Boletim da Sociedade Astronômica Brasileira, **32**, no. 1, 167-168

Recognition and characterization of metal meteorites rescued after fire of the National Museum/UFRJ

Felipe Abrahão Monteiro[1],, Filipe Abreu de Oliveira[1], Amanda Araujo Tosi2, & M. E. Zucolotto[3]

[1] Instituto de Geociências/PPGL/UFRJ e-mail: famont@globo.com
[2] LABSONDA/IGEO/UFRJ e-mail: amandatosi@hotmail.com
[3] Setor de Meteorítica do DGP/Museu Nacional/UFRJ, São Cristóvão, Rio de Janeiro e-mail: meteoritos@mn.ufrj.br

Abstract. This work aims to rescue and identify metallic meteorites that were found in the rubble of the main building of the National Museum after the fire that occurred in this institution in September 2018. It is part of the PhD project of the first author of this paper.

Resumo. Este trabalho tem como objetivo resgatar e identificar meteoritos metálicos encontrados nos escombros do prédio principal do Museu Nacional após o incêndio ocorrido nesta instituição em setembro de 2018. Faz parte do projeto de doutorado do primeiro autor deste artigo.

Keywords. Meteorites, meteors, meteoroids – Methods: laboratory – Astrochemistry

1. Introduction

The National Museum/UFRJ holds the largest meteorite collection in Brazil, being the official type deposit of most Brazilian meteorites. Due to the tragic fire in the main building on September 2nd, 2018, most of the collection, except Bendegó and a few in exhibition, was under the debris and exposed to the weather, mixing up with rubble, making it very difficult to recognize them.

The next morning, the Meteorite Curator (fourth author of this summary) managed to reach the showroom. After this day, there was a long wait (seven-week) until access to the rescue is again allowed.

In Fig. 1, you can witness the gravity of the situation, showing the state of the laboratory in which the wooden ceiling had burned and the upper floors and ceiling collapsed over the room where most of the collection was housed. The long (seven-week) wait for free access to the rescue site exposed the meteorites to rain. Iron meteorites, which are the subject of the first author's thesis, became rusty due to delayed rescue causing the "break" of the mill scale (dark protective layer that formed after the metal was subjected to thermal gradients), making them to oxidize quickly.

Thus, the central objective is to reconstruct the collection of metallic meteorites, using analytical techniques for identification and recovery of the collection, combined with the experience to recognize mineral and petrographic assemblies, and litho-chemical peculiarities.

Figure 1. Laboratory in which the wooden ceiling burned. The upper floors and ceiling collapsed over the room where most of the meteorite collection was housed.

Figure 2. Left: The Bendegó meteorite, in the main entrance of the Palace after the fire. Right: Some rescued meteorites

2. Rescue and Recognition

The next morning after the fire, the Meteorite Curator retrieved 30 from 39 specimens that were on display at the showroom. Seven week later, the access was allowed again and other meteorites were being rescued.

The Bendegó meteorite, in the main entrance of the Palace, was one of the objects less affected by the fire. It remained unchanged not only because it is solid iron and withstood high temperatures in the atmospheric entry, but because the fire did not cause much damage in this location, seeing the wood panels in the background with the history of the meteorite practically intact. Fig. 2 shows Bendegó in the main entrance of the Palace after the fire and a part of the rescued meteorites.

Some meteorites were in the LABSONDA/UFRJ for analyses before the tragedy and escaped the fire. These and the new ones will enter the collection with a registration number subsequent to the last redeemed.

Of all meteorites recovered, only about 150 specimens were identified by the catalog (database), based on comparison by photograph, type and weight, although the latest digital version of the file was not the most up to date.

Samples are being cleaned, stabilized and packed in catalog numerical order (Figure 3). To minimize oxidation, some need to be stored with silica gel because we do not have a suitable cabinet with humidity and temperature control.

All meteorites that were in the original exposition (From Genesis to Apocalypse) have already been identified, restored and are now part of a new exposition (Rising from the

Figure 3. clean, stabilized and packaged samples

Figure 4. A part of a new exposition "Rising from the Ashes", held at the MAST

Ashes), held at the MAST (Museum of Astronomy and Related Sciences).

3. Laboaratory Analysis

Unidentified meteorites, as well as metallic meteorites that have samples before and after the fire will be analyzed in the laboratory.

Petrographic and metallographic analyzes are being performed by optical microscopy. Meteorites, which are not identified after this step, will undergo to further analysis, such as EPMA (Electron Probe Microanalyser), XRF (X-Ray Fluorescence), INAA (Instrumental Neutron Activation Analysis) for trace elements (Gallium, Germanium, Iridium and Gold) and LA-ICP-MS (Laser Ablation Inductively Coupled Plasma Mass Spectrometry) to identify isotopes, which allow them to be genetically correlated with other similar meteorites.

4. Conclusions

Although some analyzes still need to be performed, more than a hundred meteorites have been recovered and identified. This first stage of the project has already been achieved.

After all this process of restoration and reconstruction of the collection, an online database and images is being created, presenting the new collection of metallic meteorites from MN/UFRJ. The benefits are invaluable, as it contributes mainly to scientific dissemination by making credible and verifiable information about that collection available again.

Than, this project has achieved positive results, reducing the losses caused by the fire that consumed the National Museum.