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THE SCIENTIFIC CULTURE PROPAGATION FOR THE PUBLIC: A CASE STUDY ON KIGAM GEOLOGICLA MUSEUM AND ITS MINERAL EXHIBITION

Seok-Ki Kwon and Hong-Ja Shin
Geological Museum, Korea Institute of Geoscience and Mineral Resources (KIGAM), Daejon 305-350, Korea

Abstract

Minerals play very important roles in the exhibition contents of natural history museums. Minerals, the fundamental constituent materials of the Earth crust, are known to be more than 3,000 species. They are the main concerns of natural history museums in that they are aesthetically and academically important. 'Human and Minerals' is the main exhibition concept in the Geological Museum of Korea Institute of Geoscience and Mineral Resources(KIGAM). Minerals are exhibited in groups according to the crystal chemical classification so that the visitors can understand them systematically. They are also displayed for the visitors to understand their definition, characteristics and applications to human life. In addition to the systematic mineral exhibition, there are other facilities such as experience corners, mineral observation corners, etc. to help people understand minerals. The KIGAM Geological Museum's mineral section offers a criterion for mineral exhibition of natural history museums in Korea. KIGAM Geological Museum is now connecting people with geological sciences and assumes a main role in communicating with scientific museums in other countries. Thus, it is the key center for scientific culture propagation especially in geological fields for the public in Korea.

Key Words : Geological Museum, mineral exhibition, natural history museum, scientific culture propagation

1. Introduction

Museums collect, record and present the meaning and value we find in life and in art, history and science [1]. Especially geological museums focus on the materials that have been formed during geological processes or activities. Minerals, rocks and fossils are the main categories the museums treat. We meet the geological materials in our everyday lives without noticing that they are the main or source constituent of our familiar goods or materials such as cars, cement, building blocks or even cosmetics. The Geological Museum of Korea Institute of Geoscience and Mineral Resources(KIGAM), which will be referred to just as Geological Museum in this paper, plays a leading role in connecting and communicating with the public in geological sciences in Korea. Minerals, presumed to be more than 3,000 species, are famous for their beauty, which means that they are usually the main exhibition items in natural history museums as in the Geological Museum.

The museum was opened on November 9th in 2001 as a geologically specified museum with the aim of making people familiar with geological sciences as well as collecting, researching and recording geological specimens systematically. The museum consists of the center hall, the 1st exhibition hall, the 2nd exhibition hall, the public relations hall, the drilling core exhibition hall and the outdoor experience garden. The center hall mainly consists of large specimens such as dinosaurs or a stalactite with a model of the Earth that especially shows oceanic topography. The main theme of the 1st exhibition hall is 'the Earth and evolution of life'. The 2nd exhibition hall is mainly composed of rocks and minerals with the theme of 'rocks and geology' and 'minerals and human life'. The public relations hall shows the past, present and future of KIGAM. In the outdoor experience garden, visitors can experience various kinds of large geological specimens like minerals, rocks and fossils [2].

In this paper, we will treat mineral exhibition strategy and its relationship with people in terms of scientific culture propagation.

2. Mineral Exhibition

It may be natural that the mineral exhibition should be systematic, educational, informative and more than anything else interesting. Museum visitors can be moved with good specimens, which does not necessarily mean that the museum is worth visiting. Random or impromptu display diminishes specimen's value, and in worse cases can give people wrong information. It is essential to exhibit and establish specimens, models or facilities on the basis of scientific research, which is not observed in some private or even in some public museums in Korea.

Figure 1. The KIGAM Geological Museum

2.1 Understanding of Minerals

People are not accustomed to distinguish between rocks and minerals, which can be the main issue of mineral exhibition in museums. Rocks are composed of minerals. A granite, one kind of rocks, can be composed of minerals such as quartz, feldspars or micas. Visual presentations with photos or illustrations can be more effective than 'real' specimens. Minerals are not found only in rocks. They can be found in soils, on the beach, on the ocean floor, in meteorites and even in the air dust. Mineral distribution can be easily understood by visual presentations because their distribution sites are familiar to us. The next step is to understand people what minerals are. A mineral is defined as a naturally occurring homogeneous solid with a definite (but generally not fixed) chemical composition and a highly ordered atomic arrangement, which is usually formed by inorganic processes [3]. The definition itself is very difficult for people to understand, and there are some exceptions. Synthetic diamonds are not minerals because they are not formed in nature, while natural diamonds are minerals. Natural glasses or opals are amorphous, which means that they do not have a highly ordered atomic arrangement. They are called mineraloids, which fall in the domain of the mineralogist. The internal ordered arrangements of minerals give them regular geometric forms known as crystals. Definition and crystal structure of minerals are key points for the mineral understanding, which should be explained and displayed step by step using illustrative methods with models and specimens.

2.2 Classification of Minerals

Minerals can be classified in various ways according to their crystal systems, constituent elements, occurrences or usages etc. The most representative classification method depends on the crystallochemical principles. In general, minerals are classified according to the dominant anion or anionic group, such as native elements, sulfides, sulfosalts, oxides, hydroxides, halides, carbonates, phosphates, sulfates and silicates. Silicates are subdivided into nesosilicates, sorosilicates, cyclosilicates, inosilicates, phylosilicates and tectosilicates according to their internal structure [3], [4]. Gold, silver, copper, iron or diamond are native elements. Sulfides are metals combined with sulfur such as pyrite, galena, sphalerite and covellite. They usually have metallic luster and many useful metals are extracted from sulfides. Oxides are metals combined with oxygen such as cuprite, corundum, hematite or rutile. Some oxides are very hard and beautiful like corundum the hardness of which is 9, just below diamond. Halides are metals with halogen elements such as chlorine, fluorine, bromine or iodine. Flourite and halite are the most famous among minerals belonging to this group. Silicates are the most abundant minerals in the earth's crust.

In the Geological Museum, minerals are displayed according to this classification method in the mineral classification corner.

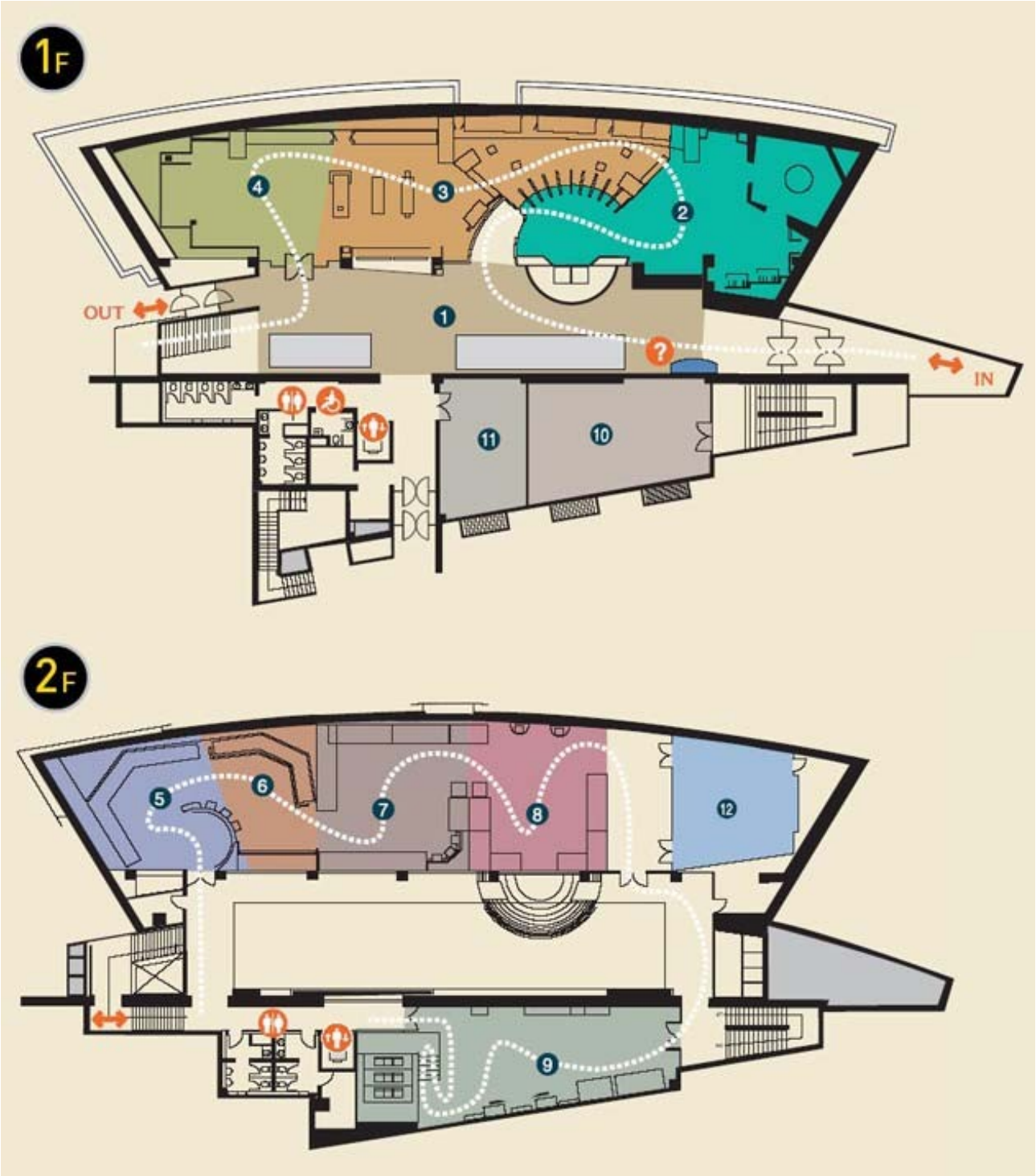

Figure 2. A guide map to the Geological Museum.
The 1st floor consists of the center hall(1) and the 1st exhibition hall(2,3,4). The 2nd floor consists of the 2nd exhibition hall(5, 6, 7, 8) and the public relations hall(9).10, 11 and 12 are affiliated rooms.

2.3 Physicochemical Characteristics of Minerals

Distribution, definition and classification of minerals give people a basic concept for the minerals. Physicochemical characteristics of minerals strengthens and enhances the understanding of minerals. Crystal habits, cleavage, fracture, hardness, color, luminescence or radioactivity are physical properties of minerals. Chemical properties of minerals include isomorphism, polymorphism, exsolution and solid solution.

The resistance of a mineral to scratching is called its hardness. Mohs' scale of hardness is based on the relative hardness among minerals: 1. talc 2. gypsum 3. calcite 4. fluorite 5. apatite 6. orthoclase 7. quartz 8.topaz 9. corundum 10. diamond. In general, the hardness of a finger nail approximately equals to 2.5, a copper coin 3, a knife edge5.5 and a file 6 to 7, which are good indicators for hardness.

Figure 3. Definition and Crystal Systems (left), Classification (right)

Polymorphism is one of the important chemical properties. Minerals can have different crystal structures even though they have identical chemical compositions, which means that they are different minerals according to mineral definition. Calcite and aragonite have the same chemical composition, $CaCO_3$, but different crystal structures. Diamond and graphite are different minerals even though they have the same chemical composition, C.
Physicochemical characteristics of minerals are one of the main parts of mineral exhibition, which are ignored in some private or public natural history museums in Korea.

2.4 Minerals and Human Life

Man would not have been able to achieve modern civilization without knowing how to use or make goods from minerals. In the Stone Age, man used rocks, a compound of minerals, as tools. In the Bronze Age, bronze was made from minerals. In the Iron Age, man extracted iron from minerals. In the present age, we use quartz (silicon dioxide) for making semiconductors. Even though minerals are so closely related to human lives, people do not know whether they make use of minerals or not. Almost all goods and devices except food are made from minerals. Iron is made from minerals such as magnetite or hematite. Almost all metallic and most of nonmetallic elements are extracted from minerals, which suggests that almost all the things we use are made from minerals.

Figure 4. Physicochemical Properties (left), Minerals and Human Life (right)

For the most part, gems are minerals. Minerals that are used to make gems are called gem minerals. The most part of gems are minerals: diamond, corundum (ruby, sapphire), spinel, topaz, turquoise, olivine, garnet, zircon, beryl (emerald), jadeite, quartz (amethyst, rose quartz, citrine), etc. But coral and pearl are not minerals. Good gems should meet the following requirements: beauty, rarity, tenacity, tradition and portability or transparency. Diamond is estimated from four factors: color, clarity, cut and carat.

Minerals are not only used as essential materials in our daily lives but also used as accessory materials. In some cases, they may be fatal to human life. Asbestos causes cancer, heavy metals cause environmental pollution and some minerals are used as a poison. We cannot live without minerals, but only wise usage will make us live in good health. ‘Minerals and human life’ is an essential part that natural history museums cannot do without it.

2.5 Experience Section of Minerals

Under polarized microscope, people can observe optical properties of minerals. Touching and feeling as well as observing are important factors to understand minerals. At the outdoor experience garden in the Geological Museum, people can touch and feel minerals. Without experience section, a natural history museum will not be a living one. Minerals have various colors. They show various kinds of luster. Some minerals like pyrite, galena or hematite show metallic luster. Some minerals show non-metallic luster, which may be adamantine(diamond), silky(asbestos), vitreous(quartz, halite), pearly(talc), greasy(nepheline) or earthy(clay minerals). Talc or gypsum can be scratched with finger nails. Halite tastes salty. Sulfosalts taste astringent. Chalcanthite tastes sour. Some minerals emit ordor: alliaceous(arsenopyrite), sulfurous(sulfides) or argillaceous(clay minerals).We can know the feelings through observing, touching, tasting or smelling minerals. Experience section is such an area that visitors can relax and enjoy themselves.

3. Conclusion

Minerals, as fundamental constituents of the Earth’s crust or as useful materials closely related to human life, are an essential exhibition factor in natural history museums that are related to geological sciences such as the Geological Museum. It is difficult for people to understand minerals with just specimens. Appropriate explanations or models with illustrations or photos are necessary, which will be desired to be followed by basic concepts, classification, properties, relationship with humans and personal experience.

The Geological Museum's mineral section offers a criterion for mineral exhibition of natural history museums in Korea. The museum is a bench mark target, especially for the geologically related exhibits for the natural history museums in Korea. The Geological Museum is now connecting people with geological sciences and assumes a main role in communicating with scientific museums in other countries. Thus, it is the key center for scientific culture propagation especially in geological fields for the public in Korea.

Figure 4. The Outdoor Experience Garden

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