'AWAKENING' FOSSILS IN CHINA: INTERNATIONAL EFFORTS IN PUBLISHING PALAEONTOLOGIA SINICA

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ABSTRACT



Earth Sciences History Vol. 43, No. 2, 2024 pp. 256–271

The *Palaeontologia Sinica* founded in China in 1922, was one of the most important Chinese academic journals with international influence in the first half of the 20th century. It originated from Ding Wenjiang's (V. K. Ting, 1887–1936) emphasis on paleontological research in China. The success of its publication was also due to the strong support of Swedish geologist Johan G. Andersson (1874–1960) and the academic guidance of American paleontologist Amadeus W. Grabau (1870–1946). Mainly based on fossil collections in most parts of China at the time, 126 monographs of the journal were contributed by 50 authors from different countries, and various fossils lying dormant in the land of China were brought to light.

Keywords: *Palaeontologia Sinica*; Ding Wenjing (V. K. Ting); Johan G. Andersson; Amadeus W. Grabau; China; Sweden; international cooperation doi: 10.17704/1944-6187-43.2.256

1. INTRODUCTION

Among the many scientific journals published in China in the first half of the 20th century, *Palaeontologia Sinica* was one of the most international and influential. *Palaeontologia Sinica* was founded in 1922, and as of 1949, a total of 126 volumes¹ (numbered to 133) had been published, despite social turmoil and upheaval at the time. After 1950, it continued to be published, and by 2022, 100 years after its founding, in sum 202 volumes had been published. The journal was mainly organized and planned by Ding Wenjiang (V. K. Ting, 1887–1936),² director of the Geological Survey of China (GSC), the Swedish geologist Johan G. Andersson (1874–1960), and the American paleontologist Amadeus W. Grabau (1870–1946). Its successful publication also benefited from the strong support of relevant organizations and individuals in China and Sweden, as well as the fundamental research on fossils unearthed in various parts of China by Chinese and foreign scholars, which can be said to be the result of international cooperation.

Through a large number of fossil collections and researches, *Palaeontologia Sinica* gradually unveiled the mystery of China's stratigraphy. Niall J. Mateer and Spencer G. Lucas discussed the fossil collecting activities of Andersson's team in China, the Swedish sponsorship of Andersson, Chinese fossil collections in Sweden, as well as the publication of the *Palaeontologia Sinica* (Mateer 1985). Several scholars dealt with the publication of geological

¹ Several monographs by Swedish scholars were published in 1950s.

² This paper gives Chinese names in Pinyin, with family names first and given names second. When applicable, the first occurrence of each Chinese name is accompanied by the non-Pinyin name used by the same person in previous publications. Concerning Chinese locality names, except for those which are now retained as non-pinyin usages, all appear in pinyin.

journals in the Republic of China (Pan 1996a; Zhang 2018), and *Palaeontologia Sinica* and its importance in the development of Chinese paleontology was also analyzed (Pan 1996b). Apart from the monographs in this journal, little is known about its origin, publication, academic impact, and the international cooperation that led to its production. Mainly based on the publications of *Palaeontologia Sinica* in the first half of the 20th century and relevant literature, this paper first describes the fossil collecting of Ding Wenjiang (Figure 1) which primarily was the origin of *Palaeontologia Sinica*; secondly, this paper examines the impetus of the journal, inspired by the fossil collecting of Johan G. Andersson; thirdly, this paper presents the founding and publication of *Palaeontologia Sinica*; and finally, this paper analyzes the distribution of the authors and highlights the research topics covered by the journal, in order to unveil the hidden history and significance of the journal, as well as the efforts and enthusiasm of scholars from both China and foreign countries in 'awakening' the fossils in China.



Figure 1. Portrait of Ding Wenjiang (also known as V. K. Ting) in 1922 (photograph courtesy of Museum of Far Eastern Antiquities, Stockholm, No. 011069).

2. ORIGIN OF *PALAEONTOLOGIA SINICA*: DING WENJIANG'S FOSSIL COLLECTING

China has a very early record of investigations of fauna and flora fossils. As early as the 5th century, Li Daoyuan (*circa* 470–527) recorded trilobite and fish fossils in his *Shuijing zhu* (Commentary on Water Classic). Later, there were quite a few descriptions of different fossils in such works as Yan Zhenqing's (709–784) *Magu xiantan ji* (Fairyland of the Lady Magu), Shen Kuo's (1031–1095) *Mengxi bitan* (Brush Talks from Dream Brook), Zhu Xi's (1130–1200) *Zhuzi yulei* (Classified Conversations of Zhu Xi), and Du Wan's (*circa* 12th century) *Yunlin shipu* (Yunlin Stone Book). Some scholars even proposed the conjecture "blue seas change into mulberry fields" based on marine fossils in the mountain. In the Ming and Qing Dynasties (14th

to 19th centuries), the related fossil records were more and more popular in the writings of the literati.

Scientific studies on fossils originated in Europe in the 17th century. Modern understanding and collecting of fossils in China began when western scholars arrived in China in the second half of the 19th century. Raphael Pumpelly (1837–1923), Ferdinand von Richthofen (1833–1905), Lajos Lóczy (1849–1920), Vladimir Afanasyevich Obruchev (Владимир Афанасьевич Обручев, 1863–1956), and Bailey Willis (1857–1949), among others, came to conduct geological surveys and they collected many fossils, which they published in their books. In the 20th century, more and more western scholars conducted scientific investigations in China, in particular, the Central Asiatic Expedition, sponsored by the American Museum of Natural History and led by Roy Chapman Andrews (1884–1960), the Scientific Expedition to the North–Western Provinces of China under the leadership of Sven Hedin (1865–1952), and several Japanese organizations, obtained a large number of fossils and made other scientific achievements as well. These western scholars also began to encounter Chinese claims of sovereignty (Sun 2021).

Ding Wenjiang was the first Chinese scholar to collect fossils in China. He went to Japan to study in 1902 and transferred to Britain in 1904. He entered Glasgow University in 1908, and graduated in 1911 with a double diploma in zoology and geology. He directly afterward traveled to Yunnan to conduct geological and ethnographic surveys when he returned to China in 1911. Through his efforts and those of Zhang Hongzhao (H. T. Chang, 1877–1951), the Institute of Geology was established in Beijing in 1913 to train young geologists, and then the Geological Survey of China (GSC) was founded in 1916, with Ding Wenjiang serving as its director for a long period of time. As a result of the efforts of Ding Wenjiang, Zhang Hongzhao, Weng Wenhao (W. H. Wong, 1889–1971) and others, the GSC "enjoys the reputation of being the first scientific organization in China in the true meaning of the term" (Tsai 1936).

In addition to being an encyclopedic scholar and an influential social activist³, Ding Wenjiang placed particular emphasis on geological surveys in the field and made fundamental contributions to Chinese geology. During his lifetime, he systematically conducted long-term investigations in Yunnan, Guangxi and Guizhou, and wherever he went, geology, paleontology, ethnography, folklore and geography were all involved. In addition, he also made surveys to Beijing, Shanxi, Hebei, Shandong, Jiangxi, and Hunan among other places (Huang 1936) (Figure 2). He attached great importance to the study of paleontology and stratigraphy; in particular, he collected a large number of fossils in his investigations in Yunnan, Guizhou and Guangxi. These led to the idea of publishing a work on fossil research in China, and the project of the *Paleontologia Sinica* was in fact started to describe his own fossil collections (Zhang 1936); Weng 1936).

Because of Ding Wenjiang's emphasis on paleontology, a Paleontological Research Laboratory was set up in the Geological Survey of China. Invited by Ding, Amadeus W. Grabau came to China from America in 1920, and acted concurrently as professor at the Department of Geology of Peking University and chief paleontologist of the Geological Survey of China. Grabau was actively engaged in paleontological research and wrote a large number of works, including seven monographs in the *Palaeontologia Sinica*. At the same time, he cultivated at least two generations of paleontological scholars, most of whom published their monographs in the *Palaeontologia Sinica*. Thus, Grabau can be called the "Father of China's Paleontology" (Sun 2016).

³ In addition to academic positions in geology such as Director of the Geological Survey of China, President of the Geological Society of China, Ding Wenjiang also served as General Manager of the Beipiao Coal Mining Company, Director-General of Greater Shanghai (equivalent to the Mayor of Shanghai), Professor of the Department of Geology at Peking University, board member of the China Foundation for the Promotion of Education and Culture, and Secretary-General of the Academia Sinica. He had the misfortune to be poisoned by gas during a trip to Hunan for a geological survey in December 1935. He died on January 5, 1936, due to unsuccessful resuscitation.

Due to his heavy administrative duties, Ding Wenjiang did not publish many works on paleontology and stratigraphy, but his investigations and fossil collections became an important foundation for later geological research in China. As Zhang Hongzhao said:

As for the discovery and collection work, Ding Wenjiang's achievements in the southwestern provinces are the most outstanding, not only did he open the Chinese surveys in the southwestern region of the country, but also the gradual identification of the paleontological strata of that area are mainly based on the fossils collected by him. (Zhang 1936a, p. 74)



Figure 2. Map of routes and locations of Ding Wenjiang's geological surveys in China (Huang 1936).

The fossils collected by Ding Wenjiang in Yunnan, Guizhou, and Guangxi later became the basis for many monographs of *Palaeontologia Sinica*, such as: Thore Gustaf Halle's (1884–1964) *Fossil Plants from South–Western China* (Halle 1927), *On Drepanophycus, Protolepidodendron and Protopteridium* (Halle 1936); Si Xingjian's (S. C. Sze, 1901–1964) *Beiträge zur Mesozoischen Flora von China* (Sze 1933); Amadeus Grabau's *Silurian Faunas of Eastern Yunnan* (Grabau 1926), *Devonian Brachiopoda of China, I. Devonian Brachiopoda from Yunnan and other Districts in South China* (Grabau 1931), *Early Permian Fossils of China* (Grabau 1934; Grabau 1936); Xu Jie's (Hsü, Singwu C., 1901–1989) *Fresh–Water Gastropods from Tertiary and Quaternary Deposits of Kwangsi, S. China* (Hsü 1935); Nils Odhner's (1884–1973) *Non–Marine Mollusca from Pliocene Deposits of Kwangsi, China* (Huang 1932); Ji Rongsen's (Chi, Yungshen S, 1907–1942) *Weiningian (Middle Carboniferous) Corals of China* (Chi 1931). At least 11 of the

monographs were mainly based on fossils collected by Ding Wenjiang. Other works using fossils collected by him were even more numerous.

In summary, Ding Wenjiang was one of the most active fossil collectors in China in the first half of the 20th century. His collections led to the plan to produce *Palaeontologia Sinica*, which opened a door to paleontology in China.

3. IMPETUS OF *PALAEONTOLOGIA SINICA*: JOHAN G. ANDERSSON'S FOSSIL COLLECTING IN CHINA

The founding of *Palaeontologia Sinica* also benefited from the strong support of the Swedish geologist Johan G. Andersson (Figure 3), the most important foreign scholar in fossil collecting and research in China in the first half of the 20th century. In 1914, he was invited to China as the 'Mining Advisor' of the government in Beijing, and in the meantime he collected many fossils in various places. After the death of Yuan Shikai (Yuan Shih-k'ai, 1859–1916)⁴ in 1916, his duty as a 'Mining Advisor' was interrupted by political divisions and the civil war. In 1917, he proposed a joint fossil collection program to Ding Wenjiang, a like–minded person, in which the fossils collected, would be divided equally between the Geological Survey of China and Swedish museums, while the funds would be raised by Andersson in Sweden. Ding Wenjiang accepted this proposal and requested that the results of the research on the collected fossils be published in *Palaeontologia Sinica* (Andersson 1929a; Andersson 1929b).



Figure 3. Johan G. Andersson in the field (photograph courtesy of Museum of Far Eastern Antiquities, Stockholm, No.000882).

⁴ Yuan Shikai was an important figure in modern Chinese history. After years of experience in the military and local government, he became the Provisional President of the Republic of China in 1912, and the first President in 1913. In 1915, he manipulated public opinion to make himself the Emperor of the Empire of China and ascended to the throne on 1 January 1916. However, due to opposition from various parties, he declared the abolition of the imperial system in March 1916. He died on 6 June 1916 due to illness.

In 1918, Andersson formulated the "General Plan for Natural History Collections in China by Means of China Funds (Kina–Fonden)" (Mateer 1985; Chen 2014; Han 2019). For this, he first turned to his friend Axel Lagrelius (1863–1944), the chief administrator of the Swedish royal family. He soon received a positive reply from Lagrelius (Andersson 1929). On 15 September 1919, in conjunction with Andersson's plan to collect fossils in China with Ding Wenjiang, Lagrelius invited Louis Palander (1842–1920) and Gunnar Andersson to join him in establishing a Chinese Research Committee in Stockholm, with the main purpose of supporting Johan G. Andersson's fossil collecting activities in China. Many people contributed to this effort, the more important including Lagrelius himself, H. Westman, J. G. Vennersten, the Swedish match king Ivar Kreuger (1880–1932), and the Hultmark brothers (E. Hultmark and R. Hultmark). By 1929, Andersson's fossil collecting and research in China had been funded by the Chinese Research Committee to the tune of nearly 860,000 Swedish francs (Andersson 1929b), not including Andersson's donation of his salary in China.

Through the information provided by western (in particular Swedish) missionaries in China, Andersson and his Swedish colleagues and Chinese assistants carried out largescale fossil surveys and collections in China. The places where Andersson investigated and collected fossils included: the western suburbs of Beijing, Yuanqu and Baode in Shanxi, Xin'an and Mianchi in Henan, Baoding in Hebei, Longwusu and Shangdengtu in Inner Mongolia, western Gansu, Shaguotun in Liaoning, and Mengyin in Shandong. Among them, the discovery of the Peking Man fossils in Zhoukoudian, Beijing, and the Yangshao culture in Henan Province were the most important, and brought Andersson a worldwide academic reputation (Yu 2022). The Peking Man fossil, which was later transferred to the Geological Survey of China and Peking Union Medical College, was the earliest discovery of a primitive man site in East Asia, and the richness of the unearthed fossils and paleolithic remains remains a rare find. Yangshao culture was the earliest Neolithic site discovered in China, which marked the beginning of Chinese archaeology, and was also an important opportunity for Andersson to shift from geology and paleontology to archaeology. This switch established his position as a pioneer of Chinese archaeology (Han 2019).

Most of the fossils and artifacts collected by Andersson in China, in addition to those that remained in China, were sent back to Sweden, where relevant scholars from Europe and America were asked to appraise and study them. Many of the results were later published in *Palaeontologia Sinica*. Before Amadeus Grabau came to China in 1920, Andersson also sent the fossils collected in Shanxi, Fujian, Jiangxi and other places to him in America, asking him to identify and study them.

In connection with the *Palaeontologia Sinica*, mention should also be made of the Scientific Expedition to the North–Western Provinces of China organized by the Swedish explorer Sven Hedin. The expedition, which consisted of nearly 30 members from Sweden and China, conducted extensive and in–depth scientific investigations in northwest China from 1927 to 1933, including geography, geology, paleontology, archaeology, astronomy, meteorology, anthropology, folklore and other disciplines. The expedition achieved fruitful results. According to the agreement, the paleontological research results of the expedition were published in *Palaeontologia Sinica* (Hedin 1937). A total of 10 monographs were published, including 8 volumes by Swedish scholars and 2 volumes by Chinese scholars, while those published after 1971 were not labeled as part of the *Palaeontologia Sinica*.

In addition to Swedish workers, the French Jesuits Emile Licent (1876–1952) and Pierre Teilhard de Chardin (1881–1955) also conducted a long–term expedition in China, and collected a large number of fauna fossils and Paleolithic specimens, on the basis of which Musée Hoangho Paiho was established in Tianjin. The research studies of some of these fossils were included in monographs published by the *Palaeontologia Sinica*.

4. A SPLENDID SIGHT: THE PUBLICATION OF PALAEONTOLOGIA SINICA

Under the direction of Ding Wenjiang, Johan G. Andersson, Amadeus Grabau and others, *Palaeontologia Sinica* was officially published in 1922. The style of the journal was mainly modeled on similar publications in the West. With the rise of paleontological research in Europe and America in the 19th century, a variety of paleontological works were written, and a number of paleontological academic journals came into being as well, e. g., *Natural History of New York: Palaeontology*⁵ founded in 1847 by James Hall (1811–1898), *Palaeontologia Scandinavica* in 1854, and *Palaeontologia Indica* in 1861. The founding of *Palaeontologia Sinica* was undoubtedly influenced by these journals. At about the same time as *Palaeontologia Sinica*, *Palaeontologia Hungarica* and *Palaeontologia Polonic* were founded in 1921 and 1929, respectively.

Palaeontologia Sinica was divided into four types of publications: Series A covered fossil plants, Series B fossil invertebrates, Series C fossil vertebrates, and Series D ancient man. Each series was divided into different volumes which consisted of different fascicles. The earliest one that appeared was Amadeus Grabau's *Ordovician Fossils from North China* (Series B, Vol. 1, Fasc. 1, Figure 4), published on 28 April 1922, which was based on the fossils collected by



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Figure 4. Cover page of Amadeus Grabau's Ordovician Fossils from North China (Grabau 1922).

Natural History of New York consists of six parts: 1) Zoology, 2) Botany, 3) Mineralogy, 4) Geology, 5) Agriculture, and 6) Palaeontology.

Ferdinand von Richthofen (1833–1905), Bailey Willis (1857–1949), Frederick K. Morris (1886– 1962), George B. Barbour (1880–1977), François. F. Mathieu, Sun Yunzhu (Y. C. Sun, 1895– 1979), and Grabau himself. This is also considered to be the first paleontological work in China. A little later, Rudolf Florin's (1894–1965) *Zur alttertiären flora der südlichen Mandschurei* (Series A, Vol. 1, Fasc. 1) was published on 1 August 1922. This was shortly followed by another Amadeus Grabau monograph *Palaeozoic Corals of China* (Part 1. Tetraseptata, Series B, Vol. 2, Fasc. 1) published on 1 September 1922. It was amazing that three monographs of *Palaeontologia Sinica* were published in less than six months.

According to the agreement between China and Sweden, the paleontological works written in China were printed in China, while those written abroad were uniformly printed in Stockholm, while all the copyrights belonged to the Geological Survey of China. As a result of the efforts of Chinese and Western scholars, monographs of *Palaeontologia Sinica* were published in a steady stream, as Amadeus Grabau marveled: "[the speed of the publication] in the history of paleontology is unprecedented" (Chen 1931). He also said: "Mr. Ding [Wenjiang]'s had an intention to make this publication better than its counterparts in other countries . . . In less than fifteen years from [when] the first volume appeared till now [1936], there have been nearly one hundred monographs published. This is a great achievement which no other country can show." (Hu 2014)

The cover of the *Palaeontologia Sinica* bears a design of a trilobite (see Figure 4). This kind of trilobite, which was often found in China in early times, in particular in Dawenkou area of Shandong Province, was called a 'bat stone' or 'swallow stone', for the two large tail spines that resemble bats or swallows. The fossil was described in 1899 by the French scholar Bergeron and named *Drepanura premesnili* (Peng 2019). Zhang Hongzhao visited the Dawenkou area twice in 1914 and 1915, and obtained some fossil specimens. He pointed out that the so-called 'bat stones' were actually *Drepanura premesnili* (Zhang 1927). Being one of the few fossils studied in China at the beginning of the 20th century, the beautiful 'bat stone' was naturally used as the cover art for the *Palaeontologia Sinica*.

Since its inception, the *Palaeontologia Sinica* had been edited by Ding Wenjiang, with Weng Wenhao or Sun Yunzhu as co–editors. After Ding's death in 1936, Weng Wenhao succeeded him as editor–in–chief. The editorial board of the journal was mainly composed of Amadeus Grabau, Sun Yunzhu, Yang Zhongjian (C. C. Young, 1897–1979), Yin Zanxun (T. H. Yin, 1902–1984), and Huang Jiqing, while Zhou Zanheng (1893–1967), who had returned from his studies in Sweden, served as the secretary and editor for a long time. They represented the main force in paleontological research in China at that time.

The Geological Survey of China moved to Nanjing in 1935. Due to the outbreak of the Anti-Japanese War in 1937, it was forced to move to Changsha and then to Chongqing. The place of publication of the *Palaeontologia Sinica* was also moved from Beijing to Nanjing and Chongqing, and several monographs were also published in Changsha. In terms of style, the Series A, B, C, and D of the journal were changed to New Series A, New Series B, New Series C, and New Series D, respectively. Unlike before when each volume was divided into several fascicles, now one volume only consisted of one monograph and fascicles were no longer assigned. During that extremely difficult period, the research of Chinese and foreign scholars on fossils collected in China did not seem to be affected, and the *Palaeontologia Sinica* continued to be published as scheduled.

According to the numbering, the last volume published before 1949 was No. 133, *Die Mesozoische Flora aus der Hsiangchi Kohlen Serie in Westhupeh* by Si Xingjian (New Series A, Vol. 2). However, 122 volumes were actually published, including: 9 monographs of Series A⁶, 46 of Series B, 51 of Series C, and 16 of Series D. Some of the works originally planned to be published did not appear, such as: Series A Vol. 3, Series B Vol. 10, Series B Vol. 12 Fasc. 1,

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Including New Series A. The same is to Series B, C, and D.

Series B Vol. 12 Fasc. 2, New Series B Vol. 1, New Series B Vol. 3, New Series C Vol. 4, Series D Vol. 2, Series D Vol. 4, Series D Vol. 5, New Series D Vol. 2, New Series D Vol. 4, and New Series D Vol. 8. Including four unnumbered volumes, but labeled as *Palaeontologia Sinica* monographs, which appeared as Reports of Scientific Expedition to the North–Western Provinces of China (Frebold 1940; Regnéll 1941; Bohlin 1951; Bohlin 1953), a total of 126 volumes of *Palaeontologia Sinica* were published in the first half of the 20th century.

Under the co-ordination of Ding Wenjiang, Johan G. Andersson and Amadeus Grabau, the publication of *Palaeontologia Sinica* had a relatively complete program from the beginning. Detailed publication plans were published in *Palaeontologia Sinica* in 1927 and in 1931. However, as the amount of fossils unearthed increased and the progress of research changed, the publication plan was adjusted accordingly, resulting in vacancies in some volumes as aforementioned. For example, in the 1927 publication program, Vol. 10 of Series B was Amadeus Grabau's *Permian of Mongolia*. This monograph was a study of Permian fossils from Mongolia obtained by the Central Asiatic Expedition led by Roy Chapman Andrews. Probably due to the dispute between China and the United States over the attribution of fossils from the Expedition, the book (nearly 700 pages) was eventually published as a special issue of the Central Asiatic Expedition in New York in 1931, and was not included in the *Palaeontologia Sinica*. Volume 10 of Series B of the journal was therefore left vacant.

5. COOPERATION ON A GREAT UNDERTAKING: THE AUTHORS AND HIGHLIGHTS OF *PALAEONTOLOGIA SINICA*

Among all the 126 volumes of the *Palaeontologia Sinica*, English accounted for 100 titles, reflecting the fact that English was the international academic language at that time; German accounted for 24 titles⁷, and French accounted for only 2 titles. In addition to Chinese and Swedish authors, there were also scholars from America, Germany, Britain, France and other countries, all cooperating to create this great undertaking. The distribution of the authors is shown in Table 1 (in order of appearance from Series A to D of *Palaeontologia Sinica*):

| Nation | Authors | Total |
|---------|--|-------|
| China | Si Xingjian (H. C. Sze), Pan Zhongxiang (C. H. P'an), Hu Xiansu (H. H. Hu), | 21 |
| | Yu Jianzhang (C. C. Yü), Zhang Mingshao (M. S. Chang), Sun Yunzhu (Y. C. | |
| | Sun), Ma Tingying (T. Y. Ma), Sheng Xinfu (S. F. Sheng), Li Siguang (J. S. | |
| | Lee), Chen Xu (S. Chen), Tian Qijun (C. C. Tien), Zhao Yazeng (Y. T. Chao), | |
| | Xu Jie (S. C. Hsü), Bing Zhi (C. Ping), Yue Senxun (S. S. Yoh), Huang Jiqing | |
| | (T. K. Huang), Yin Zanxun (T. H. Yin), Ji Rongsen (Y. S. Chi), Yang | |
| | Zhongjian (C. C. Young), Pei Wenzhong (W. C. Pei), Bian Meinian (M. N. | |
| | Bien) | |
| Sweden | Rudolf Florin, T. G. Halle, Nils H. J. Odhner, Gustaf T. Troedsson, Gerhard | 14 |
| | Regnéll, Einar Lönnberg, Torsten Ringström, Erik Stensiö, Birger Bohlin, | |
| | Ivar Sefve, Carl Wiman, Johan G. Andersson, T. J. Arne, Nils Palmgren | |
| France | Étienne Patte, Pierre Teilhard de Chardin, M. Trassaert, Henri Breuil | 4 |
| America | Ralph W. Chaney, Amadeus W. Grabau, Gerrit S. Miller | 3 |
| Germany | Max Schlosser, Hans Frebold, Franz Weidenreich | 3 |
| Britain | Helga Sharpe Pearson, Percy Roycroft Lowe, Arthur Tindell Hopwood | 3 |
| Canada | Davidson Black | 1 |
| Austria | Otto Zdansky | 1 |

Table 1. Distribution of authors in Series A to D of Palaeontologia Sinica.

⁷ Most were written by Swedish and German scholars. Yang Zhongjian, Si Xingjian, who studied in Germany, also wrote several monographs in German.

A number of authors contributed to different works, with the most prolific authors (two co–authors of a volume equate to 0.5 for each) as follows:

C. C. Young: 11 Otto Zdansky: 9; Birger Bohlin: 8; Amadeus W. Grabau: 7; W. C. Pei: 6.5; Pierre Teilhard de Chardin: 6; Franz Weidenreich: 6; Y. C. Sun: 5; Davidson Black: 4; Y. T. Chao: 4.

In addition, T. G. Halle, Si Xingjian, Huang Jiqing, Ji Rongsen, Yin Zanxun, and Tian Qijun also made notable contributions.

As the father of China's paleontology and the main planner of the *Palaeontologia Sinica*, Amadeus Grabau contributed seven volumes to the journal, focusing mainly on Ordovician, Silurian, Devonian, and Permian fossils from all parts of the country. His contributions were breathtakingly extensive. In addition, he completed even more papers on Chinese stratigraphy and paleontology in other publications.

Sun Yunzhu's *Contributions to the Cambrian Faunas of North China* published in 1924, was the first monograph on paleontology written by a Chinese scholar for which Amadeus Grabau was often credited. Later, Sun Yunzhu published some other volumes concerning Cambrian trilobites, Ordovician trilobites and graptolites, and Silurian graptolites. He was honored with the title of 'Cambrian Sun' for his brilliant studies.

As the most prolific author in *Palaeontologia Sinica*, Yang Zhongjian contributed 11 monographs to the journal. His first work published in the journal, *Fossile Nagetiere aus Nord–China* in 1927, was the first monograph on vertebrate paleontology by a Chinese scholar. His later monographs published in *Palaeontologia Sinica* focused on mammalian fossils excavated in northern China and Zhoukoudian in particular. He was also the first Chinese scholar who studied dinosaurs, and he published three monographs on dinosaurs from Ningxia, Xinjiang, and Yunnan (Young 1941) (Figure 5) respectively. He was the founder of Chinese vertebrate paleontology and was a longtime leader of the Cenozoic Research Laboratory and the later Institute of Vertebrate and Paleoanthropology of the Chinese Academy of Sciences.

Otto Zdansky (1894–1988) was known for his discovery of the first Peking Man teeth at Zhoukoudian. In addition to collecting numerous fossils in Shanxi and Zhoukoudian, he also contributed nine monographs, ranking him as the second most prolific author in *Palaeontologia Sinica*. His research focused on the carnivore fossil of northern China, and his cautious description of the Peking Man teeth was published in *Bulletin of the Geological Survey of China* (1923, 1926).

Birger Bohlin (1898–1990), who succeeded Otto Zdansky in the Zhoukoudian excavations in 1927 and was later invited to participate in the Scientific Expedition to the North–Western Provinces of China, also published eight monographs in *Palaeontologia Sinica*. His early studies were about Giraffidae and Hipparion fossils from northern China, while his later works were focused on mammalian fossils based on his collections in Gansu and Qinghai during his expedition to north–western China.

Davidson Black (1884–1934) and Franz Weidenreich (1873–1948), on the other hand, provided an in–depth description and study of the Peking Man fossils from Zhoukoudian, which greatly contributed to the progress of paleoanthropology in China. The French Jesuit, Pierre Teilhard de Chardin, who had long been supervising Yang Zhongjian and Pei Wenzhong, also contributed a great deal, mainly concerning the mammalian fossils of Zhoukoudian and northern

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China (Sun 2024).



Figure 5. Lufengosaurus huenei Young, unearthed in Lufeng, Yunan in 1938 (Young 1941).

Zhao Yazeng (1898–1929), an outstanding young scholar of early Chinese paleontology and a student and friend of Amadeus Grabau, published 4 brilliant monographs in *Palaeontologia Sinica* in just a few years. He was particularly skilled in the study of brachiopods (Figure 6) and was highly regarded by Grabau. Unfortunately, Zhao was killed by bandits in 1929 while on a geological survey in Yunnan. When he was dying, he still closely guarded the fossils that he had collected with great effort, which embodied the nature of a true paleontologist. He might have contributed even much more if he had not died at an early age.

It is also worth mentioning Li Siguang's (1889–1971) research on microfossils. His *Fusulinidae of North China*, published in 1927, was the first study of microfossils in China and was greatly appreciated by Amadeus Grabau and others. Under his influence, Chen Xu later published *Fusulinidae of South China* in 1934.

Pei Wenzhong (1904–1982), who was the first to discover the skull of Peking Man in 1929, at first specialized in the study of mammalian fossils from Zhoukoudian. After he obtained his Ph.D., directed by Henri Breuil in France in 1935, he gradually shifted to the study of Paleolithic culture.

Chinese and foreign people surveyed many places throughout the country and collected countless fossils, and the study of these fossils by scholars from all over the world resulted in the magnificent *Palaeontologia Sinica*. From the descriptions in the monographs of *Palaeontologia Sinica*, we are amazed to find that fossil collecting covered most of China at that time (Figure 7).

The fossils described in the monographs of *Palaeontologia Sinica* were from the following places and they highlighted the paleontological research at the time. Fossils from Yunnan, Guizhou, and Guangxi in southwestern China were mainly surveyed by Ding Wenjiang. Fossils from Beijing, Henan, Shanxi, Shaanxi, and Inner Mongolia in North China were investigated by Johan G. Andersson, in particular those unearthed from Zhoukoudian near Beijing. Fossils from



Figure 6. An illustration of Zhao Yazeng's Carboniferous and Permian Spiriferids of China (Chao 1929).

'AWAKENING' FOSSILS IN CHINA



Figure 7. Fossil sites indicated in Palaeontologia Sinica (illustration prepared by the author with the help of Mr. BAI Yufang).

Jiangsu, Zhejiang, Anhui, Hubei in south China were mainly collected by Li Siguang, Xie Jiarong, Zhao Yazeng, etc. And the fossils from Gansu, Qinghai, Xinjiang in northwestern China were investigated by the Scientific Expedition to the North-Western Provinces of China. These investigations and related research "awakened" fossils from underground and largely laid the foundation for modern paleontological research in China.

6. CONCLUSION

Although fossils had long been recorded in ancient Chinese literature, the scientific study of fossils began in the second half of the 19th century, mainly by western scholars who conducted geological surveys in China. Autonomous fossil collecting by the Chinese began with Ding Wenjiang, who returned from his studies in Britain in 1911. As the first director of the Geological Survey of China, he conducted long-term and systematic geological surveys in Yunnan, Guizhou, Guangxi and other regions, and collected a large number of fossils. This led him to found a paleontological journal to publish the results of studies of these fossils. *Palaeontologia Sinica* was thus created in 1922.

The success of *Palaeontologia Sinica* was also due to the strong support of Johan G. Andersson and the academic guidance of Amadeus Grabau. Andersson led his Swedish colleagues and assistants to collect a wide range of fossils in China, and also actively sought financial funding from his Swedish friends and the Swedish government to support fossil collecting in China and the publication of the journal, reflecting the friendly cooperation between China and Sweden in the first half of the 20th century.⁸ Grabau, who was invited to China in 1920, made irreplaceable

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Another example of friendly cooperation between China and Sweden was the Scientific Expedition to the

contributions to paleontological research and student training in China, which in large measure ensured the high academic standards of the *Palaeontologia Sinica*.

Despite social turmoil and upheaval, a total of 126 monographs were published in *Palaeontologia Sinica* from 1922 to 1949. The authors were from China, Sweden, America, Germany, Britain, France, Canada and Austria. It can be regarded as a successful model of international academic cooperation. *Palaeontologia Sinica* won wide attention from international scholars for its high academic standards and it became the most influential academic journal in China in the first half of the 20th century. The in–depth investigations in China by the Chinese and foreign scholars brought to light various fossils lying dormant in the land of China, and the continuous publication of *Palaeontologia Sinica* brilliantly presented the colorful stories of China's geological history.

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to Dr. Kathleen HISTON and Dr. YAMADA Toshihiro for inviting me to write this paper for the special issue and for their valuable comments on writing this paper. Heartfelt thanks also go to Prof. ZHANG Jiuchen and Dr. MA Xi for insightful suggestions on an early version of this paper, and to Prof. John DIEMER for stimulating feedback and discussions. I am grateful to Mr. BAI Yufang and Mr. HU Yangdong for providing me with research materials.

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