

Construction and Development of National Mineral Rock and Fossil Specimen Resource Center, China

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Abstract: National Mineral Rock and Fossil Specimen Resource Center (NMRFC) is an important infrastructure for the collection, management, sharing and preservation of geological specimen resources. It integrates the mineral rock and fossil specimens scattered in universities, scientific research institutes and museums in China in the field of geosciences in a standardized manner, establishes a specimen resource information platform by using modern information network technology, promotes the rational protection, scientific management and efficient sharing of specimen resources. By 2022, 301,790 specimen resources provided by 40 participants are shared on the website, including 125,873 fossils, 351,504 minerals, 107,843 rocks and 32,924 ores. Focusing on specimens and data, more than 200 thematic data sets and data products have been integrated, including China's typical ore deposits, China's prominent paleontological fossil groups, systematic mineralogy database, traditional Chinese medicine minerals database as well as gemstones and jade and so on. The NMRFC operates in a combination of online and offline ways, providing services for scientific and technological projects to support innovative research. It also plays an important role in gathering the resources of scientific research projects supported by national public finance. In view of the construction and sustainable development of the resource center, it is proposed to further strengthen the construction of incremental resources, comprehensively promote the construction of storage infrastructure, mine the potential value of data, and strengthen the construction of resource management capacity.

Keywords: Geological Specimen Resource, Mineral Rock and Fossil, National Resource Center, Resource Sharing, Platform Management

1. Introduction

Scientific and technological resources are important basic and strategic resource to support national scientific and technological innovation as well as economic and social development. In the era of big data, promoting the opening and sharing of these resources is of great significance to strengthen the utilization and enhance the application value of them [1-3].

China has entered a new era of the implementation of the development strategy of scientific and technological

innovation. To achieve the goal of comprehensively improving the ability of scientific and technological innovation, higher requirements have been put forward for the level of informatization of scientific and technological resources and the ability of information mining and analysis, while improving government management and decision-making also increasingly relies on the comprehensive analysis of massive scientific and technological resources and large data information [4].

Focusing on scientific and technological resources, China has established a number of National Science and Technology

Infrastructure in various fields, and has formed a large number of scientific and technological resource centers specializing in the informatization of scientific and technological resources, resource utilization and information mining, and public services of scientific and technological resources for the whole society in many disciplines involving scientific research

facilities, scientific instruments, scientific data, biological germplasm, geological specimens and scientific experimental materials. National Science and Technology Infrastructure portal system has been established, which is specially used for the integration, analysis and mining of information on scientific and technological resources [4-10].

Table 1. Cooperation Units of NMRFC.

Type	Name of Organization
Universities	China University of Geosciences, Beijing; China University of Geosciences, Wuhan; Jilin University; Peking University; Chengdu University of Technology; Kunming University of Science and Technology; Shenyang Normal University; Lanzhou University; Hebei GEO University; Guilin University of Technology; East China University of Technology; Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences;
Research institutions	Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences; Institute of Mineral Resources, Chinese Academy of Geological Sciences; Xi'an Mineral Resources Investigation Center of China Geological Survey; Shenyang Geological Survey Center of China Geological Survey
Museums	The Geological Museum of China; Natural Resources Physical Data Center of China Geological Survey; Shanghai Natural History Museum; Chongqing Natural History Museum; Henan Natural History Museum; Anhui Geological Museum; Guangdong Geological Science Museum; Hunan Museum of Geology; Hubei Geological Museum; Hubei (Huangshi) Geological Museum; Ningxia Geological Museum; Qinghai Natural History Museum; Jiangxi Bureau of Geology; Gansu Geological Museum; Shandong Geological Museum; Xinjiang Geology and Minerals Museum; Zhangjiakou Geological Museum
Geo-parks	Zigong Dinosaur Museum; Guizhou Guanling Fossil Museum; Yunnan Luoping Paleontological Fossil Geopark; Yunnan Chengjiang Fossil Museum; Paleontological Fossil Geopark in Hezheng, Gansu; Tianjin Jixian Profile Nature Reserve; Shenzhen Dapeng Peninsula National Geopark


2. The Construction of National Mineral Rock and Fossil Specimen Resource Center


Mineral, rock and fossil specimens and the research findings related to such materials are the fruit of the persistent work of collecting, sorting, identifying and analyzing carried on by geological professionals. These resources provide the most intuitive and scientific evidence for people to study and restore the earth's evolution history. They are important supporting materials for earth science research and significant strategic resources for the survival and development of human society and the long-term development of social economy.

The NMRFC is one of the vital parts of national scientific and technological resource sharing service platform, which is a national science and technology innovation base approved by Ministry of Science and Technology and Ministry of Finance [11].

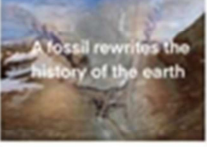
The NMRFC is led by China University of Geosciences (Beijing). From 1999 to 2022, the number of participants has increased to 40, including 11 universities and 5 scientific research institutions in the field of geosciences in China, as well as 17 museums and 7 geoparks, listed in Table 1. The

NMRFC integrates and digitizes the rock and mineral fossil specimen resources preserved in China [12, 13]. The specimens themselves remain the property of the institutes and are to be preserved by them, while scientific data related to these specimens are managed, published and shared jointly. The portal website "National Infrastructure of Mineral Rock and Fossil Resources for Science and Technology" (<http://www.nimrf.net.cn/>) (Figure 1) offers information on 301,790 (280,900 on its English version) specimen resources, covering all provincial administrative regions in China and 110 countries in the world such as the USA, Russia and Canada [14]. In addition to releasing information, the platform has developed a series of thematic data products, such as China's typical ore deposits, China's prominent paleontological fossil groups [15], China's "Golden Spikes" sections, systematic mineralogy database [16], traditional Chinese medicine minerals database [17] and so on. The NMRFC has built the largest national platform for physical resources and data sharing of rock and mineral fossil specimens in the field of geosciences in China. It provides services for scientific research, technical innovation, artificial intelligence research, education and public outreach in the earth sciences, and provides important basic support in the implementation of the national innovation driven development strategy and the national scientific and technological innovation system.


Related Science & Technology Information
Chinese version



National Infrastructure of Mineral Rock and Fossil Resources for Science and Technology



A fossil rewrites the history of the earth

Welcome to the National Infrastructure of Mineral, Rock and Fossil for Science and Technology (hereafter "NIMRF").

NIMRF was founded in 2003 as a vital part of the National Science and Technology Infrastructure (NSTI), which is directly governed by the Ministry of Science and Technology of the People's Republic of China.

NIMRF offers more than 300,000 state-owned specimens with scientific values, including minerals, rocks and fossils. As a data provider, it is our mission to advance the understanding of geo-resources and to provide services for academia, education and scientific popularization in the field of geoscience through collecting, organizing, and sharing specimen resources as well as attaching links to rock-mineral-fossil websites worldwide.


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Search for


keyword:


Specimen Resources

Total Specimens(280900)

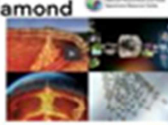
 Mineral Specimens(34208)

 Rock Specimens(101403)

 Fossil Specimens(115559)

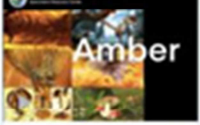
 Ore Specimens(29730)

Video Resources [+ MORE](#)



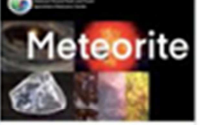
Diamond

Diamonds: Messengers from the Earth




Amber

Ambers: Recording the Evolution of Life



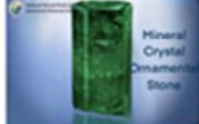
Meteorite

Meteorites: Visitors from Outer Space




Jurassic Dinosaurian Fauna in China

Fossils: Reconstructing the World




Mineral Crystal Ornamental Stone

Mineral Crystals and Ornamental




Ruby and Sapphire

From Ruby to Sapphire



Nephrite

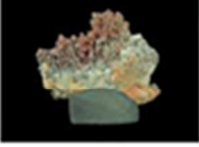
Nephrites: Aristocrats from the Orient



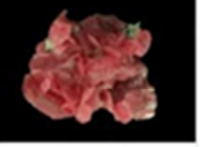
Lengshuikeng Ag-Pb-Zn Deposit

Typical Ore Deposit in China: Leng


3D Models of Mineral Crystals [+ MORE](#)



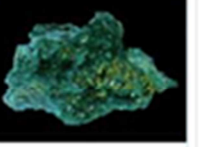
Vanadinite



Rhodochrosite




Cerussite

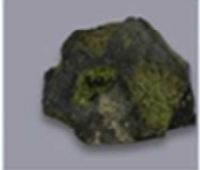


Diopside


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Mineral Collection



Rock Collection



Ore Collection



Fossil Collection

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Organizer: China University of Geosciences, Beijing. Tel: 010-82322623 Email: nimrf@cugb.edu.cn

Figure 1. Homepage of the NMRFC.

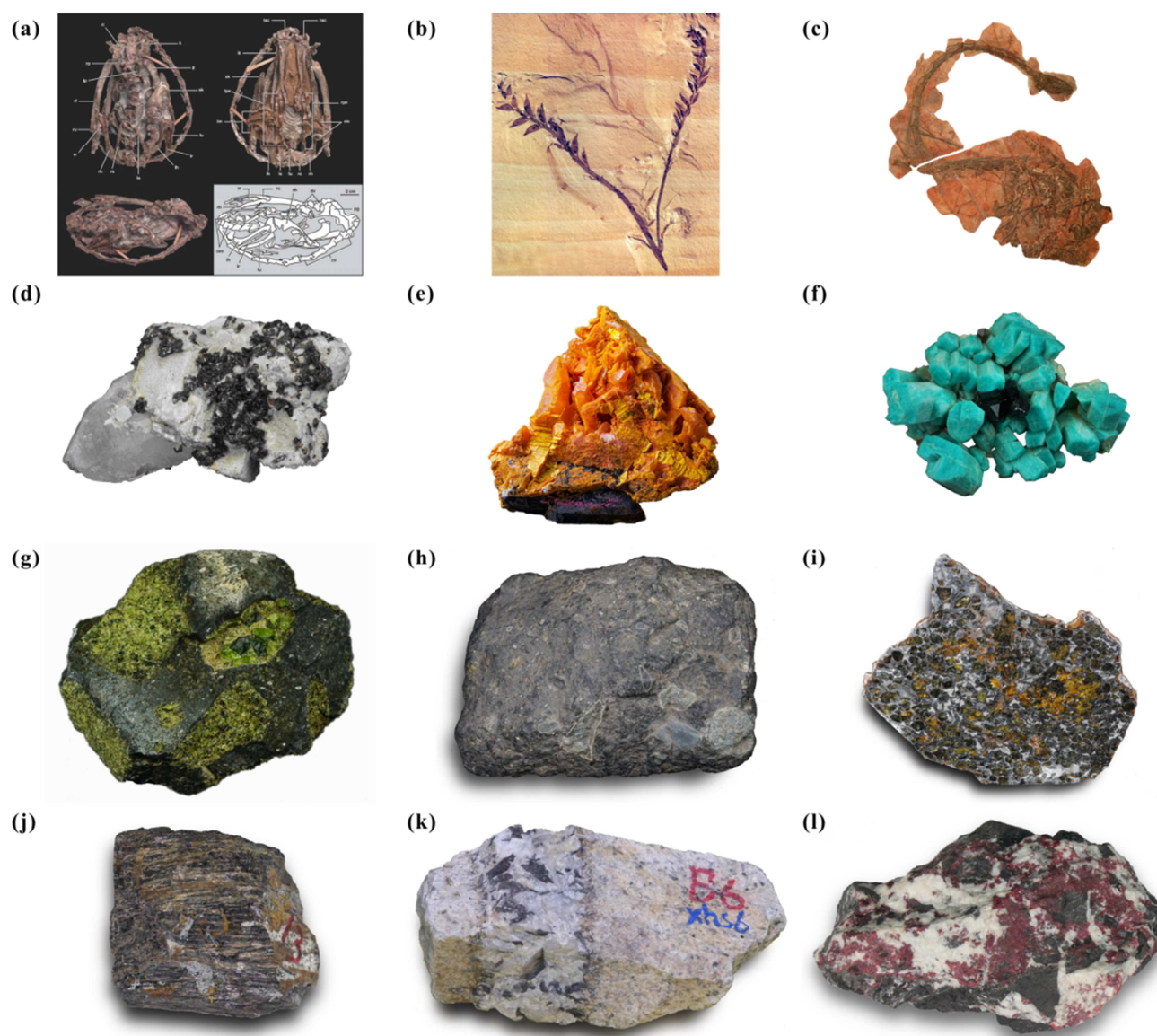


Figure 2. Typical Specimens From the NMRFC.

(a) *Mei long* from Liaoning, China; (b) *Archaeofructus liaoningensis* from Liaoning, China; (c) *Dinocephalosaurus orientalis* from Guizhou, China; (d) *Hubeite* from Hubei, China; (e) Orpiment and Realgar from Hunan, China; (f) Microcline from the United States; (g) Basalt with Olivine Inclusion from Jilin, China; (h); Kimberlite from South Africa; (i) Pallasite; (j) Rare-earth Ore from Inner Mongolia, China; (k) Tungsten Ore from Jiangxi, China; (l) Mercury Ore from Guizhou, China.

3. Physical Specimen Resources and Information

3.1. Fossil Specimens

China is one of the countries with the most abundant paleontological fossil resources in the world. The strata of all major geological periods are exposed, and the corresponding fossil records can be found from Proterozoic to Cenozoic [18]. The brilliant achievements of Chinese paleontology over the past 100 years have made important contributions to the fields of international paleontology and evolutionary biology, and accumulated a large number of valuable fossil

resources [19].

The NMRFC integrates 125,873 specimens of model fossils and typical fossil communities of significant scientific value, among which there are 41,000 model fossil specimens and 81,500 typical fossil specimens. Typical fossil specimens mainly include: specimens of human fossils in China, typical fauna specimens of the Chengjiang Biota, typical specimens of the Jehol Biota (Figure 2a and b), floral specimens of the western Henan Biota, Guizhou marine reptile specimens (Figure 2c), specimens of the Jiayin Upper Cretaceous dinosaur fauna in Heilongjiang, stratigraphic paleontological specimens typical for China, and the stonework specimens discovered in Zhoukoudian (Beijing), Yangyuan (Hebei), Sanmenxia (Henan), Yimeng (Inner Mongolia), Yuncheng (Shanxi) and western Guizhou.

3.2. Mineral Specimens

The NMRFC integrates a total of 351,504 new Chinese mineral specimens (Figure2d), rare mineral crystal cluster specimens (Figure2e and f), typical mineral specimens and some foreign typical mineral specimens, covering over 1,500 species, 89% of which are from China, and the rest from 110 other countries.

3.3. Rock Specimens

The NMRFC encompasses 107,843 typical Chinese and foreign rock specimens of significant scientific value, including rocks from the Qinghai-Tibet Plateau and neighboring areas; eclogites in Qilian-Qinling-Dabie-Sulu high and ultra-high pressure metamorphic belts; the Mesozoic-Cenozoic basalts and mantle xenoliths of eastern China (Figure2g); specimens of the northern block of the lower crust and upper mantle rock; ultrabasic rocks from Emei Mountain igneous province; section specimens of ancient strata in Jixian (Tianjin); and typical rock specimens collected from abroad such as basalts from Antarctic, kimberlites from South Africa (Figure2h), gneisses from Canadian craton, meteorol (Figure2i) and so on.

3.4. Ore Specimens

There are 4500 formed deposits in China, including about 1,500 super large, large, medium and featured deposits [20]. The NMRFC integrates 32,924 metal, non-metal and energy ore samples of more than 700 endangered and typical deposits out of those 1,500 (Figure 2j, k, l).

3.5. Specimen Data

The establishment of unified description standards and data standards is vital for the integration, exchange and sharing of specimen information. In accordance with the principles of fully considering the existing foundation and long-term development of specimen resources, as well as the needs of database construction and resource sharing, and focus on scientificity, effectiveness and operability, the platform has formulated the specimen information data standard, which stipulates that the specimen information should cover passport information, marking information, characteristic information, preservation information and shared information, including 28 data items [21-23], as shown in Table 2. The data standard has been widely used in Chinese geological specimen preservation institutions, and provides demonstration and guidance for Chinese geological specimen resource preservation units to carry out standardized collation, standardization, digitization and scientific management of specimen resources.

The database of specimens is shared on the website (<http://www.nimrf.net.cn>). Users can quickly search for the information of specimens through 11 query conditions, such as name in Chinese and English, origin, sample number, resource formation age, preservation unit and stock location number. The platform specimen data WebGIS visual display system is developed to realize the visual display and query of the map mode of the specimen, which is convenient for users to intuitively view the location distribution and information query of the specimen and thematic data.

Table 2. Items of Specimen Data.

Type	Items
ID Information	Platform ID; Resource ID; Resource Name; Locality; Province; Country
Label Information (Classification and Features)	Classification Code; Main Uses; Geological Age; Occurrence/Horizon
Basic Descriptions of Features	Description; Specific Uses; Provider; Date of Provision; Longitude; Latitude; Altitude
Other Information	Images; Web Address
Information of Storage Institution	Storage Institution; Specimen No.; Storage Location No.; Sampling No.; Quantity of Resource; Type of Resource
Sharing Method	Sharing Method; Status of Resource; Obtaining Method; Contact Information; Last Update Time

4. Development of Thematic Database

Focusing on specimens and data, the NMRFC has developed a series of thematic databases. More than 200 thematic data sets and data products have been integrated, including China's typical ore deposits, China's prominent paleontological fossil groups, China's "Golden Spikes" sections, typical geological profile, systematic mineralogy database, traditional Chinese medicine minerals database, gemstones and jade, original educational videos of science, as well as 3D mineral database and rock and boutique picture gallery of specimens.

The massive and scattered geoscience specimen resource data are collected and integrated into a thematic data set according to one or more of the same elements, the relevant thematic information is expanded for fusion processing, and

the data association is established between the thematic database and the specimen database, forming a specimen centered knowledge chain.

4.1. China's Typical Ore Deposits

Deposit specimens (Mineral, ore and rock produced in deposit) and geological information are of great value for investigating, studying and learning the characteristics, genetic types and metallogenic processes of deposits, and are extremely precious resources. This topic catalogues thematic data sets of 125 famous large, super large and endangered deposits in China, such as Bayan Obo rare earth deposit in Baotou, Inner Mongolia; Yinshan Cu-Pb-Zn deposit in Dexing, Jiangxi Province; Jinchuan Cu-Ni Sulfide deposit in Gansu Province; Zijinshan copper-gold deposit in Shanghang, Fujian Province; Tungsten-tin polymetallic deposit in

Shizhuyuan, Chenzhou, Hunan Province; Nannihu porphyry molybdenum deposit in Luanchuan County, Henan Province; Heishan Iron Deposit in Chengde, Hebei Province, etc.

The main information for each deposit includes location, the discovery history; the size and grade of the deposit; a diagram of the region's structure; a regional geological map; an integrated geological map and an ore body distribution map; a brief introduction to the deposit's geology (tectonic background, formation, structure, magmatic rocks, ore body, minerals, wall rock alteration, ore genesis, testing data); and mineral samples from the area.

4.2. China's Prominent Paleontological Fossil Groups

This topic includes 35 China's prominent paleontological fossil groups, many of which are known to all the world, such as the biota in Chengjiang, Yunnan; the biota in Hezheng, Gansu; Jurassic dinosaur fauna in Zigong, Sichuan; the "Plant Pompeii" in Inner Mongolia; the biota of Guanling, Guizhou; vertebrate fauna in the Cretaceous in the center of Jilin; Peking man in Zhoukoudian; mammoth and coelodonta antiquitatis fauna from the Late Pleistocene; and the ancient human site in the Nihewan Basin.

The contents of the special topics refer to the overview of the biota, geographical location, discovery and research history, geological historical evolution, geological characteristics, classic sections, main fossil types and representative species, biota ecology, scientific significance and research results, specimen index and references.

4.3. Systematic Mineralogy Database

Systematic mineralogy data is a set of data describing the classification, name, chemical composition, crystal structure, crystal morphology, physical properties, chemical properties, thermal properties, origin, genesis, occurrence and relationship with other minerals.

The platform has a database of 3600 mineral species. Each entry includes information on names (Chinese & English), crystal chemical formula, chemical composition, crystal morphology, java diagram, system, class, symmetrical type, cell parameters, X-ray powder diffraction, crystal structure, color, luster, transparency, streaks, pleochroism, Mohs hardness, relative density, genetic forms, associated minerals, index of mineral specimens in the NMRFC [16].

4.4. Traditional Chinese Medicine Minerals Database

Traditional Chinese medicine is the carrier of Chinese civilization and plays a unique role in the cause of people's health. The use of natural minerals and rocks in Chinese medicine has a long history. The earliest record was Shen Nong Ben Cao Jing (The Divine Farmer's Materia Medica) in the Qin Dynasty, which has a history of about 2200 years [24-25]. Due to the different names of mineral drugs in the past dynasties, some drugs have the same name, while others have different names, which often leads to confusion in drug use. On the other hand, the young practitioners of traditional Chinese medicine have insufficient experience in mineral

identification, which is easy to be confused, thus affecting the safety of drug use.

In combination with the systematic mineralogy knowledge in mineral medicine and geology used in traditional Chinese medicine, as well as the spectroscopy test means widely used in the field of material structure and composition analysis, the NMRFC has established a database of traditional Chinese medicine minerals, and collected data on 55 kinds of traditional Chinese medicine minerals, including their medicinal properties, chemical components, physical properties, mineralogical characteristics, as well as the infrared spectra, which are commonly used as standard references for rapid analysis of mineral components and purity by quality inspection institutions Raman spectrum data atlas, and collected the data of 16963 physical samples of traditional Chinese medicine minerals from different places of origin [17]. This database intends to provide practitioners with professional knowledge of traditional Chinese medicine minerals and rapid identification methods and data, raise public awareness of traditional Chinese medicine minerals, inherit and carry forward traditional Chinese medicine culture.

4.5. Gemstone and Jade Topics

There are 39 special topics on jewelry and jade, including 19 topics on natural gems such as diamonds and ruby sapphire, 16 topics on natural jade such as jade and Hetian jade, 4 topics on natural organic gems such as pearls and corals, and recorded lecture series of jewels and jade. In each case, information about basic properties, colors, the quality evaluation and process evaluation, optimal treatment, synthesis, similar varieties and counterfeits, origin, markets, maintenance, the appreciation of famous examples is provided.

5. The Function of the NMRFC

5.1. Integrate Decentralized Specimen Resources

The integration, digitization and sharing are essential for maximizing the value of specimen resources. The preservation organizations of geological specimen resources in China are subordinate to Ministry of Natural Resources, Ministry of Education, Chinese Academy of Sciences, Ministry of Culture and Tourism, etc., and are scattered all over the country. The construction of the NMRFC has realized the integration of specimen resources across departments, regions and units without changing the current management system, digitized according to unified standards, uniformly released data on the platform, and strengthened the unity of various resource units' collaboration and complementarity, promoting sharing of resources and improving utilization efficiency.

5.2. Provide Specimen Resource Services for Science and Technology

The time-honored and unique specimens accumulated by the NMRFC are important basic resources for domestic and

foreign scholars to study, investigate and do comparative research. The NMRFC operates in a combination of online and offline ways, providing convenient and fast online services. Users can browse and retrieve specimens and related information online. For physical resources and other needs that require on-site services, users can make online appointments, contact the resource library and get offline services. The NMRFC has established a mechanism for sharing agreements between both parties to protect intellectual property rights and provide quality service.

In the past five years, the NMRFC has provided specimen resource services for more than 100 scientific and technological projects to support innovative research in the field of geosciences, providing physical and information resource services and supporting the publication of more than 500 scientific research papers in the origin of life, the co-evolution mechanism of global life and the environment, the deep biosphere, the origin of continental crust and the deep recycling of continental crustal materials, chemical geodynamics study of deep mantle and continental crust, determination of stratotype profile of global chronostratigraphic unit boundary, uplift of Qinghai-Tibet Plateau and its impact on natural environment and human activities, research on mineralization under different tectonic backgrounds, etc.

5.3. Gather Scientific Research Project Resources Supported by National Public Finance

As an important part of the management of scientific research projects supported by the national public finance, Ministry of Science and Technology has preliminarily established a resource exchange mechanism through long-term exploration, involving geoscience, biology, agriculture, forestry, medicine and other disciplines [4].

The collection of scientific plan data is an important source of high-quality scientific and technological resources, which greatly enriches the quantity and quality of the NMRFC. The long-term preservation of specimens also provides guarantee for future scientific verification and in-depth excavation and research. Standardizing and strengthening the management of data collection and delivery, ensuring the quality of scientific and technological resources and data security, is conducive to sharing scientific and technological specimen resources and data around the world and serving the society [26, 27].

The NMRFC has focused on the collection and submission of specimen resources for scientific research projects, collected specimen resources formed by nearly 100 scientific and technological projects supported by financial funds, and obtained more than 50 thousand high-quality rock and mineral fossil specimens, including: National Key Research and Development Program of China, the Second Tibetan Plateau Scientific Expedition and Research Program, National Natural Science Foundation of China, special projects for basic work of science and technology, the Strategic Priority Research Program of Chinese Academy of Sciences, Geological survey project of China Geological

Survey, International Continental Scientific Ultra-Deep Drilling Project, IGCP projects as well as other international cooperative research projects.

6. Suggestions on Promoting Sustainable Development of the NMRFC

6.1. Improve the Construction of Incremental Resources

Compared with developed countries such as the United States, the United Kingdom, and Germany, the overall strength of the resource center is still weak, especially in the scale and coverage of specimen resources. Therefore, there are 4 areas that need to be accelerated:

- 1) Based on the analysis and statistics of the inventory resource, the NMRFC should draw up a series of specimen resource collection plans to fill the gap of the stock specimen resources and expand the specimen resource types through field collection and purchase, including collecting specimens of important strategic deposits, rare minerals, representative species of fossil groups and so on.
- 2) The NMRFC should establish a center for the collection and management of physical specimen resources of scientific and technological projects in the field of geosciences, coordinate with various departments, improve the mechanism for the exchange and sharing of scientific and technological resources, and urge the collection of specimen resources formed by various scientific and technological projects funded by national financial funds.
- 3) The NMRFC should also collect global high-quality rock and mineral fossil specimen resources through international cooperative scientific projects, purchase and exchange.
- 4) The NMRFC should formulate incentives for donation of specimen resources, and encourage researchers and collectors to hand over personally preserved specimens to the resource center for long-term preservation and sharing.

6.2. Comprehensively Promote the Construction of Warehousing Infrastructure

For a long time, the preservation of mineral rock and fossil specimen resources in China has been limited by the conditions of preservation venues and facilities, resulting in the loss of a large number of resources accumulated in science and technology and exploration work. Therefore, it is necessary to further strengthen the infrastructure construction of specimen resource center, scientifically plan and coordinate the layout at the national level, and highlight the long-term, scientific and public welfare strategic positioning.

The NMRFC plans to build a large-scale physical repository of geoscience specimen resources, which can accommodate 5 million specimens and preserve 3 million meters of cores, and build a supporting data center and

research center to comprehensively improve the guarantee capability of the national center.

6.3. Mine the Potential Value of Data

Data mining refers to the purposeful extraction, sorting and classification of massive data information based on computer technology, and the discovery of the internal connection of data in order to obtain more valuable information and knowledge [28].

At present, the NMRFC is insufficient in the ability to carry out in-depth analysis, mining and utilization of specimen data, and its advantages in resources have not been fully applied. It still lacks mature data mining, integration, analysis and visualization tools, which can be used to convert data into information and knowledge.

The NMRFC should use computer technology to establish mathematical models and optimization algorithms, and develop data analysis tools and software to analyze and mine the potential value of specimen data more accurately. This is especially applicable to the prediction of the blank area of resource collection, the discovery of new species, the distribution simulation of special ores, and the analysis of the temporal and spatial evolution of paleontology [29-32].

6.4. Strengthen the Capacity of Resource Management

Organization management is the key to the construction and development of the NMRFC. The focus is to effectively integrate resources, standardize operation services, coordinate the responsibilities and rights of resource providers and users, and ensure the long-term stable operation of the NMRFC. As it enters the operation stage, it is necessary to strengthen the construction of the platform organization, including the platform decision-making organ (management committee), the executive organ (management office), the consulting organ (expert committee) and the supervision organ (user committee) [4], and further improve the resource management related regulations, norms, standards and quality control systems. The NMRFC should also strengthen the construction of management personnel and talent teams, carry out international scientific and technological cooperation and technological exchanges, and actively promote the training of resource management and service personnel.

7. Conclusion

The NMRFC is a vital part of National Science and Technology Infrastructure of China. Through more than 20 years of construction, it has built the largest national platform for physical resources and data sharing of rock and mineral fossil specimens in the field of geosciences in China. The NMRFC integrates decentralized specimen resources, provides specimen resource services for science and technology and improves utilization efficiency of the resource. With the growth of resource scale and the development trend of big data, the management and

utilization of specimen resource are facing more challenges. Therefore, improving the construction of incremental resources, promoting the construction of warehousing infrastructure, unifying the computation technology to better mine the potential value of data and strengthening the capacity of resource management would be the goal and the main task in the future.

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