Book Review

A complete chronicle of Chia Yung Hsieh (C. Y. Hsieh) and his life and works

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Abstract

In the process of pioneering and developing China's geological career, Mr. Hsieh created numerous firsts in Chinese geological sciences. Some of them were even the first in the world. Hsieh has been a unique all-round geologist in the Chinese geological community. His research fields include general geology, regional geology, stratigraphy, structural geology, geotectonics, mineralogy, petrology, paleontology, meteorite science, hydrogeology and engineering geology, seismology, lithofacies and paleogeography, physiography and geomorphology, pedology, coal petrology, coal geology, petroleum geology, mineralogy, mineral deposits, economic geology, core drilling, geophysics, geochemistry, prospecting and exploration geology, and geological technology management, etc. Hsieh has conducted in-depth research or application in all the above disciplines and has achieved remarkable and great achievements. In many aspects, he has occupied a pioneering position in China geological community. He is a well-deserved pioneer and founder of modern Chinese earth sciences. In terms of geological education in China, Hsieh's students are spread across different regions of China. In 1913, Hsieh entered the Institute of Geology，Ministry of Industry and Commerce, to study geology. Hsieh was recommended to study in the Department of Geology at Stanford University in 1917. In 1919, he transferred to the Department of Geology at the University of Wisconsin and received a Master of Science degree in 1920. All of these are documented in detail in the book titled *A Complete Chronicle of C. Y. Hsieh*, which was completed by researcher Lisheng Zhang after eight years of hard work and countless efforts. The book consists of two volumes, large 16 mo format, with rich illustrations and text, totaling 1,203 pages and 1,444,000 Chinese characters. The book was published by the Shanghai Jiao Tong University Press in December 2022.

Key words: Chia Yung Hsieh (C. Y. Hsieh); a complete chronicle; a pioneering geologist in China; a unique all-round geologist; suicide

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1 Introduction

In the early days of modern sciences in China, especially geological sciences, Mr. Chia Yung Hsieh (C. Y. Hsieh) was an extraordinary figure that could not be ignored, even though his life ended in an incredible tragedy. It is said to be a tragedy because the mental and physical suffering he suffered in his later years and the abnormal way his brilliant life ended were seriously disproportionate to his great contributions to China's geological sciences and mineral development, and even completely put the cart before the horse. I am not saying this without basis. Just look at his unparalleled and great contributions to the establishment and development of China's geological sciences and related disciplines, various geological explorations, mining developments and economic development, and then compare it with his untimely death, and you will understand the sadness and even tragedy of it.

In the process of pioneering and developing China's geological career, Mr. Hsieh created numerous firsts in Chinese geological sciences. Some of them were even the first in the world. However, due to the completely unreasonable extreme political environment at that time, that is, the extreme left social atmosphere of politics in command and politics first, even a great scientist like Mr. Hsieh, who made unprecedented and great contributions to modern Chinese science and technology and was known as a versatile geologist, was banished to the cold palace for a long time after 1950, and finally committed suicide after being criticized and humiliated. What's more, his great oil prospecting achievements during his lifetime were plundered by the political celebrities and his former colleagues at that time, and so on. All of these are documented in detail in the book A Complete Chronicle of C. Y. Hsieh, which was completed by researcher Lisheng Zhang after eight years of hard work and countless efforts. In a sense, rather than saying that this book is a chronology of Mr. Hsieh, it is better to say that it is a detailed reflection and empirical evidence of modern Chinese geological career and social conditions.

The book consists of two volumes, large 16mo format, with rich illustrations and text, totaling 1,203 pages and 1,444,000 Chinese characters. The book was published by Shanghai Jiao Tong University Press in December 2022 (Figure 1, hereafter referred to as the Chronicle).

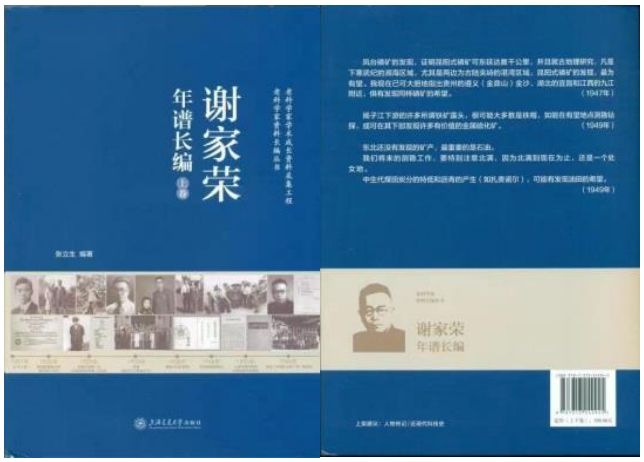

Figure 1. The book *Complete Chronicle of Chia Yung Hsieh*

2 Created many firsts in China's geological science community

According to the meticulous research of *the Chronicle*, Mr. Hsieh created at least the following firsts in Chinese earth sciences during his geological career before he was forced to commit suicide, and made tremendous contributions to the establishment and development of the country's geological sciences and the exploration and development of various mineral resources:

- Hsieh was one of the first 28 Chinese geologists ever trained by the Chinese people. He graduated from the Institute of Geology, China's first real scientific institution, in 1916 (Figure 2).

Figure 2. A group photo of some students from the Institute of Geology in 1915
(Hsieh is the second from the right.)

- Hsieh was the first graduate of the Chinese Institute of Geology to be sent abroad to study, and in 1917 he went to Stanford University in the United States for further studies (Figure 3).

Figure 3. Photo taken in California, USA in December 1918 when Hsieh was studying at Stanford University

- Hsieh was one of the first few Chinese geologists to conduct field research on the Haiyuan earthquake in northwest China from April 15 to August 15, 1921 (Figure 4).

Figure 4. Mr. Wen-hao Wong (W. H. Wong) (left) and C. Y. Hsieh (right) during the investigation of the Gansu super-earthquake in 1921
(Photo taken at Sunjiagou, Hsisiang rural community, Jingning County, Gansu Province)

- Shortly thereafter, Hsieh wrote China's first earthquake geological survey report; namely, Report on the Gansu Earthquake in December 1920.
- From August 16 to November 21 of the same year, Hsieh conducted geological and petroleum geological surveys in Gansu. This was the first petroleum geological survey conducted by Chinese geologists in China. As a result, Hsieh became China's earliest petroleum geological science investigator.

- In the winter of the same year, Hsieh and his colleague Professor P. L. Yuan first proposed the establishment of the Geological Society of China to facilitate academic exchanges and exchange of geological journals with overseas geological societies.
- In May 1922, Hsieh compiled China's first petroleum geological survey report; namely, the Gansu Yumen Petroleum Report, which was published in the 54th issue of *Industrial Magazine* published in Hunan, China.
- Hsieh completed the first monograph on coal geology in China, namely *The Coal*, which was published by Shanghai Commercial Press in January 1923. It was the tenth volume of the encyclopedia series that year.
- Hsieh pioneered the scientific research of meteorites in China. On June 15, 1923, at the Sixth Plenary Session of the Geological Society of China, he read the paper On the composition and structure of the first specimen of meteoric stone received by the Geological Survey of China, which was published in the eighth issue of the eighth volume of *Science* in August of the same year. In January 1924, Hsieh further published A Brief Introduction to Meteorites in the first issue of the ninth volume of *Science*.
- In February 1924, Hsieh compiled An Overview of Northwest Mineral Resources, which discussed the petroleum, coal, gold and copper resources in Xinjiang, Gansu, Shaanxi and Inner Mongolia in northwest China. This was the first time that Chinese geologists studied and summarized the petroleum geology in China.
- In October 1924, the first Chinese textbook *Geology (Part 1)* compiled by Hsieh was published by the Commercial Press. It was the first general geology textbook compiled by a Chinese geologist.
- On April 13, 1928, Hsieh delivered a speech entitled Geology of Chung Shan and its bearing on the supply of artesien water in Nanking at the Nanjing Society of Chinese Science. This article was revised and published in the fourth issue of Volume 13 of *Science*. It was the first work of Chinese hydrological research. In June of the same year, his article Geology of Chung Shan and its bearing on the supply of artesien water in Nanking was published in the second issue of Volume 7 of *the Bulletin of the Geological Society of China*.
- In March 1929, the first petroleum geology monograph in China, *Petroleum*, compiled by Hsieh, was included in the 14th volume, No. 161, of the Encyclopedia Series edited by Yunwu Wang and published by Shanghai Commercial Press. This is the earliest petroleum geology monograph in modern China.
- In April 1929, Hsieh published A microscopical study of some coals from Szechuan, S.W. China in Volume 8, Issue 1 of *the Bulletin of the Geological Society of China*. It was later reprinted by the British magazine *Fuel*. It was the opening and foundational work for China's coal petrology research. It was one of the research results of his visiting scholar in Germany in 1928 (Figure 5). In December of the same year, Hsieh wrote Geological and microscopical study of some copper deposits of China based on another result of his research in Germany, which was published in Volume 8, Issue 4 of the *Bulletin* of *the*

Geological Society of China. It pioneered the study of mineragraphy in China. The attached microphotographs were first cited by the well-known German mineralogist and ore deposit geologist H. Schneiderhohn (1887-1962) in his *Mineragraphy Course*, and then introduced by German mineralogist and petrologist Ramdohr Paul (1890-1985) in his professional masterpiece *Mineragraphy Course*.

Figure 5. Hsieh's passport photo in August 1928 when he went to Germany as a visiting scholar

- In July 1930, the Soil Research Laboratory of the Geological Survey of China was established. In the same month, Hsieh and Longqing Chang went to southern Shaanxi and northern Hebei to conduct soil geological surveys. This was the first time that Chinese geologists conducted soil geological surveys and research.
- In October 1930, Hsieh published articles entitled Some new methods in coal petrography and A preliminary petrographical study of the Peipiao coals in Volume 9, Issue 3 of *the Bulletin of the Geological Society of China*. It was also listed as the first and second issues of *the Special Report on Fuel Research*.
- On January 10, 1931, at the 25th meeting of the Geological Survey of China, Hsieh first gave a speech on soil research, classification and investigation. In March of the same year, Hsieh's article entitled *Soil Classification and Soil Investigation* and *Report on Soil Reconnaissance in San-ho, Ping-Ku and Chi-Hsien Area, Hebei Province* co-authored by him and Long Ching Ch'ang (L. C. Ch'ang) were published in the second issue of *Soil Special Report* jointly sponsored by the Geological Survey of China and the Institute of Geology of the Peking Academy of Sciences. Among them, the article entitled Soil Classification and Soil Survey is the first soil science paper written by a Chinese geologist, and Report on Soil Reconnaissance in San-ho, Ping-Ku and Chi-Hsien Area, Hebei Province is the first soil survey report written by Chinese people.
- The exploration's drilling network was used for the first time in China to conduct exploration of the Huainan coal mines in Anhui Province.

- In February 1948, Hsieh organized and initiated geological research on uranium and thorium deposits in Guangxi, China. On May 19 of the same year, he was invited to give a speech at the School of Engineering of Wuhan University entitled How to Explore Radioactive Minerals Such as Uranium and Thorium, and mentioned in his speech that China has discovered several uranium deposits. Later in the same month, he completed the Brief Report on the Uranium showing in Huangqiangping, Zhongshan County, Guangxi, which was the 73rd in the series of *Provisional Reports of the Mineral Exploration Bureau*. In July of the same year, he published the article A Brief Introduction to Uranium deposits in the 89th issue of *Mineral Exploration Newsletter*, which outlined the main minerals of metallic uranium and how to detect and identify them. It also discussed the exploration methods of uranium deposits, the world's uranium geology and mining at that time, and the application of uranium. It is the earliest document that introduced uranium deposit knowledge in detail in China, "the starting point of China's uranium deposit geological research", thus opening the prelude to China's uranium deposit geological research, exploration and development.

It is worth mentioning that Hsieh was also the first Chinese geologist to advocate the use of geological theory to prospect for minerals. He actively promoted the application of metallogenic theory, advocated the use of geological theory for mineralization prediction, and used comprehensive methods and multiple means for geological exploration and mineral survey. It must be said that Hsieh had profound theoretical knowledge and rich field practice experience in almost all minerals and mineral species, and personally discovered or guided the discovery of many mineral deposits in China.

Figure 6. In July 1932, Hsieh was in the Northern Shaanxi Oil Exploration Brigade
(Hsieh is the first from the left)

3 Fruitful mineral prospecting results and excellent management capabilities

So far, Mr. Hsieh has been a unique all-round geologist in the Chinese geological community. His research fields include general geology, regional geology, stratigraphy, structural geology, geotectonics, mineralogy, petrology, paleontology, meteorite science, hydrogeology and

engineering geology, seismology, lithofacies and paleogeography, physiography and geomorphology, pedology, coal petrology, coal geology, petroleum geology, mineralogy, mineral deposits, economic geology, core drilling, geophysics, geochemistry, prospecting and exploration geology, and geological technology management, etc. Hsieh has conducted in-depth research or application in all the above disciplines and has achieved remarkable and great achievements. In many aspects, he has occupied a pioneering position in China geological community. He is a well-deserved pioneer and founder of modern Chinese earth sciences.

During his lifetime, Hsieh personally explored, studied and guided the exploration and research of a wide range of mineral resources, such as fuel, ferrous metals, non-ferrous metals, rare metals, rare earth metals, precious metals, important non-metallic minerals and water resources, etc. Specifically, he involved coal, oil, natural gas, iron, manganese, aluminum, copper, lead, zinc, tungsten, tin, antimony, gold, mercury, silver, rare earth metals, cement raw materials, refractory clay, clay, graphite, bentonite, vermiculite, groundwater and other mineral deposits of different genetic types, such as sedimentation, contact metamorphism, regional metamorphism, magma differentiation, magmatic hydrothermal, hot water, weathering and leaching, and residual slope accumulation.

Figure 7. A group photo of some colleagues from the Mineral Exploration Bureau in front of the Li Family Ancestral Hall in Zhaotong, Yunnan on November 5, 1941
(At that time, Hsieh, who is in the middle of the first row, had just returned from Xiangyun in western Yunnan after completing a geological survey)

In addition to personally conducting or directing geological research, Hsieh also has outstanding organizational and management skills and the wisdom to operate a mining company.

In order to raise foreign exchange to meet the country's needs for anti-Japanese war and to support the war with practical actions, on May 11, 1939 during World War II, Hsieh left his comfortable teaching and geological survey positions and founded the Jianghua Mining Bureau

in the wild land of Hunan Province, the rear area of the Anti-Japanese War, and served as the general manager. During this period, he established the only mining site in Hunan at that time that used machines to mine placer tin deposits, which strongly supported China's great anti-Japanese war.

On May 15, 1940, after the Jianghua Mining Bureau entered normal production, Hsieh went to Yunnan to prepare for the establishment of the Mineral Prospecting Engineering Office along the Xufu (Yibin)-Kunming Railway (Xu-Kun Railway) and served as the Engineer in Chief of the office. On October 11 of the same year, the Southwest Mineral Exploration Bureau (SMEB) was established, and Hsieh served as the director. At this time, since most of northern, eastern and even central China had fallen into the hands of the Japanese army, the southwest became China's rear area. During this period, Hsieh led the SMEB with only a few dozen people, in the harsh environment of remote and poor villages with high mountains and dense forests, bandits and occasional bombings by Japanese fighter planes, in many areas including today's Yunnan, Sichuan, Guizhou, Chongqing, Hunan and Guangxi Provinces, and investigated the coal, iron, copper, lead, silver and tin deposits and other mineral resources and related geological and geographical settings in this area, and also investigated and discovered bauxite and rich aluminum deposits in Guizhou and Yunnan Provinces. At the same time, he also wrote and published many investigation reports and research articles on the geology and mineral deposits of the area in his busy schedule. On October 1, 1942, the SMEB was renamed the Mineral Exploration Bureau (MEB).

As a result, Hsieh became a pioneer in China's geological and mineral exploration and one of the earliest geological technology managers.

On April 25, 1946, after the victory of the Chinese War of Resistance Against Japanese Aggression, Hsieh assigned C. C. Chang and Shuo-Hai Huo to conduct geological surveys of uranium mineralization at Huangqiangping in Zhongshan，Guangxi using trenching exploration. On October 6 of the same year, the new coalfield of Bagongshan in Huainan, Anhui was discovered through drilling. The borehole was located by Hsieh in September of that year. Later, the new coalfield in Huainan became one of the eight major coal bases in China and the most important coalfield in East China. On October 28 of the same year, Hsieh announced at the second paper symposium of the 22nd Annual Meeting of the Geological Society of China held in Nanjing that the Geiger-Muller Counter made by Zonghuang Zhang, director of the Geophysics Prospecting Section, MEB, had been initially successfully developed. On November 22 of the same year, Hsieh sent Zonghuang Zhang to Nanjing with the Geiger Muller Counter made by Zhang to test uranium ores mined from Nanling in South China and Northeast China. On the morning of December 1 of the same year, Hsieh presided over the first popular science lecture held by the MEB in the auditorium of the Science Museum of the China Central University in Nanjing. The title of the lecture was The Method of Identifying Radioactive Minerals Using the Geiger-Muller Counter, and he introduced the Geiger-Muller Counter made by Zonghuang

Zhang. On December 25 of the same year, Hsieh delivered a speech entitled How to Discover New Coal Fields and further emphasized the use of geological theory to guide mineral prospecting: “As long as we can conduct planned drilling according to geological principles, the key to this natural treasure house will eventually be obtained by us. The days of finding minerals by tracing old mining relics are over.” On May 16 of the following year, Hsieh published an article titled Discovery of the New Coalfield in Huainan in Shanghai's *Ta Kung Pao*, saying: "The discovery of the new coalfield in Huainan was based on many theoretical deductions and inferences in paleogeography, stratigraphy, and structural geology; in other words, it was the result of pure geological theory coupled with drilling."

Figure 8. Group photo of the 12th anniversary of the founding of the Academia Sinica of the Republic of China and the first academician conference in April 1948
(The 2nd from the left in the 4th row is Hsieh)

On February 17, 1947, Hsieh predicted that there would be phosphate mineralization in Chuxian and Bengbu, Anhui, and sent K. W. Sha, T. M. Han and others to investigate. As expected, a phosphate layer extending for thousands of meters was found in the Wutai system. In February of the same year, Hsieh published an article entitled New Trends in China's Economic Geology in the 1st and 2nd issues of *Geological Review*, which summarized the development of China's economic geology for the first time and divided it into three periods: the initial survey period, the period of theoretical research, and the period of new trends. In late March of the same year, the Fengtai phosphate deposit in Anhui was discovered. In the same month of the same year, Bentan Wang and Cunli Gao were sent to the Xisha Islands to investigate phosphate deposits with the investigation team organized by the Navy Department, and Hsieh himself went to the Xisha Islands for a field investigation on the 12th of the same month. Also in March of the same year, Hsieh published an article titled Chatting about Crystal Deposits in the *Mineral Exploration*

Newsletter and pointed out that crystal was "listed as one of the war minerals during World War II, and the warring countries searched for it everywhere. Our country also sent geologists to search for it, but except for a small amount of production in Tianyang, Guangxi, no large deposit has been found. In the future, there may be a possibility of discovering huge amounts of crystals in Donghai county, northern Jiangsu, and/or various parts of Shandong". A few years later, Donghai, Jiangsu became China's most famous crystal producing area and crystal city, completely fulfilling Hsieh's prediction. On April 7, Hsieh speculated that there was potential for phosphate mineralization in the Jiangsu and Anhui Provinces, so he sent Nanting Dong and T. M. Han to Luhe in northern Jiangsu for an on-site investigation. As expected, they discovered the Tertiary phosphorus-containing layer near Beibanqiao. On the 20th of the same month, Hsieh and others discovered a Tertiary phosphorus-bearing layer in the Fangshan area of Luhe, Jiangsu Province. In May of the same year, Hsieh published an article titled Gibbsite bauxite deposit discovered by the MEB in the 75th issue of *Mineral Exploration Newsletter*, announcing the discovery of Gibbsite bauxite deposit in Zhangpu, Fujian Province. In early July, Hsieh discovered multiple layers of siderite and bauxite shale while observing the drill core of the Huainan New Coalfield on site. In November of the same year, Hsieh completed the article titled *Some promising regions for searching uranium and thorium deposits in China*, which identified seven prospecting regions for uranium-thorium deposits in China. A world-class uranium deposit discovered in China later is located in the first uranium prospecting region identified by Hsieh, namely the Pegmatite veins in the Precambrian basement. As of 2011, 74% of the proven uranium reserves in China came from the second prospecting region identified by Hsieh. On December 6 of the same year, Hsieh attended the first petroleum geology symposium in Chinese history, namely the Sichuan Petroleum Geology Symposium held by the MEB, and expressed seven opinions on Sichuan petroleum geology.

In April 1948, Hsieh sent personnel to investigate the uranium-thorium deposits in Guangxi. In March, he personally went to Guangxi to investigate the Huangqiangping uranium mineral showing and believed that it was worth drilling in the future. In September of the same year, he discovered the Qixiashan lead deposit in the suburbs of Nanjing. In October of the same year, Hsieh read out the article entitled On oil exploration in the Region South of the Yangtze River, criticizing the argument of "China has no oil", and for the first time clearly criticized the "theory that oil is only in the Northwest China", clearly pointing out that China must have oil, and it is not necessarily limited to the northwest. He first pointed out that Heilongjiang Province in the northeast China has oil. In December of this year, China's cultural giant and scholar Hu Shih mobilized Hsieh to go to south to Taiwan, but Hsieh declined. In the same year, Hsieh organized seven drilling teams to operate 16 drilling rigs in seven mining areas in five provinces, including Anhui, Hunan, Guangxi, Hubei and Taiwan, to explore for various minerals and discovered the Qixia lead deposit and the Xiashu molybdenum deposit.

In June 1949, Hsieh formulated the 1950 China Uranium Exploration Plan, planning to send 15 people to the uranium mineralization prospecting areas he had identified, such as Heilongjiang,

East Liaoning, Taiwan and Guangxi, to conduct uranium-thorium ore exploration, detailed investigation or drilling.

After 1949, Hsieh discovered the Qixiashan lead-zinc-silver-manganese deposit in the suburbs of Nanjing, and guided the discovery of the Baiyinchang copper-lead-zinc polymetallic deposit in Gansu.

In 1954, Hsieh wrote the article titled Notes on uranium-thorium ore prospecting to provide further specific guidance for China's uranium prospecting work. There is no doubt that Hsieh is the pioneer and founder of China's uranium-thorium geology and exploration.

In 1954， Hsieh as a member of the standing committee and the engineer in chief of the Reconnaissance Committee of the Ministry of Geology published a paper titled *China's oil-producing areas and potential oil-bearing areas* which divided China’s oil-producing areas and potential oil-bearing areas into 3 categories including 20 oil-gas areas. This paper played a role of programmatic literature of petroleum and natural gas reconnaissance in China in the 1950s, he defined the target areas for oil exploration, enabling China to achieve a major breakthrough in oil exploration and discover world-class oil fields such as Daqing and Shengli, completely removing the label or fallacy of "oil-poor" in China.

In short, as he himself very objectively evaluated, Hsieh is an all-round geologist who has received rigorous geological training.

Figure 9. Hsieh and his wife took a group photo in November 1947 when they attended the 23rd Annual Meeting of the Geological Society of China in Taiwan, China
(Hsieh delivered a speech at the conference titled Palaeogeography as a guide to mineral exploration)

4 Teaching and educating people, with students all over the world

In terms of geological education in China, Hsieh's students are spread across different regions of China. Before 1949, he served as a professor of geology and dean of geology departments at

several top universities in China. During the period of 1924-1927, he served as a professor of geology at Peking University. In July 1927, he was sent to Sun Yat-sen University in Guangzhou to participate in the establishment of the Guangdong-Guangxi Geological Survey and carried out the first field geological survey in Guangdong Province.

Figure 10. Department of Geology, Peking University, bids farewell to the graduating class of 1937
(The person in the front row wearing a black veil is Hsieh, whose mother had just passed away)

In February 1928, Hsieh left Guangzhou and arrived in Nanjing, the capital of China at that time, to teach at the Department of Geology of the then China Central University. During this period, he investigated the geology of the Zhongshan Mountain in Nanjing and its relationship with the water supply of Nanjing city, pioneering the study of the geology of urban water supply in China.

In May 1930, Hsieh returned to China after having worked in coal petrology and mineragraphy for nearly two years in Germany and France. Together with his mentor Wong, Hsieh founded China's first soil research laboratory, carried out China's first soil survey, and published the first systematic soil research paper. In October of the same year, the Qinyuan Fuel Research Laboratory of the Geological Survey was established, with Hsieh as the director. Hsieh first introduced polarizing microscopes into coal petrology research, and published papers such as *Microscopic research on domestic coal* and *Some new methods of coal petrography*, which attracted the attention of the international geological community. Early coal petrology researchers from France, the United States, the United Kingdom, Germany and other countries wrote to request relevant papers, thus establishing Hsieh's status as one of the world's coal petrology pioneers and the founder of China's coal petrology.

In 1936, Hsieh published *On the Late Mesozoic-Early Tertiary Orogenesis and Vulkanism, and Their Relation to the Formation of Metallic Deposits in China*, based on Wong's previous *Theory*

of Mineral Regions of China and *The Age of Mineral Deposits in China*, advanced Chinese metallogeny by a great step forward.

Shortly after 1949, Hsieh founded the Nanjing Geological and Mineral Exploration School and served as the director and professor of the school affairs committee. In a short period of time, the school trained 110 geological personnel of various types that were urgently needed at the time, equivalent to more than one-third of all geological personnel in China at the time. It provided a vital force for China's mining development.

After 1949, nearly half of the backbones in charge of geological technology in the geological departments of provinces and regions across China, including geologist-in-chief, were Hsieh's students. In addition, the backbones of geological technology in the Ministries of Petroleum, Metallurgy, Coal and Nuclear Industry of China were also his students. At the same time, Hsieh served as the deputy director of the China Geological Work Planning Steering Committee of the People's Republic of China and the director of the Planning Department. He actively participated in the geological work plan after the founding of the People's Republic of China, especially the deployment of exploration in key mining areas. He mobilized Y. C. Cheng, K. Y. Yen, Y. L. Wang, C. H. Lu, W. K. Kuo, S. H. Sung, C. Wang and C. Y. Lee, who served as the geologists-in-chief of the most important mines in China at that time, namely Hubei Daye Iron Mine, Inner Mongolia Bayan Obo Iron Mine, Hebei Pangjiabu Iron Mine, Guizhou Guanyinshan Iron Mine, Gansu Baiyinchang Copper Mine, Shanxi Zhongtiaoshan Copper Mine and Shaanxi Weibei Coal Mine, which played a decisive role in China's successful completion of the mineral exploration tasks of the first and second "Five-Year Plans" that year. Later, most of these geologists-in-chief became academicians of the Chinese Academy of Sciences and the backbones of geological technology in China.

Figure 11. In 1950, Hsieh and his wife Jingnong Wu took a group photo with their eldest son Xuejing Xie and his wife, their third son Xuefang Xie, and their youngest son Xuezheng Xie

5 What his teachers, colleagues and students say about Hsieh?

In 1924, Mr. V. K. Ting, the founder of Chinese geology and Hsieh's mentor, wrote in the preface to the textbook *Geology (Part 1)* compiled by Hsieh: "Mr. Hsieh is the most hardworking young man in the Chinese geological community. He has never taught so far, but since 1916, except for the three years he studied in the United States, he has spent four months every year studying geology in the field." Ting also said that Hsieh "is fond of reading and writing, so this textbook he wrote... is well-organized and well-ordered. The examples he cited are all Chinese facts, such as the causes of earthquakes, the distribution of minerals, and the changes in rivers. They all incorporate recent research to arouse readers' interest. It can only be regarded as a pioneering work among textbooks..."

In 1934, when Wong, then director of the Geological Survey of China, was in danger of death after a car accident, Ting wrote worriedly: "If Wong does not survive... we should not send anyone to be the director of the Geological Survey. I personally believe that Mr. Hsieh (now a professor of geology at Peking University) is the most qualified and can serve as acting director of the Geological Survey if necessary."

In 1947, Hsieh's student C. Y. Li wrote in his article entitled Mr. Hsieh and China's mineral exploration: "The promotion of national mineral exploration began with the establishment of the Mineral Exploration Bureau. Up to now, this is still the only institution, whether public or private. And this institution has been presided over by Mr. Hsieh since its establishment, which is really a cause for celebration... Mr. Hsieh is so hard working that he really can't put down his books." When talking about the position of director of the MEB, Li said that most geologists then are pedantic nerds and are not qualified for this scientific and technological management position. "We are close to being pedantic because we cannot put aside books. It is actually difficult to find such workers, and it is even more difficult to find a director of such an organization." He went on to write: "Mr. Hsieh is undoubtedly a very suitable candidate. Mr. Hsieh has made great achievements in academics. He has hosted lectures at several national universities, served in the Geological Survey of China, traveled to many places, visited many mines, and was responsible for running mines himself. He was in charge of the MEB from the Mineral Prospecting Engineering Office along the Xu-Kun Railway. He is experienced. The mineral exploration business is gradually valued in China today, and Mr. Hsieh's contribution cannot be erased".

In the same month of the same year, Y. T. Nan wrote an article summarizing Mr. Hsieh: "The sun is shining brightly in the sky, and he has been drinking for fifty years. He has accumulated billions of pearls and has educated thousands of students. He is a man of extraordinary talent and swiftness, and he is a man of great skill when slaying a dragon. How can one look up to the mountains? He is a wise man in the world. The fortunes and the winds and clouds are together, and the good luck has come over the years. He is the key figure to success, and he has a keen eye for excellence. He has developed aluminum, copper, and tin in Yunnan and Guangxi Provinces;

and phosphorus, iron, and coal in Jiangsu and Anhui Provinces. The career will last for generations, so I'll toast to your happiness with two or three glasses. Nan went on to explain this congratulatory message, which has a strong Chinese ancient style and is therefore difficult to translate into other languages: Mr. Hsieh "once encouraged me with the words 'one should not live in vain', which shows that he is a man who is willing to work hard. With his persistence in his post and hard work for more than 30 years, his so-called genius has been brilliantly exerted. His great achievements and numerous publications really make people sigh that no one can catch up with him. For all mineral issues such as coal, iron, tin, copper, aluminum, oil, gas, salt and phosphorus, he has written extensive, rigorous and insightful articles, which have benefited people a lot... In less than two years after we returned to the capital Nanjing after the victory of the Anti-Japanese War, based on the relationship between Chinese paleogeography and mineral deposits, Hsieh discovered the Huainan coalfield, the phosphate deposits in northern Anhui, and the gibbsite deposit in southern Fujian. This can only be said to be the reward and achievement he has achieved for his persistence in his post over the years." "When Mr. Hsieh was the director of the Rock and Mineral Research Laboratory at the Peking Geological Survey, the academic research atmosphere in the institute was the strongest."

At the same time, Hsieh's student C.C. Chang concluded in the article titled Teacher Hsieh's Contribution and Success in Applied Geology: "The development of China's geology has only been in the past thirty years. During this period, although three or four hundred people have studied geology, there are still not many who actually work in this field. As for the current geological institutions and mines in various places, the number of people doing field work and concentrating on research is less than one-third of the total. Most people are forced by life or limited by physical strength, and some are unwilling to endure hardship, so they abandon their own geology major and do work that is not what they learned. Among these more than one hundred actual workers, those who specialize in applied geology are probably less than one-third. Given China's vast territory, abundant mineral resources, and the number of places that urgently need to be surveyed and developed, these dozens of applied geologists are really too few. After the long Sino-Japanese War and the continued turmoil in China after the victory... People who work in geology have a sense of 'no tomorrow'. Therefore, many geologists have abandoned their jobs and changed their careers. It is rare to be able to make geological work a lifelong career. The person who has been engaged in applied geological research for 30 years is Mr. Hsieh, who led us in mineral exploration. I remember that fourteen years ago, when Mr. Hsieh was a lecturer hired by the Chinese Culture Foundation at the Department of Geology of Peking University, he worked in the Geological Survey of China except for teaching... Mr. Hsieh has always worked hard for the geology institute, but he does not receive subsidies or allowances from the survey institute, and he often voluntarily leads a team to go out for investigation every spring and autumn. This is worthy of our admiration. Mr. Hsieh has served as a geological instructor in Peking University, Tsinghua University, Peking Normal University, and Sun Yat-sen University, and has produced many disciples who continue to work hard for applied geology.

Most of them can now conduct independent research, and some can even train younger generations to do field work. This is Hsieh's harvest in geological education over the years, which is also his indirect contribution to applied geology. "

B. C. Yang described Hsieh's spare time in the article entitled Miscellaneous memories of teacher Hsieh's work and life in the past seven years published in the same period: "Except for working eight hours per day in the office, the teacher mostly reads books in the evening. In addition to smoking and drinking tea, he occasionally takes his family to see one or two movies, and never attends dances. Teacher Hsieh's writing skills are rare. His speed, detailed insights, and expertise are especially outstanding. In addition to English, French, and German, he also learned Russian from our colleague Da-Nien Yeh in 1943. When our office was in Chongqing in 1944 and 1945, Teacher Hsieh attended the Russian class of National Central University until he reached the level of listening and reading ability. This kind of hard work and perseverance is truly admirable and worth emulating."

Hu Shih commented on the graduates of the Institute of Geology in 1956: "This Institute of Geology was founded in the third year of the Republic of China and ended in the fifth year of the Republic of China. The Graduates were responsible for survey work in various places at the Geological Survey. The best students were gradually selected to study abroad. Many leading talents in the Chinese geological community, such as Chia Yung Hsieh, C. C. Wang, L. F. Yih, C. Li, H. C. T'an, T. O. Chu, and H. T. Lee, all graduated from the Institute of Geology."

In 1989, H. Chu, academician of the Chinese Academy of Sciences, commented: "Mr. Hsieh is such a geologist: he never despises intuitive empirical evidence, but pays more attention to speculative rationality. He is good at microscopic examination, but never ignores the macroscopic whole. He constantly pursues the dynamic research of the system from discrete static analysis. He is good at seeing the big picture from the small details, and never misses any new ideas. At the same time, he firmly and persistently stares at the future and thinks about the long term. He has devoted his life to the development of China's mineral resources, and has always been fighting at the forefront of geological science thought."

On the centenary of Hsieh's birth in 1997, Chingchang Biq, who later became the director of the Geological Survey of Taiwan, commented on Hsieh: "China has had geology for about 90 years. In the first 40 to 50 years, Hsieh was the first true scholar who made direct, concrete, and multi-faceted contributions to Chinese geological studies."

In 1998, Y. C. Cheng, one of Hsieh's students，an academician of the Chinese Academy of Sciences, wrote: "Teacher Hsieh is a master of geology, a good teacher and mentor to me, and the enlightenment mentor of my 60-year geological career! His academic achievements, scientific and technological achievements, his contributions to the motherland and even the entire geological science and technology, and his great achievements in the establishment of my country's geological cause will be recorded in history forever! His hard-working spirit for the

cause of science and technology will always be a role model for future generations to learn from!"

The late academician of the Chinese Academy of Sciences and well-known geologist Shu Sun once sincerely pointed out: "The Chinese geological community owes Mr. Hsieh justice and has not given him enough recognition."

The author of this book, Prof. Lisheng Zhang, praised Mr. Hsieh as: a well-known economic geologist and mineralogist at home and abroad, the main founder of China's mineral geology, the founder of China's mineragraphy, the pioneer and one of the founders of China's coalfield geology, one of the pioneers of world coal petrology and the founder of China's coal petrology, a pioneer of China's petrology, an advocate of the theory of terrestrial oil generation, the pioneer and one of the founders of China's soil science, a pioneer in China's modern meteorite research, one of the pioneers of China's hydrogeology and engineering geology and China's geomorphology and physiography, a pioneer and founder of China's mineral exploration, a pioneer of economic geology in China, a pioneer and advocate of China's geological drilling business, the main instructor of China's petroleum survey in the 1950s, a great contributor to the discovery of China's Daqing oil fields and other oil discoveries and the geologist and economic geologist who has discovered the most mineral deposits in China to date.

In January 2024, Guangbo Song, an expert on the history of Chinese geological sciences, commented on Mr. Hsieh after reading this book: "In many academic fields, he is either a pioneer or a leader, which is unique in the Chinese geological community. Hsieh is also an outstanding geological educator and scientific organizer. His talent in scientific organization is no less than that of his teachers V. K. Ting and W. H. Wong. He is also a pioneering figure who can create institutions and academics out of nothing. By the 1930s, he had become a leader in his own right. He served as the director of the Department of Geology of Peking University, Tsinghua University, and Peking Normal University, the acting director of the Geological Survey of China, and the director of the Peking Branch of the Geological Survey of China." "C. Y. Hsieh has made great contributions to China's geological cause, has a very high status, and has a far-reaching and profound influence. However, for a long time, he has not received enough attention and evaluation. For decades, he has not been ‘fully affirmed’ and owed ‘justice’. T. K. Huang solemnly left a message before his death: Hsieh's rehabilitation is not thorough, and his contributions are not evaluated enough. I hope the leaders will study and solve it." "In the over 110-year history of Chinese geology, the top six figures should be Ting, Wong, Hsieh, J. S. Lee, followed by C. C. Young and T. K. Huang. "During the five years of the Anti-Japanese War, the area surveyed by the MEB led by Hsieh covered the provinces of Guizhou, Yunnan, Sichuan, Xikang, Hunan, and Guangxi. The mineral geological outline map of the southwestern provinces surveyed covers an area of nearly 100,000 square kilometers. The exploration targets include coal, iron, copper, silver, lead, zinc, mercury, gold, tungsten, tin, arsenic, antimony, nickel, aluminum, petroleum, salt, porcelain clay, apatite, sulfur, saltpeter, asbestos, mica, and

corundum. Some of these works were original discoveries made by Hsieh, while others were completed under Hsieh's leadership. At the same time, he accumulated successful work experience: professional organization, work planning, strict management, set time limits, expand the scale, raise funds generously, and reward discoveries as an incentive. In short, Hsieh's contribution to wartime mineral exploration is difficult for any other geoscientist to achieve, and he is the well-deserved first person in China's mineral exploration." "Hsieh led the mineral exploration business in the situation of ‘desperate and hard work’ during the War of Resistance Against Japan, serving the country with science. After the victory of the War, Hsieh was saddened by the interference that the war brought to the geological cause, and eagerly hoped that the turmoil would end as soon as possible, ‘so that we can start development to build a new, complete, prosperous and great country.’ When the war was about to come to an end in early 1949, he accepted the advice of the underground party of the Communist Party of China, gave up the plan to go abroad to attend academic conferences, stayed in Nanjing to protect the MEB, and looked forward to the victory of the Communist Party. In May, the MEB was handed over to the Military Control Commission in an intact and orderly manner. He was invited to lead a team to Shanghai to help take over the Shanghai Pseudo-Capital Committee. He also said: ‘Future geological work should be coordinated with the people's demands and the government's national policies. We should concentrate our efforts and seek truth from facts to move forward on the road of production and construction’. This is to welcome the new regime that is about to be established with full enthusiasm, and to expect the geological cause to have a great development in the new era. As for the examples that others could not come up with based on his foresight and experience and were proven correct by facts, there are countless of them, such as the discovery of the Yaerxia Oilfield in the 1950s. His contribution to the oil survey, especially the discovery of the Daqing Oilfield, is irreplaceable by anyone. Hsieh is a representative of all patriotic scientists. Long-term unfair treatment made Hsieh depressed and humiliated, until he committed suicide, and even could not get a fair evaluation after his death. But for the country, isn't it a great loss?"

Figure 12. In June 1955, Hsieh took a group photo with some members of the Xinjiang Petroleum Survey Brigade of the Ministry of Geology during his petroleum geological survey there
(The person in the middle facing the camera is Hsieh)

6 Study and research experience

On August 19, 1897, C. Y. Hsieh was born in Shanghai, a city of ever-changing dynasties. He was the first generation of geologists and scientists trained in China. In 1948, he was elected as an academician of the Academia Sinica of the Republic of China, and in 1955, he was appointed as a member of the Chinese Academy of Sciences of the People's Republic of China.

In 1913, Hsieh entered the Institute of Geology，Ministry of Industry and Commerce, which was founded by H. T. Chang and V. K. Ting, the founders of China's geological cause and geological science, to study geology. After graduating in 1916, he became an investigator of the Geological Survey of the Ministry of Agriculture and Commerce, one of the "Eighteen Arhats" in the Chinese geological community.

Due to his outstanding achievements, Hsieh was recommended by the Geological Survey of China to study in the Department of Geology at Stanford University in the United States in 1917. In 1919, he transferred to the Department of Geology at the University of Wisconsin and received a Master of Science degree from the university in 1920. On the eve of returning to China, he published a series of papers "The Outline of Mineral Deposits" in the magazine *Science*, which systematically expounded the theory and practice of mineral deposits for the first time in China, and pioneered the study of mineral deposits in China.

After returning to China in the spring of 1921, Hsieh rejoined the Geological Survey of China and immediately conducted the first real earthquake science survey in modern China, namely the "Gansu Earthquake Survey" with W. H. Wong and others. Then he immediately carried out the first real scientific petroleum geological survey nearby, and wrote the first earthquake geological survey report and the first petroleum geological survey report in China. In the winter of the same year, Hsieh and Professor P. L. Yuan proposed the establishment of the Geological Society of China. Hsieh was also ordered to draft the "Constitution of the Geological Society of China" for this purpose, and designed the emblem with his colleagues H. T. Chang, Amadeus William Grabau, and C. C. Young at the time. Hsieh also served as the first secretary of the society and the 11th and 23rd chairman of the board. At the same time, he suggested the establishment of the geological professional journal *Geological Review* and served as the editor-in-chief for many years.

In 1923, Hsieh completed the first monograph on coal geology in China, *Coal*. In the same year, he published "A Study of Chinese Meteorites" in the 8th issue of Volume 8 of *Science*, which studied the mineral composition and structure of the Daohe meteorites in Gansu, China under a microscope. This was the beginning of the study of meteorites by modern Chinese geologists. In 1924, the textbook *Geology (Part 1)* was published, which was the first general geology textbook in China. In 1925, after conducting an investigation, he and his classmate L. F. Yih studied the formation of the Three Gorges of the Yangtze River and proposed to establish three famous physiographical periods: the quasi-plane of the western Hubei period, the mature ground of the

mountain plateau period and the canyon period, which was a foundational work for Chinese geomorphology and physiography.

From August 1928 to May 1930, Hsieh went to Germany and France as a visiting scholar, engaged in coal petrology and mineragraphy research, thus pioneering the research of coal petrology and mineragraphy in China.

In 1929, Hsieh published China's first petroleum geology monograph, which theoretically expounded the theory of continental origin of petroleum for the first time, discussed the possibility of oil generation from various continental sedimentary rocks, and clearly pointed out that in the delta sedimentary area, "marine and continental strata often alternate, which is most suitable for the accumulation of oil" and "the most suitable oil-producing strata are shallow sea or delta sediments."

From 1931 to 1937, Hsieh taught at the Department of Geology of Tsinghua University, Peking Normal University and Peking University, and served as a professor and the dean of the Department of Geology of each school. Many of the older generation of Chinese geologists who later became world-renowned were his students. Such as T. K. Huang, Y. C. Cheng, C. Y. Lee, H. C. Wang, T. I. Young, W. Y. Chang, C. Y. Wang, Y. H. Lu, L. T. Yeh, S. P. Tung, W. K. Kuo, C. T. Yuan, C. H. Chao, and H. J. Chu. All of these students later became academic masters in various departments and colleges in China. During this period between 1932 and 1933, as a research professor at Peking University, Hsieh went to the middle and lower reaches of the Yangtze River several times to investigate iron ore, and went to Hunan to investigate the lead-zinc mines in central Hunan. *Geology of the Iron Deposits in the Lower Yangtze Region* completed shortly thereafter divided the iron ore deposits in China into four major categories and 17 types. This book, together with *The Lead-Zinc Deposits of Central Hunan* and *The Shuikoushan Lead-Zinc Mine, Central Hunan, South China* compiled by him during this period, have become classic documents and important references for the study of related mineral deposits in China. In the autumn of 1937, due to the "July 7 Incident", Hsieh fled Peiping to the southwest anti-Japanese rear area.

During China's arduous War of Resistance against Japanese Aggression in the last century, Hsieh led the MEB and actively carried out China's mineral exploration business in the rear areas. He applied geology, geological technology and geological scientific methods to production practice, while integrating theoretical knowledge of sociology and economics, and conducting cost accounting in accordance with the laws of market economy, thus becoming a pioneer of China's mineral economics.

On December 25, 1945, Hsieh flew to Taiwan to inspect oil mines and returned to Shanghai on January 15 of the following year. On February 2, 1946, Hsieh discussed Taiwan's oil geology with American experts Ruby and Small in Shanghai. In March of the same year, Hsieh's report

No. 49, "Oil and Natural Gas in Taiwan," was completed and an abstract was published in the 61st issue of *Mineral Exploration Newsletter*.

In 1947, when Hsieh celebrated his 50th birthday, the 78th and 79th issues of *Mineral Exploration Newsletter* published a special issue to celebrate his birthday. In the "Editor's Note", it was said that Hsieh "has served the geological community for nearly 30 years, and his works are numerous and his contributions to Chinese geology are great. Several articles in this issue describe him in detail..." Among them, the article entitled Catalogue of Mr. C. Y. Hsieh's Works compiled by K. C. Tsao included a total of 178 articles (books) written by Hsieh from 1922 to July 1947.

After 1949, Hsieh summarized and published a series of research articles and monographs on coalfield geology. He made great contributions to China's coalfield geological exploration and development. He is a well-deserved pioneer of China's coalfield geology.

Since the 1940s, Hsieh had paid great attention to the investigation and research of China's petroleum geology. As early as 1948, he first pointed out that there might be oil in Heilongjiang, Northeast China. In 1949, he further pointed out that "the distribution of China's oil is by no means limited to the northwest corner", "the most important mineral that has not been discovered in the Northeast China is oil...", "From a regional perspective, our future survey work should pay special attention to North Manchuria, because North Manchuria is still a virgin land... There may be hope of discovering oil." Hsieh was the first geologist to point out China's oil search target to the Daqing area. Later, China's fruitful oil exploration results fully confirmed his prediction. In 1949, Hsieh formulated the first oil exploration plan of the People's Republic of China.

After that, as the chief engineer of the Ministry of Geology of the People's Republic of China and the member of the Standing Committee and the Engineer-in-Chief of the Reconnaissance Committee of the Ministry of Geology, Hsieh went all out to shoulder the heavy responsibility of the national oil survey. In 1954, Hsieh published "China's Oil-producing Areas and Potential Oil-bearing Areas". This article became the programmatic document for China to carry out large-scale oil surveys, laying the theoretical foundation for the strategic focus of oil exploration to shift eastward, the discovery of Daqing Oilfield, and the great oil discoveries in China that began with the discovery of Daqing Oilfield. During 1954 and 1957, Hsieh and his student T. K. Huang co-authored the *Oil Survey Instructions*.

After that, due to political reasons, Hsieh's position and status gradually declined. In addition, due to his advanced age, he focused his main energy on summarizing the mineralization laws of ore deposits and prospecting predictions, and published many related research articles and monographs. Before he was forced to commit suicide, he devoted himself to summarizing *Mineral Deposits in China*. However, he only completed the writing of the *Part Ⅰ. General* of *Mineral Deposits in China* and left the world forever with hatred.

Hsieh, who had been dealing with cold stones and wild mountains all his life, was a warm-hearted and sentimental person despite his outstanding achievements and great reputation. In June 1948, when he revisited the old place Babu in March of that year to inspect Guangxi Babu tin mine, he wrote with a lot of thoughts and sadness: "When I took a car through Baisha to the company, I saw the road of the Jianghua Mining Bureau that I supervised in the past. It is said that the culvert has been destroyed and cannot be used for traffic. I can't help but think of Shuxin Chen who died tragically in a car accident that year and Mr. Xiaopeng Yu who died in southern Jiangxi. Both Mr. Yu and Mr. Chen were geological engineers of the Jianghua Mining Bureau, and they had made many achievements in business planning. Now, the Jianghua Mining Bureau has become a relic, and the two gentlemen are also buried, and it is unbearable to look back. The vicissitudes of life are extremely sad. I respectfully write this article to commemorate them." Ten years ago, when Hsieh founded and served as the general manager of the Jianghua Mining Bureau, this was a place he often visited.

In essence, Hsieh was a pure intellectual, without any concept of politics or party in his mind. In early 1946, after the victory of the Anti-Japanese War, the Nationalist government moved back to Nanjing from Chongqing, the southwest rear area. In the office of the MEB led by him, the KMT flag was not hung, no commemoration week was held, and there was no KMT party group organization. Once, Hsieh's junior H. Chu asked Mr. Hsieh: The MEB is a subordinate agency of the KMT government's Resources Committee, but there has been no KMT organization and activities. How did you withstand it? Hsieh calmly replied: "I have always advocated concentrating on mineral exploration and research, not politics." His concept is similar to that of China's great intellectuals Hu Shih and Yinko Tschen (Yinkoh Chen) at that time. Unfortunately, except for Hu Shih who later went to Taiwan to enjoy his old age, Hsieh and Tschen, who insisted on staying in the mainland under Hu Shih's persuasion, both ended their lives tragically in the mainland. Hsieh committed suicide by taking sleeping pills on the evening of August 13, 1966. About a month later, Mrs. Hsieh committed suicide in the same way and at the same place.

Figure 13. Hsieh family portrait in 1960

7 The author of this book and his writing process

The author of this book, Professor Lisheng Zhang, is from Jianyang, Chengdu, Sichuan. He graduated from Chengdu Institute of Geology with a major in metal and non-metal geology and exploration in 1963, and obtained a master's degree in ore deposits from the Chinese Academy of Geological Sciences in 1966. From 1968 to 2002, he worked at the Chengdu Geological Survey Center of the China Geological Survey. He was a member of the International Association on the Genesis of Ore Deposits (IAGOD), a member of the Society for Geology Applied Mineral Deposits (SGA), a member of the Sichuan Translators Association, and an English editor of the *Acta Geologica Sichuan*. In November 2017, he was elected as a member of the board of directors of the Professional Committee for Research on Science and Technology Figures of the Chinese Society for the History of Science and Technology.

According to the author, in order to complete the writing of this book, his data collection team interviewed the very limited number of people who are still alive, and collected and sorted out a large amount of historical data. These materials include but are not limited to:

• **Certificates**: 23 certificates collected, including Hsieh's master's degree from the University of Wisconsin in 1920, his passport for visiting Germany in 1928, his temporary passport from the Chinese Embassy in France in 1930, his appointment letter as an academician of the Chinese Academy of Sciences in 1955, etc.

• **Journals**: 38 diaries covering the period from 1921 to 1966.

• **Paper manuscripts**: including Hsieh's Chinese and English paper manuscripts from 1930 to 1966. Among them are unpublished manuscripts and the manuscript of his last paper "Geotectonics and Ore Prospecting".

• **Notes and manuscripts**: a large number of reading notes and work notes, including Hsieh's 1956-1957 research work plan (draft) for the Institute of Geology and Mineral Resources of the Ministry of Geology, the development outline and direction of the Mineral Deposit Research Office in the three five-year plans, etc.

• **Letters**: A total of 181 letters, including 133 English letters and 33 Chinese letters from the 1930s, covering the period from 1919 to 1966.

• **Archives**: including Hsieh's registration form at the University of Wisconsin and his master's thesis entitled Origin of some metamorphic foliated rocks; relevant archives of Peking Normal University, Tsinghua University and Peking University; a large number of "Jianghua Mining Bureau Archives" preserved by the Hunan Provincial Archives, relevant archives of the Exploration Engineering Office along the Xu-Kun Railway preserved by the Yunnan Provincial

Archives, and documents and personnel archives of the Chinese Academy of Geological Sciences.

• **Works**: including the published Volumes 1-6 *Collected Works of C. Y. Hsieh*, the complete set of the physical version of the lead-printed version of *Mineral Exploration Newsletter* (only the 64th issue is missing but there is a scanned copy), the complete set of scanned copies of *the Annual Report of the MEB*, the simulated version of the 1919 *General Geology of Southeast China*, the original version of the second volume of the 1923, *The Iron Ores and Iron Industry of China*, the original version of the 1926 *General Statement on the Mining Industry (1918-1925)(Special Report of the Geological Survey of China, No. 2)*, the original version of the 1927 *Geology and Mineral Resources of S.W. Hupeh*, the original version of the 1930 *Petroleum*, and the scanned copy of the 1929 edition, etc.

• **Papers**: the original versions of many papers written by Hsieh between 1928 and 1964.

• **Photos**: a total of 364 photos of Hsieh collected during his lifetime, the earliest of which was a group photo of Hsieh and 15 of his classmates from the Institute of Geology in 1915.

• **Biography**: The 15 biographical materials collected are divided into four categories: the first is the published biographies of various scientists and the introductions of Hsieh published in some newspapers and periodicals, which focus on his academic experience. The second category is commemorative collections, including the commemorative collections of the 90th, 100th and 110th anniversaries of Hsieh's birth. The third category is the incomplete *Chronicle of C. Y. Hsieh* co-edited by the author of this book, Xuetong Li and Yuntang Pan. The fourth category is the record of Hsieh's situation in Berlin, Germany in the 1920s written by Yuanhong Hsieh, the eldest grandson of Hsieh.

• **Onsite visits**: The data collection team also visited Jianghua of Hunan, Babu of Guangxi, Huainan of Anhui, Nanjing of Jiangsu, Chongqing, Kunming and Zhaotong of Yunnan, Guiyang of Guizhou, etc., where Hsieh worked or lived during his lifetime, and collected relevant materials.

The author has devoted his life to complete this book in accordance with the basic principle of "respecting history, respecting facts, seeking truth from facts, and providing readers with truly reliable history". At the same time, in the process of exploring relevant history, he pointed out and corrected "many errors" in the various biographical materials collected above, such as Hsieh's birth date, the date he entered the University of Wisconsin, the date he went to Germany for research, whether he had investigated the Gansu earthquake, the exact date of his investigation in northern Shaanxi in the 1930s, the date he left Peiping after the "July 7 Incident", the date when the Mineral Prospecting Engineering Office along the Xu-Kun Railway was established, and so on.

Figure 14. Hsieh (left) and his colleague S. M. Meng during the Huangshan Granite Symposium in October 1965

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Data availability

The data that support the findings of this study is available from the author upon reasonable request.

Declaration of competing interest

The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Use of AI tools declaration

The author declares that he has not used Artificial Intelligence (AI) tools in the creation of this article.