BOSTON UNIVERSITY

Boston University College of Arts & Sciences
Institute for Astrophysical Research

2022—2023 ASTROPHYSICS SEMINAR SERIES

Nucleosynthesis and Dust Formation in Supernovae

The chemical makeup of our Solar System reflects Galactic chemical evolution in the local interstellar medium (ISM) over the past ~9 Ga. While the incorporated ISM dust was mostly destroyed during the Solar System formation, a small fraction of the ISM dust, known as presolar dust, is preserved in pristine extraterrestrial materials and identified by their exotic isotopic compositions, pointing to their formation in gas outflows or explosions of ancient stars. Since their stellar birth at more than 4.6 Ga, presolar grains have borne witness to a huge array of astrophysical and cosmochemical processes. Presolar grain analysis has become an important component of the study of nuclear astrophysics as it allows for isotope analysis of bona fide stellar material in the laboratory at a precision that far exceeds what can be achieved by spectrographic measurements using state-of-the-art telescopes.

This presentation will highlight the unique role of presolar grains from core collapse Type II supernovae (CCSNe) in constraining supernova dust formation. The contribution of CCSNe to the cosmic dust reservoir in the Universe is highly debated. While the large amounts of dust observed for young galaxies suggest production of ~0.1 M8 dust per CCSN, theoretical models predict that the initially formed dust is efficiently destroyed later by the reverse supernova shock. Observations of dust formation timing and production quantity in CCSNe are thus required to directly evaluate the role of CCSNe in contributing to the cosmic dust reservoir over time. I will discuss how to use radioactive isotope abundances of presolar grains from CCSNe to constrain dust formation timing and the links to astronomical observations.

Monday, January 30th

3:30 - 4:30 p.m.

CAS 502

Nan Liu

Boston University