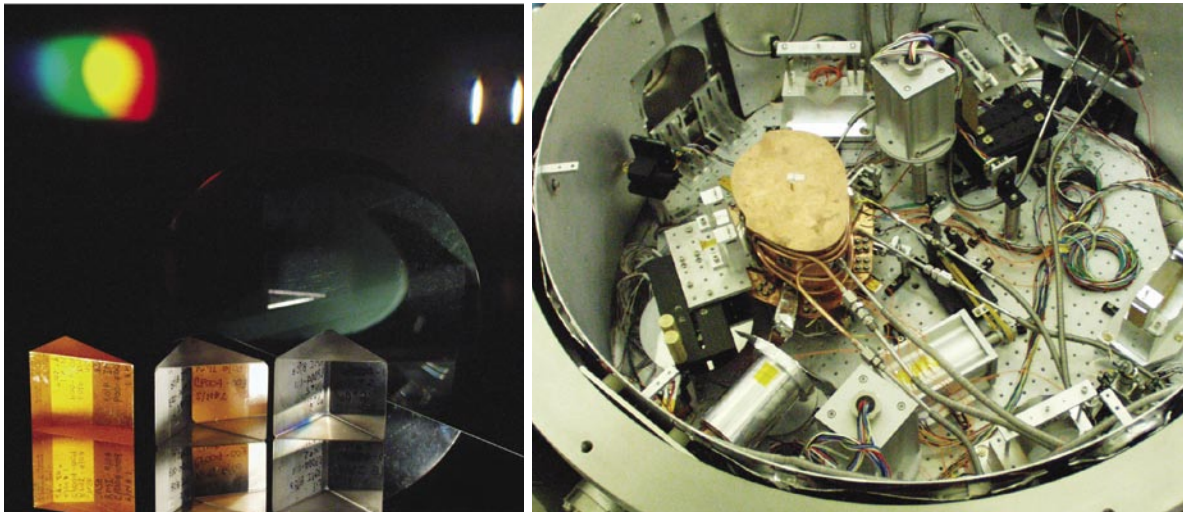




# University of Oxford Commissions Goddard's CHARMS Facility to Characterize Optics Used for a Ground-Based Infrared Instrument



Testing at Goddard's CHARMS facility will measure the refractive index of prism samples provided by the University.

As part of a reimbursable Space Act Agreement (SAA), NASA Goddard will use its state-of-the-art Cryogenic High Accuracy Refraction Measuring System (CHARMS) facility to characterize material properties of a prismatic sample provided by the University of Oxford. The testing will measure the refractive index of the prism (i.e., how the glass will process light), enabling the University to design optics that will behave correctly when cooled to the cryogenic temperatures required to achieve its science goals. The resulting data will also be available to NASA to improve future instrument designs, as well as to the scientific community as a whole.

## Benefits of Technology Transfer

- The University will benefit by obtaining knowledge of the optical properties of its sample material at cryogenic temperatures, thus improving instrument design and performance, as well as simplifying the integration and test phase of development.
- NASA will benefit by utilizing refractive index data generated for the University at various wavelengths and temperatures without investing research funds to perform additional measurements of this material in the future.
- NASA and the larger optics and aerospace industries will benefit from new, published data regarding the measurements of the University-supplied samples, enabling improved optical designs for instruments operating at cryogenic temperatures.

## On the Record

“Technology transfer at NASA benefits outside organizations through specific innovations but also through test and measurement capabilities like those offered by the CHARMS facility. These efforts benefit our partners, and the resulting data can provide returns to NASA missions as well.” - *Ted Mecum, NASA Goddard’s Innovative Partnerships Program Office*

“No other facility in the world offers the accuracy and measurement capabilities that the CHARMS facility provides. Researchers from all over the world are interested in CHARMS because of the quality index data we can generate here, benefiting them and the optics community as a whole.” - *Brad Frey, engineer, NASA Goddard’s CHARMS facility*

## About the University of Oxford

The University of Oxford is internationally renowned for the quality and diversity of its research, enhanced by the ongoing development of interdisciplinary research centers and collaboration with international academic and industrial partners. The University is also a world leader in commercializing the results of its research. Isis Innovation, its wholly owned technology transfer company founded in 1988, pioneered the successful commercial exploitation of academic research and invention.

## Technology Origins

Established in 2003, the CHARMS facility is part of Goddard’s Optics Branch. A highly versatile facility, CHARMS can provide measurements at cryogenic temperatures and a wide range of wavelengths with unsurpassed accuracy. The success of future NASA infrared missions depends on the availability of accurate refractive index data for optics operating at cryogenic temperatures. Several NASA missions, including the James Webb Space Telescope (JWST) and the Kepler Photometer, have directly benefited from the facility. For JWST, CHARMS researchers measured the refractive index of lens materials used in the telescope’s Near Infrared Camera (NIRCam) to understand how the all-refractive design would operate at the instrument’s cryogenic operating temperature. The data enabled a design that would reach its scientific goal and improve the efficiency of cryogenic testing of NIRCam on the ground, adding to CHARMS’ world-class reputation.

## Finding a New Use

Unlike NASA’s applications for the capabilities provided by CHARMS, Oxford’s application is not for optics that will actually fly in space. Rather, this work will benefit a ground-based infrared instrument: the K-band Multi-Object Spectrometer (KMOS), which will be used on one of the European Southern Observatory’s Very Large Telescopes. Knowledge of refractive index is required at cryogenic temperatures for many ground-based applications as well as those using optics that will be cooled during operation. In the case of KMOS, if the optics are too warm, the camera will see

infrared light coming from the optics as well as its science target, thus reducing the quality of the scientific data. Once the optics are cooled, this background light is reduced and the science target is more visible. Testing at CHARMS will provide the University knowledge of the optical properties of its sample material at the KMOS operating temperatures.

## The Transfer Process

Researchers at the University of Oxford were well aware of the capabilities of the CHARMS facility, thanks to the networking efforts of Goddard innovators Doug Leviton and Brad Frey, as well as notable mentions of the facility in industry publications and conference proceedings. Through these industry networks the University made contact with Goddard and expressed interest in utilizing the facility. Goddard’s Innovative Partnerships Program Office administered the agreement, helping to facilitate discussions between NASA and University researchers and arriving at an arrangement that benefits both organizations.

## Looking Ahead

As part of the agreement, Goddard will provide the University with a report of the CHARMS results. The findings also will be published in scientific papers, notably the proceedings of the International Society for Optical Engineering

## For More Information

If you would like additional information about Goddard’s technology transfer opportunities, please contact:

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