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The mineral and geological historical collections of the University of Messina (Italy)

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Abstract – **The mineral and geological historical collections reported here were part of the original collections of the Mineralogy Institute at the University of Messina, most of which date back to the 1880s. These historical collections, today hosted by the Earth Sciences Section of the Department of Mathematical and Computers Sciences, Physical Sciences and Earth Sciences at the University of Messina, comprise a thousand specimens of minerals, gemstones, ores, rocks, hundreds of topographic, geographical, and geological maps, mineralogical and geological models, and numerous original documents and instruments. They represent an essential geoscientific cultural heritage to preserve and valorize for future generations. The restoration and cataloging of this geoscientific naturalist heritage are necessary to make it accessible to scientists, students, tourists, and citizens worldwide. The preliminary results presented in this study are part of an ongoing project devoted to restoring, analyzing, and cataloging the mineral and geological historical collections of the University of Messina.**

I. INTRODUCTION

In the last decades, university museums are becoming "archives of memory" and consequently, an appropriate restoration and conservation of specimens are paramount to preserving the naturalistic cultural heritage for future generations [1].

The mineral and geological collections of the University of Messina, dating back to the 1880s, have historical value and significance for the geoscientific cultural heritage. Inventory registries and paper databases of these collections were unfortunately unavailable. Consequently, until now, it has been impossible to verify the authenticity of most specimens.

The preliminary results of an ongoing project devoted to restoring, analyzing, and cataloging (also in a database) these collections are synthesized in the present paper.

II. MATERIALS AND METHODS

Today mineral and geological collections are hosted by the Earth Sciences Section of the Department of Mathematical and Computers Sciences, Physical Sciences and Earth Sciences of the University of Messina.

They include "The Historical Mineralogical Collection", "The Mineral and Gem Didactic Collection", and "The Mine Mineral Collection" and comprise a thousand specimens, including minerals, gemstones, ores, rocks (Fig. 1), hundreds of topographic, geographical, and geological maps, mineralogical and geological models (Fig. 2), and numerous original documents and instrumentations.

Fig. 1. The mineral and gem hall.

Fig. 2. Didactic 3D geological model dated back to the sixties showing a fold system affecting a sedimentary succession (model sizes: 50 x 28 x 20 cm).

In order to restore and valorize the studied geoscientific heritage, the authenticity of the most valuable specimens was achieved by using non-destructive techniques, namely stereomicroscopy with a microscope equipped with a camera and workstation for image analysis, to establish main mineralogical properties, in tandem with X-ray fluorescence spectroscopy (XRF) and μ-Raman techniques, for elemental and molecular physical-chemical characterization.

The Central Institute for Catalogue and Documentation (CICD) is an Italian institution of the Ministry for Cultural Heritage and Activities that defines tools and standards for the cataloging and documentation of archaeological, architectonic, historical, and naturalistic cultural heritage [2]. The CICD manages all cataloging processes through the General Information System of the Catalogue (SIGEC) web-based platform. The CICD database for the here presented mineral and geological historical collections of the University of Messina is under construction.

III. THE HISTORICAL MINERALOGICAL COLLECTION

The oldest collection was realized by G. Seguenza (1833-1889), who began collecting minerals and rocks in 1880 [3]. Born in Messina, he became a full professor of geology and mineralogy at the Royal University of Messina. His son, L. Seguenza (1873-1908), collected 446 rocks from the Messina province.

The oldest mineralogical collection contains 157 samples of minerals by Andrea Aradas (1810-1882), which were bought from Aradas's heirs by F. S. Starrabba (1886-1954) of the Messina Mineralogy Institute (Fig. 3) [4].

Fig. 3. Augite (equal sample size: 0.4 cm) with the original handwritten label from the Aradas Mineralogical Collection. Provenance: Etna Mount (1669 eruption), Catania, Sicily (Italy).

This naturalist is remembered for malacology studies from the end of the nineteenth century.

His interests concerned with the naturalistic world. The Aradas Collection kept by the University of Messina contains samples from zoological campaigns conducted around Sicily.

The collection comprises prestigious samples from Sicilian sulphur mines and Zeolites from "Cyclops Island" (Acicastello, Catania, Italy).

The crystallographer Giuseppe Raimondo Pio Cesaro (1849-1939) left valuable calcite samples with crystallographic iconographies in French, dating back to the 20s of the nineteenth century (Fig. 4).

The samples were relabeled by Luigi Sequenza before the 1908 and introduced in the historical collection.

The mineralogist Francesco Rodolico (1905-1988) set up a collection of 78 mineralogical specimens. In 1939 the Florentine mineralogist moved to Messina as director of the Institute of Mineralogy.

This period was important for mineralogy and petrography studies on mineralogical samples of Tuscany, especially of the island of Elba, preserved today among the historical collections.

Most samples result from scientific collaborations between the University of Messina and university museums from worldwide countries or scientific works of researchers since the last twenty years of the nineteenth century [5].

Many samples were purchased from famous European trade companies, such as F. Krantz in Bonn (1809-1872), L. Sæmann in Paris (1821-1866), and F. Pisani (1831 – 1920) in Rue de Furstenberg in Paris (Figs. 5, 6).

Fig. 4. Crystallographic iconography by Giuseppe Raimondo Pio Cesaro concerning a calcite sample.

Fig. 5. Staurolite (sample sizes: 3 x 2 x 1.5 cm) with the original handwritten label from the F. Pisani collection.

Fig. 6. Topaz (sample sizes: 5 x 3 x 2 cm) with the original label. Provenance: Nayeki, Mino, Japan.

IV. THE MINERAL AND GEM DIDACTIC COLLECTION

The Mineral and Gem didactic collection consists of 209 samples of emerald, sapphire, topaz, tourmaline (Fig. 7), beryl, garnet, corundum, opal, amber (Fig. 8), and quartz (agate and chalcedony) from all over the world. The oldest samples date back to the 30s, whereas the most recent to the 80s of the last century. Samples were initially exposed in showcases, but in the 80s, they were arranged into fourteen glass cabinets for educational purposes. The main aim of the didactic collection was to show the different features of natural and synthetic gemstones based on different gem cuts, forms, colors, and pleochroism.

Fig. 7. Microphotograph taken with a transmitted light stereomicroscope. Reddish-purplish tourmaline gem with cabochon cut (sample sizes: 1.1x 0.9 x 0.6 cm). Provenance: Palo (California). The gemstone derives from granitic pegmatite (Pala pegmatite district, San Diego County, California [6]).

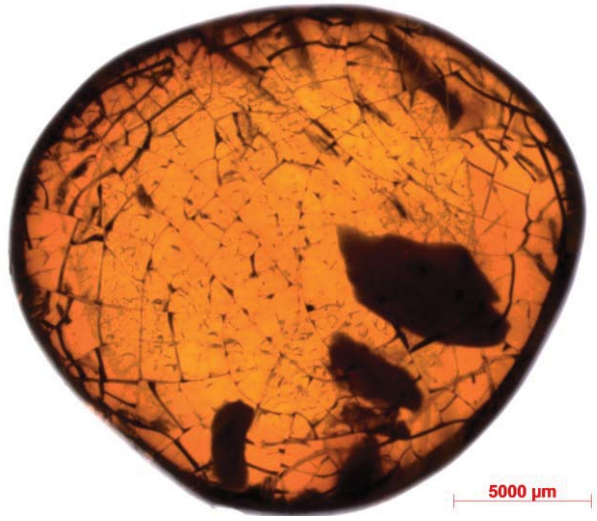

Fig. 8. Microphotograph taken with a transmitted light stereomicroscope. Orange-yellowish amber gem of the Simetite variety (sample sizes: 2.1 x 1.9 x 0.9 cm). Provenance: Simeto River, Catania, Sicily (Italy). Age: Miocene/upper Pliocene.

V. THE MINE MINERAL COLLECTION

The mining exploitation, attested in Sicily from the Middle Ages until the middle of the nineteenth century, represented an essential aspect of the Sicilian socio-economic history. A section of the geoscientific cultural heritage of the University of Messina is dedicated to the minerals of the Sicilian mines. The mine mineral

collection mainly comprises Messinian evaporitic minerals and rocks from Sicily and Paleozoic metamorphic poly-metalliferous mineralization from the Peloritani Mountains (Messina).

One hundred samples belonging to the Messinian Gessoso-Solfifera Formation (a total of 40 sulphur crystals samples and a total of 60 about celestine, gypsum, and carbonates) originates from the Sicilian mines of Enna, Palermo, Agrigento (Fig. 9-10), and Caltanissetta (Fig. 11). The abundance of sulphur led Sicily to be known worldwide as the most significant producer of sulphur for centuries.

Several Authors collected more than one hundred samples of mineralized rocks from the mines of the Fiumedinisi area in the Peloritani Mountains. These are related to Pb, Zn, Fe, As, Sb, Cu, Ag, and W poly-metalliferous ore-bearing deposits particularly widespread in the Variscan basements of the Mandanici Unit [7] (Fig. 12).

Fig. 9. Messinian sulphur (sample sizes: 30 x 10.5 x 13 cm; crystals up to 3 cm) on limestones. Provenance: San Giovannello, Casteltermini Mine, (Agrigento, Italy).

Fig. 10. Messinian sulfur crystal (sample size: 9 x 6 x 5.5 cm). Provenance: Cozzo Disi, Casteltermini (Agrigento, Italy).

Fig. 11. Messinian gypsum (sample sizes: 32 x 26 x 20 cm). Provenance: "Gessolungo" sulphur mines (Caltanissetta, Italy).

Fig. 12. Galena mineralization (sample sizes: 11 x 8 x 4 cm) on quartz vein from the Paleozoic phyllites of the Mandanici Unit. Provenance: Fiumedinisi mines (Messina).

VI. DISCUSSION AND CONCLUSIONS

The mineral and geological historical collections of the University of Messina represent an important geoscientific cultural heritage to preserve and valorize. The CICD database for the mineral and geological historical collections is under construction. This project will be improved in the future with the realization of a virtual exposition of the most valuable specimens.

Maintaining and valorizing geological and historical specimens are crucial in ensuring the "archives of memory" and the scientific and historical documentation, education, and public outreach for future generations.

Most minerals in the presented collections derive from

partially or totally destroyed Sicilian mines. Consequently, today it is essential in southern Italy the role and mission provided by geological museums [8].

Other programs for revaluating the collections are planned by creating naturalistic itineraries devoted to undergraduate and graduate students and tourists.

The improvement of geological museums and other initiatives regarding the geological heritage of geosites and geodiversity sites are strategic tools for promoting sustainable geo-conservation and geo-education [9].

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