Summary

Context

The Belgian centers for high level meteorite research are VUB and ULB. VUB is conducting research in the field of impact craters and their geochemical and isotopic signature, especially platinoid metals and light stable isotopes to trace the origin of projectiles; ULB has expertise in isotope geochemistry and geochronology, for both radiogenic isotopes and heavy stable isotopes allowing research on planetary differentiation from meteorite investigation, and the chronology of the early solar system. Both universities collaborated in the search for Antarctic meteorites during joint field campaigns set up in close cooperation with NIPR and with the support of BELSPO. These Antarctic meteorites are highly valued because of their pristine quality, hardly affected by weathering phenomena occurring at the surface of the Earth. Since 2009, 1343 meteorites have been gathered and provisionally stored in Japan. As they are shared property, half of the share has to come to Belgium, on condition that they would come in custody of an official curation center. Meanwhile RBINS, which is the main center for natural history collections in Belgium, had developed a meteorite collection of >500 meteorites which positioned this institution at middle level of European meteorite collections but had no dedicated curation facilities for meteorites. In order to support Belgian networking for meteorite research, repatriate a unique collection of Antarctic meteorites of high value for research, and establish a national curation center for meteorites, which are all interdependent, BELSPO decided to support a project, introduced by VUB, combining curation and research.

Objectives

The objectives of this project, dedicated to Antarctic meteorites, are:
(i) to establish and organise the meteorite curation facilities at the Royal Belgian Institute of Natural Sciences (RBINS), through renovation of the storage room and installation of the material required for the curation task.
(ii) in collaboration with NIPR, to identify and classify the Antarctic meteorites, a crucial part of the curation work. The detailed description and accurate classification of the new meteorites, down to the sub-group level, will guarantee the quality of the research performed on these samples. The identified meteorites will be registered in an online database.
(iii) to make the Belgian collection of meteorites available for local and international researchers. Clear rules for sample loan, destructive analyses, etc. will be established, based on existing rules and experience of RBINS, and in coordination with NIPR. A website developed and hosted by RBINS will display this information.
(iv) to set up a Belgian research network on meteorites, based on existing VUB-ULB collaboration and reaching out to colleagues in other institutions. The network will facilitate discussions and promote joint research, organise workshops and student exchanges, and stimulate participation in the meteorite curation work.
(v) to carry out quality research on the Antarctic meteorites recently collected.

Main conclusions and inputs in terms of sustainability

The main result of the project is the implementation of a curation facility for Antarctic meteorites at RBINS, including an equipped laboratory with a well-trained team, a database available to the worldwide research community, and established loan procedures. This will bring long-lasting benefits from the BELAM project and limit the critical issue of sustainability.

Now, the curation system at RBINS is functional, with qualified staff and sets of guidelines on registration, handling and arranging facilities for researchers, both in the repository and laboratory. This involves the capacity for identification and petrological characterisation of meteorites – making use of mineralogical and geochemical lab facilities at the different partner institutes – applied in synergy with the work done at NIPR and directed more particularly to the scientifically most interesting meteorite types, whereby VUB and ULB become the main partners. All samples can be accessed online by two ways that are linked, the Darwin data and loan handling system (Darwin.naturalsciences.be) and the quick access mars database system (mars.naturalsciences.be). A full chain of curation operations and protocols was defined to provide guidelines for curators and his collaborators and users interested in loans or special treatment of samples (part for external use). It is intended for guaranteeing continuity of the curation center.

Long-lasting and efficient curation at the RBINS is also ensured by three agreements signed by the partners, which resulted in: an Internal Agreement on curation and research of Belgian Antarctic meteorites between VUB, ULB and RBINS, a Deposit agreement on Antarctic Meteorites between VUB, ULB and RBINS, including the functioning of a Scientific Loan Committee, and a MoU between NIPR, VUB, ULB, RBINS concerning scientific cooperation and ways of sharing the Antarctic meteorites. The Scientific Loan Committee is active for allocating samples for either research or exhibitions.

Dissemination of results and presentation of the new curation system is also beneficial to the sustainability of the curation facilities at the RBINS.

In the frame of the BELAM project, the exhibit of an outstanding meteorite found in Antarctica coupled to a national meeting was organized in 2014. A large-scale international meeting was organized in Fall 2016 and brought meteorite curators from all over the world to visit the RBINS meteorite facility, and learn about Belgium ongoing meteorite research.

In terms of research, publications in peer-reviewed journals report the obtained results, which were presented in international conferences such as the annual Antarctic Meteorite Symposium at NIPR in Tokyo.

Finally, in order to ensure the sustainability of the curation, three BRAIN projects were formulated and approved for funding: The first project, introduced by RBINS-ULB-VUB, is entitled 'Antarctic meteorites curation, digitalization and conservation' (AMUNDSEN ; 15/03/2016-28/02/2022). The proposal is dedicated to the conservation, classification, valorisation and digitalization of meteorites at the RBINS with the goal to improve the maintenance of this fragile collection, develop best practice meteorite curation protocols, provide the most appropriate sampling procedure and stimulate and facilitate the scientific usage of the collection by the international research community. The second project, introduced under Thematic axis 2, is entitled 'Belgian Antarctic Meteorites and Micrometeorites to document solar system formation and evolution' (BAMM!; 01/01/2017 – 15/04/2022).

A third project 'Tracing differentiation processes through siderophile elements, from meteorites to giant ore deposits' (DESIRED; 15/12/2019 - 15/03/2024) also aims at expanding and improve the efficient curation of all Antarctic meteorites at the RBINS, through innovative research and meteorite recovery missions.
This novel BRAINS project, gathering the same partners, builds on and expands the assembled expertise, and centers on a number of highly promising, but previously unexplored research opportunities provided by this valuable set of newly recovered extraterrestrial samples.

Keywords: *Antarctic meteorites, curation facility, meteorite research*