

Canadian Bennu Curation Facility, the First Extraterrestrial Sample Curation Facility in Canada

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The NASA OSIRIS-REx mission collected a sample from the asteroid Bennu, on October 20, 2020, and was delivered to Earth in September 2023 [1, 2]. Study of the sample will make it possible to tackle some fundamental questions about the early composition of the solar system and its organic content and therefore needs to be preserved in an environment that reduces as much as possible potential terrestrial contamination. Due to the contribution of the OSIRIS-REx Laser Altimeter (OLA) instrument, the data from which produced a 3D model of the asteroid [3] that helped identify the sampling site, Canada will receive a portion of the Bennu sample. This portion of the sample will be transferred once the Canadian Curation Facility is ready to receive it.

The Canadian Space Agency is currently developing its Curation Facility, which is the first laboratory of its kind in Canada. The facility consists of two different clean rooms, one dedicated to the sample storage and manipulation, another one dedicated to the last steps of cleaning for the tools and containers that will come in contact with the sample. The storage and manipulation clean room will be equipped with desiccator cabinets and a glove box that will allow them to keep the sample in a contamination-free environment, under curation-grade nitrogen, to avoid degradation due to its interaction with Earth's atmosphere. The glove box has been designed to integrate a binocular microscope in a ~30-degree window main chamber to image the sample and a secondary chamber allowing a top-down view of the sample while the sample remains under curation-grade nitrogen.

The CSA is revising its cleaning (see the abstract by Hill et al. at this conference), monitoring, and handling protocols to ensure best practices are maintained throughout sample handling steps. When the sample is received, it will be described, imaged, weighed, and larger single stones will be measured. In addition, commercial stainless-steel containers have been modified to integrate a sapphire window that will allow spectroscopic analyses to be performed while the sample remains in the curation-grade nitrogen sealed container. The information collected on the sample will be made available in a sample catalogue for which the development is advanced. This catalogue will be the main source of information on the Canadian collection and will facilitate sample requests from researchers around the world. The facility will be able to provide samples in different forms: unprocessed sample, thick and thin sections, as well as polished grain mount. Information collected through early observations and subsequent studies will be catalogued to record the analytical history as well as the growing knowledge of the sample.

Acknowledgments

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References

[1] Lauretta et al. (2021). Sample Return Missions (Elsevier), 163–194. [2] Lauretta et al. (2022). Science 377, 285–291. [3] Daly et al. (2017) Space Science Reviews 212, 899–924.