services, Eriksson was awarded the Linné Medal of the Royal Swedish Academy of Sciences. Andersson found several new and relatively rich localities in eastern Nei Monggol which helped him further decipher the biostratigraphy in the region. At the same time, he made a substantial collection of living plants and animals as well as a collection of archaeological artifacts.

The Autumn of 1920 saw Andersson in Gailan on an official visit to the coal mines where he also collected many Permo-Carboniferous plants. He also visited localities just west of Beijing in the Zhaitang basin to collect Jurassic plants. Andersson hoped to send Liu to eastern Sichuan to some promising fossil-vertebrate localities. However,

according to missionaries in that region, banditry and general lawlessness would make working there quite difficult. There was hope, however, that Andersson could travel to Gansu via Sichuan in the near future.

Andersson's increased involvement with collecting enterprises not directly related to his employment as a mining consultant to the Geological Survey of China was being noted with displeasure by the Director of the Survey, Ting. Not wishing to upset Ting further, nor relinquish his responsibilities to the Kinafond, Andersson negotiated another contract with the Geological Survey of China for the years 1924–1927 but donated his salary, about 100000 Swedish Crowns, for these years to the Geological Survey to start a fund with which to publish descriptions of the material he had collected. Nevertheless, Andersson did continue in his capacity as an advisor, but was allowed to travel and collect for the Kinafond. This solution also allowed him to arrange the publication of a new monographic series. The first issues covered the fossil plants already collected, and Ting supported this because of the great importance these plants had for Chinese stratigraphy. In addition, publications of this sort would greatly help Ting promote the image and scope of geological research in China.

The arrangement for this monographic series was that 90 copies would be given to the author, 10 copies would go to Andersson and 100 copies would be sent to the library of the Royal Swedish Academy of Sciences. In addition, Ting would send Halle (or the Swedish Museum of Natural History) duplicates of the fossil plants after the monograph was published. A practical motive behind Andersson's generous donation of his salary was that the Royal Swedish Academy of Sciences, which had offered to print the monograph series, was nonetheless worried about paying the printing costs. With Andersson's donation, the funds were now secure for the publication of the series. Wiman and Halle were asked to have their respective institutions cover the expenses of having the illustrations prepared. The monograph series, to be called *Palaeontologia Sinica*, was to be published by the Geological Survey of China under the editorship of Ting, Wong and Andersson in three parts: Series A for the fossil plants (special editor Halle), Series B for the invertebrate fossils (special editor Grabau) and Series C for the vertebrate fossils (special editor Wiman). The arrangement for the conservation of the specimens described in the series was that fossil vertebrates would be sent to Uppsala and fossil plants to Stockholm. Duplicates were to be returned to China; all the invertebrate fossils remained in Beijing.

Zdansky in China

During 1920, the need for a vertebrate palaeontologist to help Andersson by taking over most of the field operations became apparent. Andersson was the first to point out that he was not a vertebrate palaeontologist and that he dearly wanted palaeontological expertise on the spot. He put his request to the Kinafond and specifically to Wiman. Wiman himself could not go to China, and at that time he had three students of fossil vertebrates in Uppsala: Birger Bohlin (Fig. 3d), Torsten Ringström and Otto Zdansky (Fig. 3c). Bohlin, however, was too young and not prepared for such a task and Ringström was in poor health. However, Zdansky, an Austrian and student of Abel in Vienna, not only seemed promising to Wiman, but he was the only feasible candidate.

Zdansky had come to Uppsala in June 1920 for the summer as an exchange student and had returned to Vienna by November. Wiman sent a cable in December inviting him to join Andersson in Beijing, without salary, but with the promise of a subsistence allowance and the exclusive right to publish on the fossil vertebrates he would collect in China. Zdansky was to go to China for three years. After accepting Wiman's offer, Zdansky travelled to Uppsala in May 1921 and then left for Beijing on a ship bound, via England and South Africa, for Tianjin. Since Zdansky was an Austrian citizen, there was some discussion over his suitability for employment in China. However, because of the Japanese annexation of all German-controlled territory in China, and because Zdansky spoke fluent English, these considerations were put aside.

By February 1921, Andersson and Ting realized that the duplicate specimens from Sweden would start to arrive in Beijing before a suitable facility for their storage and display could be secured. Also, Grabau was making substantial collections of fossil invertebrates, duplicates of which were being sent to Sweden in exchange for Swedish fossil invertebrates. Andersson, appointed Curator of the Geological Survey of China Museum in 1921, was keen to expand this facility. It is of interest that Andersson contacted both Wiman and Halle asking them to express to Ting a desire to support expansion of the Museum, particularly in the form of additional staff. As Andersson put it, "something could happen to me during the long period of extensive travelling which I am now going to start" (J.G. Andersson to C. Wiman, 24 February 1927).

In December 1920, Andersson and Ting became aware of an article by Roy Chapman Andrews in *Asia* magazine which included the following statement: "China has no national institution where

natural history objects can be studied and exhibited by modern methods and where the scientific work of her own people can be encouraged and directed." Ting was not amused. He immediately expressed his displeasure in a letter to Henry Fairfield Osborn in New York. Beside their understandably hurt pride, Ting and Andersson were deeply concerned about Andrews' mention in the article of a planned fossil-mammal-collecting expedition in northern China that would, in part, venture into areas where Andersson already had collected.

When Andrews was in Beijing in 1919, he had been on good terms with Andersson and Ting, both of whom had been interested in his zoological collecting efforts, but Andrews then made no mention of plans for fossil collecting, especially in northern China. Ting made it clear in his letter to Osborn that, although the Geological Survey of China claimed no monopoly on fossil collecting areas (in fact, they solicited foreign help in this matter), he did feel that such activities should be organized in the way most effective for the exploration of China. Two expeditions "competing" in the same region was not the most effective course. Although Andrews wrote a conciliatory response to Ting's letter in which he emphasized that the forthcoming American Museum of Natural History expeditions would have highly qualified and experienced palaeontologists and lavish funding, Ting remained uneasy. Furthermore, the promise that Osborn planned to visit China and contribute generously to a National Natural History Museum that Andrews intended to establish in Beijing left Andersson feeling threatened by American investments. He hoped that Ting would not relax his support of Andersson's Swedish program. It was these concerns that Andersson communicated to Halle and Wiman, urging them to write to Ting and underscore the strong commitment that Sweden had to palaeontological research in China.

Andersson's worries were aggravated by the appearance of the French Jesuit priest Emile Licent, who arrived in Tianjin in 1915 to start a natural history museum for the Jesuit College. In January of 1921, Andersson visited Licent (they had first met in Beijing in 1917) and saw some of the specimens Licent had collected in Gansu, primarily of hipparionid horses. Since Licent intended to create a museum for his collection, he had no desire to give it to the Geological Survey of China nor to send it to Sweden. Ting suggested that a qualified palaeontologist (Licent was an entomologist), one chosen by Licent, should describe the collection in a volume of *Palaeontologia Sinica*. Therefore, Licent contacted M. Boule in Paris and later shipped the collection to him. Boule, otherwise occupied, gave

the collection to a former graduate student of his, Pierre Teilhard de Chardin. Teilhard, writing to Licent for more information on the collection, received an invitation from him to come to China. Teilhard arrived in Beijing in May 1923.

Meanwhile, Andersson had another chance to inspect Licent's collection. In July 1920 he wrote to Wiman about what he saw as a pending danger: about 80 percent of Licent's specimens represented the same taxa as the specimens already in Uppsala. Therefore, Wiman and Boule would potentially be describing similar specimens from the same geographical areas in the same monographic series. Eager to avoid any awkward problems that could result from this, Andersson urged Wiman and Boule to get together, first in Uppsala where the larger collection was, then in Paris where Licent's collection had been sent, to divide the collections systematically between them.

Despite the many problems that characterised 1921, Andersson managed to go into the field on three occasions. During April and May he again visited Henan and Shanxi accompanied by Chang. During these months, Chang went to Fukuxian about 50 km west of Baodezhao in Shanxi and returned with a large collection very similar to that from Baodezhao where he had collected numerous specimens of sabre-toothed cats and other carnivore fossils. Chang's collection from Baodezhao well exemplifies the high cost of such an enterprise. The fossils were collected from a mine with a steeply-sloping shaft that penetrated about 50 m. Specimens such as a complete rhinoceros skull collected there caused considerable problems when negotiating the ladders in the steep shaft. The costs, apart from those for labour, rose quickly for transport. Baodezhao was six days travel from the nearest railhead, and the rate for animal transport was 75 öre/kg/day. For 20 tonnes of material, the cost for transportation to the railhead was 15000 Swedish Crowns. Clearly, work in more remote districts (such as Gansu where the nearest railhead could be as much as 30 days travel from the locality) was going to require different arrangements. The extent to which Andersson could collect, and, to a certain extent, the ways in which he could collect, were governed by his funding. Because of this limitation, Andersson asked Lagrelius for an additional 90000 Swedish Crowns, thus bringing the total to 300000 Swedish Crowns from the Kinafond (or, at that time, 60000 Gold Dollars). Although this appeared to be ample funding, and it was by Swedish standards, it was a pittance compared to the 500000 Gold Dollars provided for the American Museum expeditions.

The principal new locality discovered in 1921 was

Zhoukoudian (Choukoutien). Zdansky had arrived in Tianjin in June 1921 and from there went to Beijing to meet Andersson. The first project Andersson proposed to Zdansky was the excavation of Jigushan ("Chicken-bone Hill") about 50 km southwest of Beijing. Jigushan was the local name for a pillar-like deposit of red clay in a limestone quarry on a hill just west of the village of Zhoukoudian. The clay, which contained numerous subfossil bones (mostly of birds), was a fissure-filling in Ordovician limestone and had been left behind by the workers who quarried the limestone for cement (Andersson, 1919; Young, 1930). Andersson had become aware of this fossiliferous deposit in 1918 through J. McGregor Gibb, a chemistry professor at Peking University. Andersson felt that Zdansky could best gain experience with working conditions in the Chinese countryside by excavating this fairly small locality not far from Beijing.

After a few weeks at Jigushan, Zdansky was visited by Andersson, who brought with him Walter Granger (Fig. 4), the chief palaeontologist of the American Museum expedition. Granger was, in part, visiting Andersson as a gesture of goodwill on the part of the American Museum expedition. But he also intended to benefit from Andersson's years of experience in China, and, in exchange, advise Andersson on palaeontological field techniques Granger had used successfully in his many years of collecting. With this last purpose in mind, Granger and Andersson went with Zdansky to study the excavation undertaken by the latter at Jigushan. However, while there, a Chinese workman approached them and, after ascertaining the nature of their interest in Jigushan, agreed to show them a place nearby where much larger bones could be found. The place he showed them was also a fissure-filling, although it was much larger than Jigushan. The fissure opened on the top of a vertical limestone wall about 10 meters high, and this opening was partly covered by broken pieces of limestone (Fig. 5a; Zdansky, 1923b). The almost immediate discovery here of a suid and a cervid convinced Andersson that Zdansky's efforts were better devoted to this new locality than to Jigushan. This locality is now known as the "Main Cave" or "Locality 1" at Zhoukoudian (e.g. Black et al., 1933).

Under Andersson's direction, Zdansky remained at the new locality for several weeks and assembled a significant collection of Pleistocene mammals. During this excavation he uncovered about 1.3 meters of the uppermost layers of the fissure-filling (Zdansky, 1923b, p. 86). Among the numerous fossil mammals Zdansky collected, he found an isolated upper molar (Fig. 6a), *unmistakably hominid*,

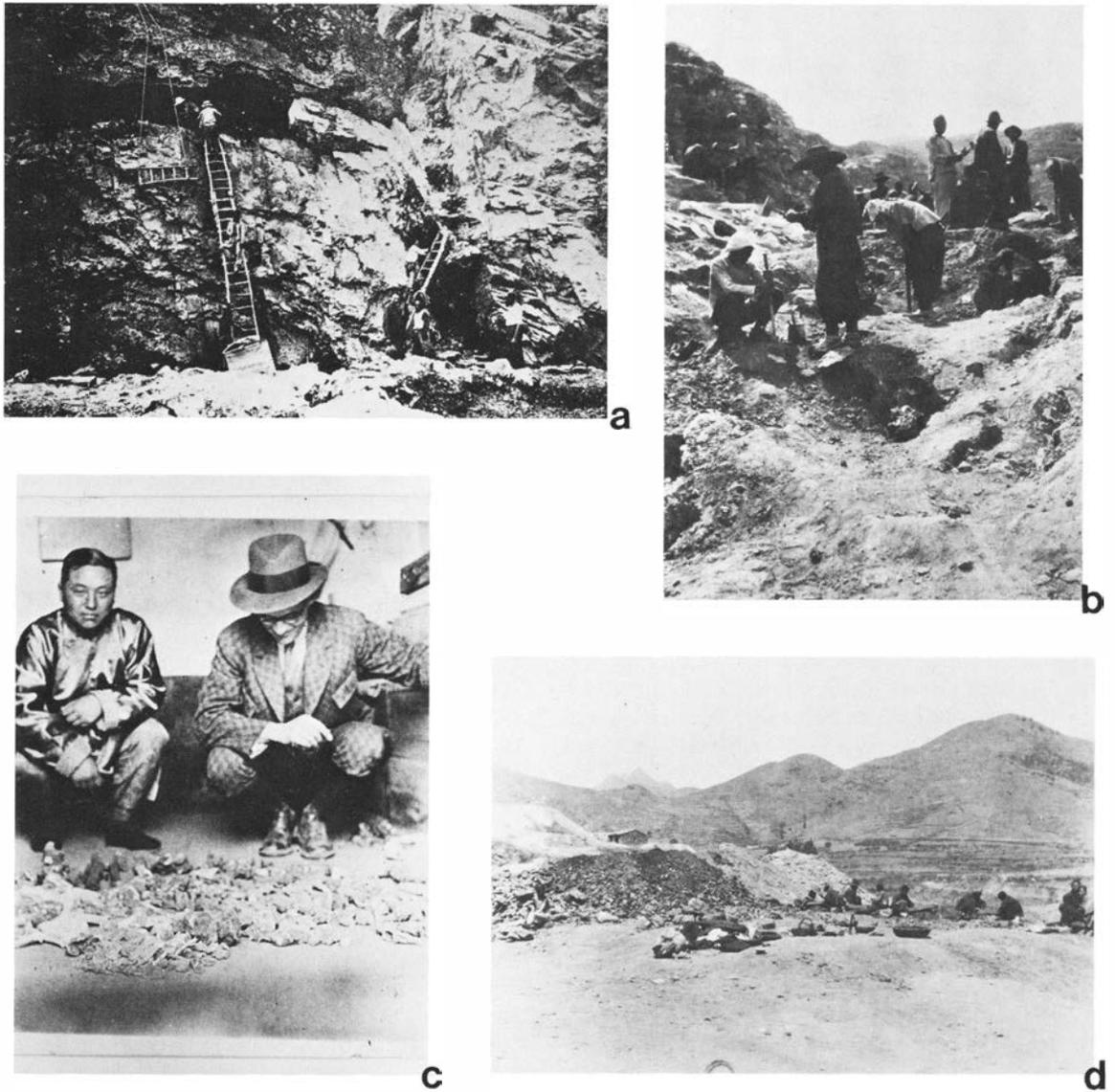


Fig. 5. The early excavations at Zhoukoudian. a, Initiation of the excavation in 1921. b, Detail of the excavation in 1927. c, Bohlin (right) and the Chinese geologist Li examine some of the specimens collected in 1927. d, Overall view of the excavation in 1927. a, courtesy of the Palaeontological Institute, Uppsala; b–d, courtesy of Birger Bohlin.

in either a layer of slightly banded brown clay (33-cm-thick) or the underlying layer of banded dark-brown clay (24-cm-thick) (Zdansky 1928, p. 141 stated that he was uncertain from exactly which horizon the hominid molar was derived). However, instead of announcing what, in retrospect, was one of the most important fossil hominid discoveries ever made, Zdansky simply put the tooth into his pocket, took it back to his dwelling and packed it amongst suid teeth from the excavation. As he later

explained, “hominid material is always in the lime-light and I was afraid that if it came out there would be such a stir, and I would be forced to hand over the material I had a promise to publish” (Reader, 1981, p. 100).

Andersson, who did not know about the hominid molar from Zhoukoudian, regarded it as but one of many potential sources of Quaternary mammals in China (Andersson, 1922). Instead, his main interest, and the major reason he had brought Zdans-

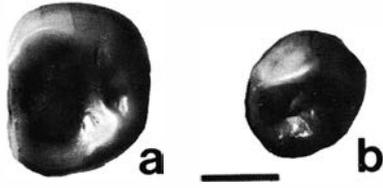


Fig. 6. Occlusal views of upper molar (a) and lower pre-molar (b) from Zhoukoudian identified by Zdansky (1927c, 1928) as *?Homo* sp. The black bar is 2-cm-long. Courtesy of the Palaeontological Institute, Uppsala.

ky to China, was the excavation of the so-called "Hipparion deposits" farther south in Henan. Consequently, at the beginning of the autumn of 1921, after only a short period of excavation at Zhoukoudian, Andersson told Zdansky to terminate the excavation and proceed to Mianzhixian in Henan. Here, and in southern Shanxi (Fig. 7b–c), Zdansky amassed a large collection of fossil mammals. He then moved on to the Eocene deposits by the Huang He before returning to Beijing in December.

1922 was marked by considerable activity with Norin sending about 100 crates of fossil plants from central Shanxi to the Swedish Museum of Natural History. Zdansky spent January to August at Baodezhao and sent another 100 crates (but of fossil vertebrates) to Beijing for shipment and compiled a detailed geological map of the area (Zdansky 1923a). From September to December Zdansky worked in eastern Gansu (Fig. 7a) in the same general area that Licent had collected, but the results were disappointing. Pai, another of Andersson's Chinese assistants, was at that time in southern Shanxi collecting a forest *Hipparion* fauna quite unlike the Baodezhao fauna. Andersson and the Chinese geologist Tan spent December working in Shandong (see later discussion).

Political problems in the later part of 1921 meant that Andersson's salary had not been paid for some four months, thus causing him to consider returning to Sweden. The Prime Minister paying Andersson was being threatened by rebel troops and was in a very uncertain position. However, Andersson's travel was not halted, although his collecting program was clearly becoming more difficult to execute.

By June 1922, Andersson had spent about 52000 Peking Dollars (about 150000 Swedish Crowns) on the collection and transportation of 1316 crates of material to Sweden. 480 of these contained fossil vertebrates, 474 were fossil plants and the remainder consisted of Recent zoological and botanical specimens as well as archaeological and ethnographical artifacts. In July Andersson requested

another 150000 Swedish Crowns to continue the collecting and to secure Zdansky's expenses until 1926. The wildly fluctuating exchange rates between the Peking Dollar and the Swedish Crown were exhausting Andersson's funds; in 1917 the Peking Dollar was worth about 1,75 Crowns, in 1921 it was valued at 6,00 Crowns and by July 1922 the Peking Dollar had settled down to a value of about 2,00 Crowns.

Early in 1922, Wiman applied for 10000 Crowns from the Kinafond with which to develop the numerous Chinese vertebrate fossils arriving in Uppsala. Not only did this material have to be prepared and described, but duplicates had to be sorted, arranged and sent to Beijing (Fig. 8). Ringström's (1922) paper describing the rhinoceros *Sinotherium* was ready for publication by June 1922 and was a promising start to the publication of the Chinese specimens. However, Andersson received a depressing blow that month when he became aware that the American Museum expedition under Andrews had located fabulous dinosaur specimens in the Gobi Desert. This was particularly discouraging to Andersson because the American discoveries were in the very region that Andersson had planned to visit in 1920, a visit prevented by civil strife in the eastern Gobi. Had Andersson visited this region in 1920, he might have made these discoveries himself. He now was quick to point out that the Americans had motorized transport which greatly facilitated collecting and reconnaissance over broad areas in contrast to his own limited resources. Andersson vented his frustration in a letter to Wiman in June 1922 and accounted for his own "failure" to explore the Gobi:

As you see from the enclosed newspaper clippings, the Americans have, during their first days in Mongolia, made a palaeontological discovery which is perhaps one of the few really big finds left on this planet. I should like to emphasize their good fortune and their automobiles that could charge around up there with a speed such that they could do in a day that which would take me a week or ten days.

Andersson then quoted from his 1920 Annual Report to the *Kinafond* (p. 5):

On account of the civil war around Beijing, which developed a general state of emergency, it was necessary to shorten the length of my trip into the Gobi. This hindrance became my misfortune... It is not that I envy Granger that he had the luck to make this wonderful find... On the contrary, I feel that it is fortunate that it was just he, an unusually good and admirable person

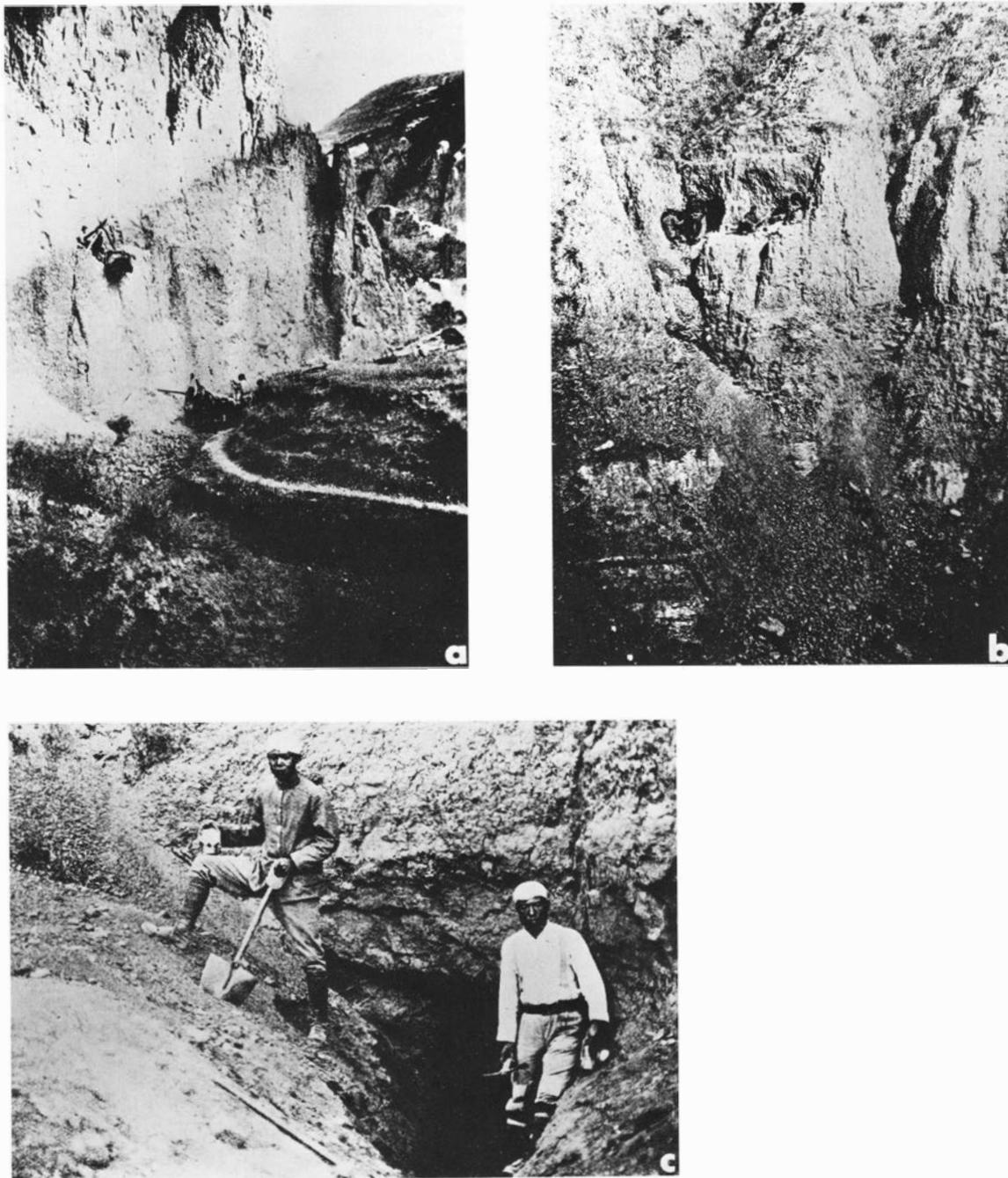


Fig. 7. Some localities of the Lagrelius Collection. a, Locality 116 at Qingyang Xian in Gansu; the fossil quarry is halfway up the hill on the left. b, "Loess" deposits at locality 105 at Yuanju Xian in Shanxi. c, Two unidentified workers at locality 114, Hechu Xian, Shanxi. Photographs by J.G. Andersson, courtesy of the Palaeontological Institute, Uppsala.



Fig. 8. Packing, shipping and preparation of the Lagrelius Collection. a, In Beijing, repacking Liu's collection from southern Shanxi; from left to right: Yao, Liu, Chang and Elsa Rosenius. b, Carl Wiman with crates after their arrival in Uppsala. c, Wiman (left) with technician begins work on the skull of a fossil rhinoceros. d, Another fossil rhinoceros undergoing further preparation in Uppsala. Courtesy of the Palaeontological Institute, Uppsala.

representing the greatest potential, both in ability and funding at the moment. Certainly, the Americans, with their unlimited resources and fleets of automobiles, could cross the endless Mongolian plains and discover the country's wonderful secrets (J.G. Andersson to C. Wiman, 2 June 1922, p. 2, 3, 5).

Other parts of this same letter revealed Andersson's concern over Wiman's waning interest in the fossil mammals that Andersson had been sending to Uppsala. Andersson also expressed grave concern over Zdansky's future. He was trying to persuade Wiman to find employment for Zdansky in Uppsala so that after his return from China, Zdansky could

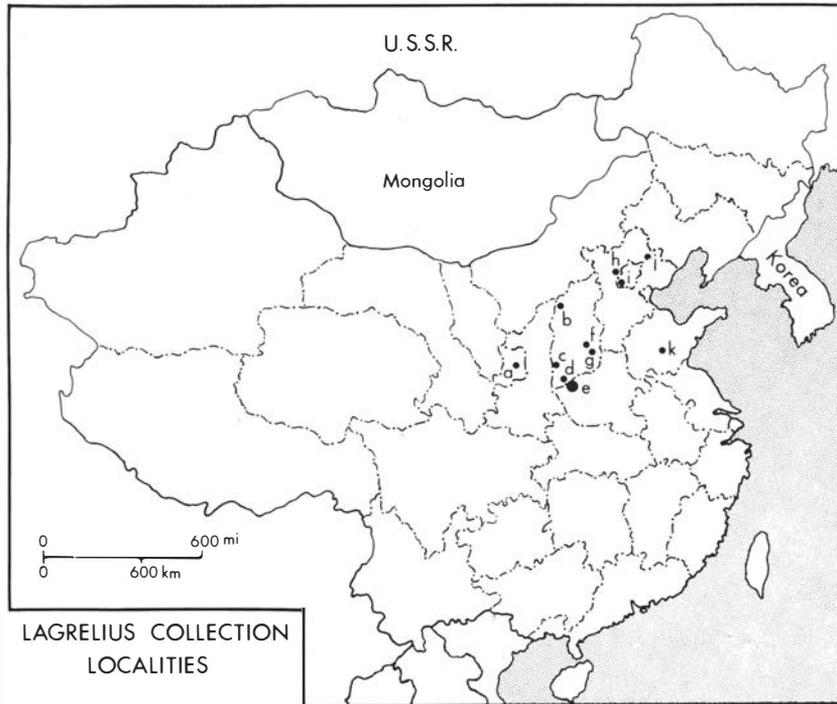


Fig. 9. Principal areas in China where fossil vertebrates in the Lagrelius Collection were collected. Areas are: a, Qingyang Xian, Gansu (localities 115, 116); b, Baode Xian, Shanxi (localities 6, 30, 31, 43, 44, 45, 49, 52, 108, 109, 110, 111, 112, 113); c, Xiangning Xian, Shanxi (localities 33, 34, 41); d, Yuanju Xian, Shanxi (localities 5, 105, 106); e, Xinan Xian and Mianzhi Xian, Henan (localities 11, 12, 13, 16, 18, 19, 20, 21, 26, 27, 28, 29, 35, 39, 40, 54, 56, 57, 58, 59, 100, 101, 102, 103, 107, A, B, C, D); f, Wuxiang Xian, Shanxi (localities 70, 71, 72, 73, 74, 75, 77, 78, 79, 80, 81); g, Zhangzhi Xian, Shanxi (locality 76); h, Huailai Xian and Xuanhua Xian, Hebei (localities 2, 3, 47, 55, 64, 65); i, Zhoukoudian, Beijing Shi (localities 1, 53); j, Zhengde Xian, Hebei (localities 62, 63); k, Xintai Xian, Shandong.

describe the specimens he was then collecting. In fact, Andersson had even consulted Granger about the possibility of securing a position for Zdansky in the United States, preferably at the American Museum of Natural History. This might have happened had not Zdansky felt such an aversion to the American way of life. The promise of future employment for Zdansky in Uppsala given by Wiman became the only option.

Having secured Zdansky's future, increasing homesickness, and the deteriorating political situation in China turned Andersson's thoughts towards his own future:

P.S. Dear Wiman, will you do me a great favour? Times are painful out here. I have not received one öre's salary this year and it is uncertain if one can continue to stay out here, however tempting it may be to remain in China for research. Perhaps I shall make my trip, then return home. Do you think it possible for me to

take the position, after De Geer, at the Högskola [University, Stockholm] when he retires? I should be most grateful if you could make some subtle enquiries into possibilities in this direction (J.G. Andersson to C. Wiman, 2 June 1922, p. 12).

Andersson's problems continued to grow during 1922. Problems with the publication of *Palaeontologia Sinica* began to arise, especially with the high cost of printing the plates in Sweden. Andersson, therefore, tried to obtain additional funds for this purpose. In November of 1922 Wong Wenhao reported from Brussels, where he was on a brief visit, that Teilhard de Chardin had almost completed description of the Licent collection and had already sent a preliminary article to the "*Comptes Rendus*" describing the new species. Andersson then realized that Wiman had neither contacted Boule nor Teilhard.

Late in November 1922, Andersson and the

Table 1. Number- and letter-designated fossil vertebrate localities of the Lagrelius Collecton. For additional information on some localities see Zdansky (1923a, 1923b), Andersson (1942) and Fig. 9. Note that "Xian" is a county and "gou" is a creek or canal.

Beijing Shi:	103. Mianzhi Xian, Shantou
1. Fangshan Xian, Zhoukoudian, Jigushan	107. Mianzhi Xian, Yangshaozun
53. Fangshan Xian, Zhoukoudian, Laoniugou	A. Mianzhi Xian, Yangshaozun
60. Wangping Xian, Sanjiadian, Huiyu	B. Mianzhi Xian, Yangshaozun
61. Wangping Xian, Lenggezhuang, Xiyanmendong	C. Mianzhi Xian, Yangshaozun
	D. Mianzhi Xian, Yangshaozun
Gansu:	
115. Qingyang Xian, Qiaozizhuan, Mujiaziguogou	
116. Qingyang Xian, Qiaozizhuan, Zhaozigou	
Hebei:	
2. Xuanhua Xian, Shuangyinzi	
3. Huailai Xian, Hulutau	
25. Longguan Xian, Wengjiayaozun, Penyao	
47. Xuanhua Xian, Zhaojiawan	
55. Xuanhua Xian, Xiapodi, Zhangliangpo	
62. Zhengde Xian, Jiguanshan	
63. Zhengde Xian, Xiejiayang, Xigou	
64. Huailai Xian, Huangluzun, Fengwo	
65. Huailai Xian, Huangluzun, Houjiwa	
66. Jingxing Xian, Qingshiling, Jimayu	
68. Jingxing Xian, Liangdu, Erling	
Henan:	
7. Luoyang Xian, Shuichuankou	
8. Luoyang Xian, Weijiayun	
11. Xinan Xian, Zhengouwan	
12. Xinan Xian, Shangyingou	
13. Xinan Xian, Zhengouwan	
16. Mianzhi Xian, Beidiwu	
18. Mianzhi Xian, Yangshaozun	
19. Mianzhi Xian, Potou	
20. Mianzhi Xian, Langou	
21. Mianzhi Xian, Langou (cave)	
26. Mianzhi Xian, Huazuigou	
27. Xinan Xian, Guzun	
28. Xinan Xian, Zhengzun	
29. Xinan Xian, Taipingou	
35. Xinan Xian, Shangyingou	
39. Mianzhi Xian, Langou	
40. Mianzhi Xian, Yangshaozun, Xiaoxigou	
50. Gong Xian, Jinggou	
54. Xinan Xian, Dongyangchen, Dongshan	
56. Mianzhi Xian, Huazigou, Nangou	
57. Xinan Xian, Songjiashuang, Shanggou	
58. Xinan Xian, Gouyu, Diaozui	
59. Xinan Xian, Zhengcun, Wagou	
100. Xinan Xian, Shanghe, Shangpo	
101. Mianzhi Xian, Dongdiantan, Xinangou	
102. Mianzhi Xian, Yangshaozun, Xigou	
	Shaanxi:
	51. Fugu Xian, Wulangou, Beihougou
	Shandong:
	23. Yidu Xian, Jingzhoufu, Jinlingshen/Yewangzhuang
	24. Yidu Xian, Yanjiashuang
	Shanxi:
	5. Yuanju Xian, Yuzizun, Nangou
	6. Baode Xian, Pufangyan, Qizigou
	30. Baode Xian, Taijiagou
	31. Baode Xian, Yuejiali, Liuwangou
	32. Ji Xian, Xiaofuzun, Dongdai
	33. Xiangning Xian, Longwanggou, Madi
	34. Xiangning Xian, Bandaobo
	41. Xiangning Xian
	43. Baode Xian, Jijiagou, Sangjialiagou
	44. Baode Xian, Yuejiali, Shenshuzui
	45. Baode Xian, Jijiamao
	48. Jingluo Xian, Yangjiagou
	49. Baode Xian, Jijiagou, Yangmugou
	52. Baode Xian, Yuejiali, Linwangou
	70. Wuxiang Xian, Xigouzun, Jinggou
	71. Wuxiang Xian, Xigouzun, Huzigou
	72. Wuxiang Xian, Haojiashuang, Xingwagou
	73. Wuxiang Xian, Dongzun, Douqiaogou
	74. Wuxiang Xian, Wangjiaji
	75. Wuxiang Xian, Xigouzun, Bozhengzi
	76. Zhangzhi Xian, Hukouzhun, Houtaogou
	77. Wuxiang Xian, Haojiapo
	78. Wuxiang Xian, Zaocun
	79. Wuxiang Xian, Jiangzun, Xigou
	80. Wuxiang Xian, Nanding, Huozigou
	81. Wuxiang Xian, Hejiannao, Hejiannaogou
	105. Yuanju Xian, Yuzizun, Nangou
	106. Yuanju Xian, Lijiagedan
	108. Baode Xian, Jijiagou, Zhenjiamaogou
	109. Baode Xian, Jijiagou, Huanglugou
	110. Baode Xian, Jijiagou, Wangjialiagou
	111. Baode Xian, Jijiagou, Nanglianggou
	112. Baode Xian, Yuejiali, Liuwangou
	113. Baode Xian, Jijiagou, Laomaouer
	114. Hechu Xian, Nanshawa, Mahuatan

Chinese geologist Tan left Beijing for Shandong where, many years earlier, a German mining engineer, W. Behagel, had found three dinosaur vertebrae. In the badlands of the Mengyin Valley in central Shandong, Andersson and Tan, with the help of a missionary from Ningjiagou, located dinosaur fossils. They found the bones in strata that also contained fresh-water invertebrates, plants and in-

sects as well as turtles and crocodylians. These strata, the so-called Mengyin Series, were then thought to be of early Cretaceous age (Tan, 1923) but are now considered to be late Jurassic. Andersson and Tan actually did little collecting in these rocks, but instead sent Zdansky in March of 1923 to collect the specimens. The results of Zdansky's work included two incomplete skeletons of the sauropod dinosaur

Euhelopus, many fragmentary dinosaur fossils, fossil fishes, including *Sinamia* (Stensiö 1935), and many fossil plants and invertebrates. Zdansky also discovered Eocene mammals in the Mengyin Valley (Zdansky, 1930).

In 1923 Andersson received good news in the form of a substantial donation from a Swedish businessman, L. Kreuger (the Swedish match magnate), of 50000 Crowns to help support the printing costs of the plates of *Palaeontologia Sinica*. Although this lessened Andersson's concern over the future of the monograph series, other problems soon appeared. Zdansky was very worried about the promise of a position in Uppsala. He questioned whether Wiman actually could guarantee him support to enable the description of the many fossils he had so industriously collected. Discouraged, Zdansky wanted to leave China immediately and return to Austria to a less stressful career as a precision engineer (watchmaker).

Meanwhile, sensing that the Sino-Swedish cooperative programme was in its twilight, Andersson embarked on a lengthy expedition to Gansu in order to fulfill a longstanding desire to explore this area. Increasing civil strife meant that Andersson was extremely fortunate to obtain four carts and donkeys with which to travel slowly from Ruanyiding via Lanzhoufou to Siningfu near the Tibetan border. On this trip, Andersson meticulously documented the geology along the roadside. To Andersson's delight, most of the collections made during this trip were archaeological and ethnographical. However, between the borders of Gansu, Xinjiang and Guide, he made small collections of Pliocene artiodactyls, rhinoceroses and proboscideans. While Andersson was in the field he also tried to alleviate Zdansky's discouragement over working in China. From his letters, Andersson appeared to have been extremely generous to Zdansky during the beginning of his sojourn. But, as Zdansky's enthusiasm waned, so did his productivity, and this was not overlooked by Andersson.

By the summer of 1923, Zdansky's money from the Kinafond was virtually exhausted. He returned to Beijing and reopened the excavation at Zhoukoudian. When Zdansky left China in December 1923 he had, in less than three years, collected an enormous number of fossil vertebrates from over 80 localities (Fig. 9; Table 1). Zdansky travelled via the Trans-Siberian railroad to Vienna to see his mother (his father had died while Zdansky was in China). Then, in January 1924, he proceeded to Uppsala. For three years Zdansky spent his days working as a technician in Uppsala and his evenings doing research on the fossil vertebrates he had collected in China. During this time, he published nine

monographs in *Palaeontologia Sinica*, but made no mention of the hominid tooth he had found at Zhoukoudian in 1921. In 1927 Zdansky married a Swede and went to the Egyptian University in Cairo to take up a professorship there.

After Zdansky

Andersson continued work along the Gansu-Tibet border until the autumn of 1924. Then he returned to Beijing via the Huang He. On this trip he made many important archaeological discoveries; vertebrate palaeontology had now assumed a very minor role in his activities.

In May of 1926, the Crown Prince of Sweden (Gustav V) departed on a trip around the World via North America and the Far East, which included a stop in Beijing. Here Gustav intended to make contact with Andersson and observe firsthand some of the scientific results and goodwill the *Kinafond* had promulgated. The recently formed Geological Society of China planned a reception for the Crown Prince, and Andersson felt it would be appropriate if some of the most notable palaeontological discoveries made by Zdansky were first announced at this reception. Therefore, Andersson wrote Wiman in Uppsala, who approached Zdansky, then in the throes of completing his large, and now classic, monograph on the Quaternary mammalian fauna from Zhoukoudian (Zdansky, 1928). No doubt to Wiman's surprise, Zdansky wrote a short paper on two hominid teeth from Zhoukoudian, the molar he discovered in 1921 and a premolar (Fig. 6b) he uncovered while unpacking the collection in Uppsala. "Peking Man" was born. Zdansky identified these teeth simply as "?*Homo* sp.", exercising admirable restraint in an area of taxonomy frequently confused by egotism and sensationalism. He ended his paper with the following conclusions:

Granted the human origin of the teeth, there arises the question of their relation to the living and prehistoric races of man. As the reader will infer, I am very sceptical towards a great deal of prehistoric-anthropological literature, and I am indeed convinced that the existing material provides a wholly inadequate foundation for many of the various theories based on it. As every fresh discovery of what may be human remains is of such great interest not only to the scientist but also to the layman, it follows only too naturally that it becomes at once the object of the most detailed – and, in my opinion, too detailed – investigation. I decline absolutely to venture any far-reaching conclusions regarding the ex-

tremely meagre material described here, and which, I think cannot be more closely identified than as *?Homo* sp. (Zdansky, 1927c, p. 284).

Besides Teilhard de Chardin, another scientist with interest in the origin of man, Davidson Black, was present at the reception for the Crown Prince. Clearly, Andersson must have shared in the excitement created by the announcement of Zdansky's discovery on 22 October 1926, over five years after Zdansky first found a hominid tooth at Zhoukoudian. However, he must also have felt chagrined that Zdansky had not informed him of the hominid tooth when it was first discovered. Had Zdansky done this in 1921 (or in 1922–1923) while in China with money from the Kinafond still available, Andersson could have focused all, or at least most, effort on the further excavation of Zhoukoudian. Now, it was apparent that Andersson lacked the resources to do this on his own, and this, coupled with the great enthusiasm Davidson Black expressed for the reopening of the Zhoukoudian site, made some sort of cooperative, and therefore not wholly Swedish-controlled, excavation of the site unavoidable.

It was fortunate for Andersson that he and Black were good friends, for this made it easy to arrive at a cooperative agreement for the new excavation at Zhoukoudian. Black immediately rushed into print with a short article in *Nature* (Black, 1926) extolling the importance of Zdansky's discovery. He then approached the Rockefeller Foundation in New York (which had previously supported renovation of the Peking Union Medical College where Black taught) for funding to support the new excavation at Zhoukoudian.

Andersson quite logically suggested that Zdansky should direct the new excavation. However, Zdansky, with a secure position in Cairo in hand, had no desire to return to China. Andersson then insisted that a Swede supervise the excavation, having in mind Birger Bohlin who had just completed his doctoral dissertation on Chinese fossil giraffids (Bohlin 1926). Black accepted Andersson's choice, and in 1927 Bohlin arrived in China and reopened the excavation at Zhoukoudian.

For two years, 1927–1928, Bohlin supervised a much more extensive excavation at Zhoukoudian than Zdansky had been able to undertake (Fig. 5b–d). Of the many fossil mammals collected, an additional hominid molar was discovered (Bohlin, 1944).

End of the Sino-Swedish Programme

Andersson left China in 1926 after almost 12 years. He returned to Sweden to become, temporarily, Professor of Geology at the University of Stockholm before assuming the position of Director of the Museum of Far Eastern Antiquities in Stockholm, a museum primarily founded upon Andersson's enormous collections from China. Although Andersson returned to China later, this was the end of his collecting efforts there.

Under Andersson's direction, the Sino-Swedish venture had been funded by the Chinese Government and by largely private funds from Sweden. Despite his energy and success in securing funds, Andersson always operated on a relatively small budget. Clearly, it was his great efficiency that enabled the collection of such vast numbers of specimens.

Sven Hedin, a renowned Swedish explorer and geographer, was independently wealthy and also had access to extensive resources reminiscent of those commanded by Roy Chapman Andrews. In 1927, Hedin was commissioned by the Chinese Railroad Authority to organize an expedition to investigate Inner Mongolia and Xinjiang in order to improve communications with these farflung provinces. Hedin wanted a palaeontologist as part of his team exploring the interior of China, and Bohlin became the natural choice because of his presence in China.

By the end of 1928 the first installment of Rockefeller Foundation money for the excavation of Zhoukoudian was exhausted, so it was a reasonable decision for Bohlin to accept the offer from Hedin. Ironically, the great discoveries of hominid fossils at Zhoukoudian, initiated by Pei Wen-chung's discovery of a skull-cap in 1929 (Fig. 10), occurred after Bohlin's departure for Central Asia.

Bohlin carried out his responsibilities as palaeontologist for Hedin's expedition with remarkable success, making large collections of fossil vertebrates and plants in Nei Monggol, Gansu and Tsaidam during the years 1928–1933 (Fig. 11). Most of the specimens he collected were shipped to Uppsala but were later returned to China during the late 1940's.

Political upheaval in China during the late 1930's, especially in the western provinces (Fleming, 1936), and the pending Japanese invasion of Manchuria, were not conducive to foreign exploration, and Hedin had to terminate his expedition. The dedication of Hedin and his colleagues, several of whom disappeared into the nether regions of desolate Central Asia and were presumed lost, only to reappear years later with a wealth of scientific data, are the stuff of legends. The immense contribution



Fig. 10. Pei Wen-chung at Zhoukoudian in 1979, pointing out the spot where he found the first skull-cap of "Peking Man" in 1929. Courtesy of the Institute of Vertebrate Palaeontology and Palaeoanthropology, China.

made by the 54 volumes of the *Reports of the Scientific Expeditions to the Northwestern Provinces of China under the Leadership of Dr. Sven Hedin* amply testifies to the scope and success of Hedin's expeditions.

The disturbances of the late 1930's were, in part,

a renewal of the problems that started the Boxer Rebellion in 1899. The establishment of a weak, but fiercely nationalistic government in Nanjing spelled clear trouble for all foreign enterprises in China and caused a mass exodus of foreigners from the country. Thus ended for some time any foreign scientific

Fig. 11. Fieldwork of the Hedin expedition. a, Breaking camp at Uh Tokhoi, Alakshan, Nei Monggol. b, Bohlin (on right) and Johansen at a fossil vertebrate locality near Tebchi, Nei Monggol. c, Bohlin uncovering a vertebrate fossil at Tebchi. d, Johansen sharpening chisels for excavation. Photographs by Folke Bergman courtesy of the Swedish Ethnographical Museum.

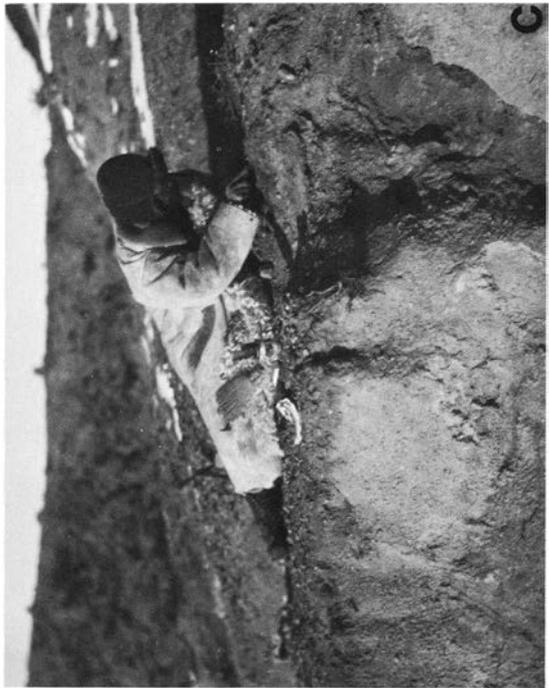
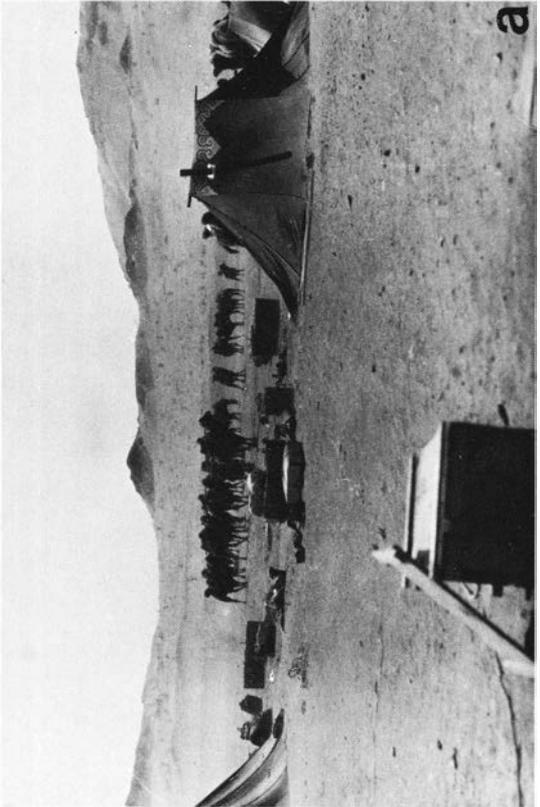




Fig. 12. Minchen Chow (on left) and C.C. Young examine a fossil proboscidean in Beijing, 1974. Courtesy of the Institute of Vertebrate Palaeontology and Palaeoanthropology, China.

research and exploration in China. The tragic and mysterious loss of the Zhoukoudian hominid fossils during the Japanese invasion well emphasizes the chaos then prevalent in China (Shapiro, 1974).

The Sino-Swedish cooperative exploration of China was over by the late 1930's, ending the longest foreign involvement in palaeontological and geological collecting and research in China. After the establishment of the Revolutionary Government of the Chinese Communist Party in 1949, and the subsequent return of civility to China, palaeontological research has been conducted by Chinese palaeontologists (Young, 1959; Chow, 1979; Zhou, 1981) (Fig. 12) with, in recent years, the increasing cooperation and collaboration of non-Chinese palaeontologists throughout the World.

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Appendix 1 (Biographies)

Below are brief biographies of the more significant people associated with the acquisition of the Lagrelius Collection.

Andersson, Johan Gunnar: Born on 3 July 1874 in Örebro, Sweden. He graduated from Uppsala University in 1901 and received his doctorate the same year. In 1906 he became Professor of Geology at Uppsala University. Andersson joined the Nathorst Expedition to Spitsbergen in 1898; in 1899 he led his own expedition to Bear Island in the Barents Sea. Andersson joined the Nordenskjöld Expedition to the Antarctic (1903–1906) and became its deputy leader. Upon his return to Uppsala in 1906, in addition to his new position as professor in Uppsala, he took the post of Director of the Geological Survey of Sweden. The 11th International Geological Congress convened in Stockholm in 1910 with Andersson as General Secretary. In 1914, Andersson left Sweden to become a mining advisor to the Chinese Government. During the years he worked in China (1914–1926), in the fields of

economic geology to palaeontology to ethnology and archaeology. Andersson returned to Stockholm in 1926 to become Professor of Geology at the University of Stockholm, a post that he held for just two years before becoming the Director of the new Museum of East Asian Antiquities (built around his collections and later supplemented with those of Sven Hedin). Before Andersson's death on 29 October 1960, he published several books about his research and experience in China, the penultimate concerning his final expedition to China (1936–1938).

Black, Davidson: Born on 25 July 1884 in Toronto, Canada. After graduating from the Toronto Medical School in 1909, he immediately became an instructor of anatomy at the Western Reserve School of Medicine in Cleveland, Ohio. Black eventually became an Assistant Professor of Anatomy there (1913), and in 1916 he joined the Canadian Medical Corps during the First World War. After the War, Black accepted the position of Professor of Neurology and Embryology at the Peking Union Medical College (1917). He held this post and achieved world-wide recognition for his studies of human evolution until his untimely death in 1934.

Bohlin, Anders Birger: Born on 26 March 1898 in Uppsala, Sweden. He attended Uppsala University and, in 1927, defended his doctoral thesis on the fossil Giraffidae from China (material collected by Andersson) which was later published in *Palaeontologia Sinica*. In 1927 Bohlin went to China to supervise the excavations at Zhoukoudian. Amongst the many mammalian fossils he discovered there, Bohlin found the third hominid tooth. In 1929, Bohlin joined Sven Hedin's expedition to northwestern China where he undertook palaeontological, geological and botanical research, mainly in Gansu. Bohlin returned to Sweden in 1933 and began to describe the extensive collections he had made in China. He became a lecturer in palaeontology at Uppsala University and, later, a biology teacher at a local high school. Since his retirement, Bohlin has worked steadily on the Chinese Carboniferous plants he collected.

Hedin, Sven: Born on the 19 February 1865 in Stockholm, Sweden. He was one of the more remarkable figures in scientific exploration, and his accomplishments in Central Asia were monumental. Hedin graduated from Uppsala University in 1888 and then studied for his doctorate under F. von Richthofen in Halle, graduating in 1892. He led three lengthy expeditions to Central Asia (1893–1897, 1899–1902, 1905–1908) before his final enterprise, the "Travelling University Expedition" (1927–1935). This ended a career of total commitment to exploring and writing about Central Asia. During the 1930's, Hedin entered the political arena as a nationalist in Sweden and a friend of Nazi Germany. This aspect of his career put a cloud over his other remarkable accomplishments, although he continued to receive many honors until his death in 1952. He was the last person admitted to the nobility in Sweden (1.7. 1902).

Lagrelius, Axel: Born in 1863, Lagrelius' career was with the General Staff Lithographic Establishment (1883–1933) and he was manager of three printing companies in Stockholm. Lagrelius was the Consul General in Finland from 1924 to 1936; in 1927 Uppsala University awarded him an honorary doctorate. Because of his successful business enterprises and high social connections, Lagrelius was able to finance several Swedish scientific expeditions, of which the Sino-Swedish Expeditions (1916–1926) were preeminent. Lagrelius died in 1944.

Pei Wen-Chung: Pei was born in January 1904 and died recently (September, 1982). He graduated from the Geological Department of Peking University in 1927 and began working at the Zhoukoudian site in 1928. Pei found the first skull-cap of "Peking Man" there in 1929. In 1935 he travelled to France to study prehistory and archaeology under Breuil and earned his doctorate from the University of Paris in 1937. After his return to China that year, Pei held a number of positions including professorships at the Geological Survey of China, Peking University and the Institute of Vertebrate Palaeontology and Palaeoanthropology. He was also director of the excavations at Zhoukoudian and of the Peking Natural History Museum.

Ringström, Torsten: Little is known of Ringström's life. He was born in Sweden in 1895 and died of cancer in 1939. Ringström is buried in Uppsala, Sweden. Ringström's monograph on the Late Tertiary rhinocerotids in the Lagrelius Collection (Ringström, 1924) is now regarded as a classic; he published only two other papers (Ringström 1922, 1927).

Sefve, Sven Ivar: Born 22 November 1886 in Norrköping, Sweden. He graduated from Uppsala University in 1908, and, following the defense of his master's thesis in 1910, he joined an expedition to South America. Sefve received his doctorate from Uppsala University in 1912 for his studies of fossil horses from South America. His substantial collection of fossil vertebrates from South America is housed in Uppsala. Sefve became a lecturer in zoology at Uppsala University in 1912; between 1914 and 1928 he was a school teacher, and headmaster, at various schools throughout Sweden. In 1927 he published a monograph on the fossil horses from northern China collected by Andersson (Sefve 1927). After 1928, Sefve became totally immersed in Swedish political life.

Teilhard de Chardin, Marie-Joseph-Pierre: Born 1 May 1881 near Orcines, France. He led a controversial life along the borders of palaeontology and theology. He received his degree in letters from the University of Caen in 1902. Between 1905 and 1908 he taught physics and chemistry at the Jesuit College in Cairo and wrote his first palaeontological monograph, on the Eocene of the Fayum. In 1922 he defended his doctoral thesis on the Eocene mammals of the Paris Basin. He then studied theology at Hastings, England between 1908 and 1912 and was ordained in 1911. Further studies in palaeontology in Paris (1912–1914) were largely under the tutelage of Marcellin Boule. After teaching geology at the Catholic Institute in Paris he left in 1923 for China to help Licent at the Tianjin College Museum. After travelling widely in China, Teilhard returned to Paris in 1924 only to find that his writings and research were at variance with the views held by his colleagues in the Catholic Institute. He returned to China via Ethiopia in 1926, to arrival in 1929 as scientific advisor to the Geological Survey of China and a participant in the excavations at Zhoukoudian. Teilhard remained in China until 1946. For the remaining nine years of his life, he travelled widely to study the prehistory of man. He died in New York on 10 April 1955 (Grenet 1966).

Ting, V.K.: Born in 1887 in Jiang Province, China. He visited Japan in 1902 and England in 1904. Before his graduation from the University of Glasgow in 1911, Ting travelled extensively in Europe. He returned to China in 1911, and, following a short period as a teacher in Shanghai, he joined the Ministry for Industry and Commerce

in Beijing as director of the geology section. He spent much of 1914 doing fieldwork in Yunnan and Sichuan studying the mineral deposits. Ting visited Europe again in 1920, returning via the United States where he urged Amadeus Grabau, then at Columbia University, to take a position at Peking University and the Geological Survey of China. In 1921, Ting became director and manager of the Peipiao Mining Company and took the title of honorary director of the Geological Survey of China (Wong was acting director). By 1925, Ting was elected Mayor of Shanghai and Wusung. He successfully rebuffed an attack on Shanghai by the revolutionary army of Chiang Kai-shek in 1927, but with the breakdown of the national government, he resigned his post in 1928 and resumed his geological career. Ting spent much of the following three years doing fieldwork for the Geological Survey of China in various parts of the country. He was offered the position of Professor of Geology at the National University in Beijing (1931) and in 1933, upon his return from a trip to the United States, Europe and the U.S.S.R., he was elected Secretary General of the *Academia Sinica*. Ting died of asphyxiation while inspecting a coal-mine in Henyang in 1936.

Wiman, Carl: Born 10 March 1867 in Mårsta, Sweden. He graduated from the University of Uppsala in 1891 and earned his doctorate in 1896 for his studies of graptolites. In 1896 he took charge of the palaeontological collections at the Department of Geology of Uppsala University and was appointed to the post of lecturer in pre-Quaternary geology. In 1911, a special chair in historical geology and palaeontology was created for Wiman in recognition of his work on the Cambro-Silurian of Sweden. He later expanded his studies to include the Lower Palaeozoic of the entire Baltic region. Wiman took part in the De Geer Expedition to Spitsbergen in 1908 where his discovery of extensive fish-bearing strata changed his sphere of interest to vertebrate palaeontology and inspired the Swedish school of palaeoichthyology developed by Stensiö, Jarvik and Ørvig. Wiman's interest in fossil reptiles (after 1920) brought many specimens to Uppsala from diverse parts of the World. He was thus instrumental in bringing the fossil vertebrates Andersson collected in China to Uppsala. Wiman died in June 1944.

Wong Wenhao: Born 29 January 1889 in Yin Xian, Zhejiang. He received his doctorate in geology from Leuven University in Belgium in 1912 and returned to China the following year to commence teaching for the Geological Survey of China in Beijing. In 1915 he was appointed head of the Mineralogical Section of the Survey. From 1923 to 1935 he was Director of the Geological Survey and also held positions as Professor of Geology at Peking University and Professor in the Department of Geography at Tsinghua University. After 1935 he entered politics and became a high-ranking official of the Kuomintang Government (Chief Secretary of the State Council, Chairman of the National Resources Committee, Minister of Economics, Vice-Premier and Premier). In 1949, Wong fled to Japan and then to France following the fall of the Kuomintang Government. He returned to Beijing in March 1951 and died there on 27 January 1971.

Zdansky, Otto: Born on 28 November 1894 in Vienna, Austria. He first attended a private school and then a technical high school to study engineering. From 1914 to 1918, Zdansky's schooling was interrupted by service in the Austrian Army during the First World War. After the war he studied vertebrate palaeontology under Abel at the University of Vienna. His doctorate, awarded in 1921, was on the temporal region of the turtle skull, and a short version of it was published in Sweden (Zdansky 1924b). Zdansky spent June-November of 1920 in Uppsala and, in May 1921, left Uppsala for Tianjin via London. He remained in China until December of 1923. From 1924 to 1927 Zdansky worked as a technician at the Paleontological Institute in Uppsala. During the evenings he undertook research on the fossil vertebrates he had collected in China. Zdansky was offered, and accepted, a position at the Egyptian University in Cairo in 1927. He also married a Swedish woman that year; before the Second World War he frequently visited Uppsala to continue his research on the Lagrelius Collection. In 1939, Zdansky took his wife and son to Sweden where they remained for the duration of the war. Zdansky returned to Sweden in 1951 when his contract was not renewed in Cairo as an outcome of anti-foreign sentiment that was part of the Nasser regime in Egypt. After 1951, Zdansky worked part-time for several years at the Palaeontological Institute in Uppsala and occasionally taught classes.

