BOSTON UNIVERSITY

Boston University College of Arts & Sciences
Institute for Astrophysical Research

2022—2023 ASTROPHYSICS SEMINAR SERIES

A Half-Century of Interstellar Gas and Magnetic Field Measurements

Interstellar magnetic fields in neutral gas are revealed by Zeeman splitting of spectral lines, especially HI, and the polarization of continuum emission from starlight and IR emission, both caused by aligned dust grains. Ancillary data include column density N(HI), velocities, linewidths, and temperatures. Magnetic fields in ionized gas produce Faraday rotation (the Rotation Measure RM). Ancillary data include pulsar dispersion (the Dispersion Measure DM), and emission from ionized gas (the Emission Measure EM).

N(HI), RM, EM, and DM are integrals of quantities such along the entire line of sight, such as R neBlosds, so they are all non-local quantities. Accordingly, one does not expect small-scale angular structure to be easy to see. However, maps of all four quantities show plenty of structure. This can happen only if the quantity itself has structure on small scales.

We focus on a few such regions that are visible in HI, RM, EM, and DM. It is not uncommon for RM structural shapes to match those of N(HI) and EM, but for the three structures to be positionally offset from one another. This reflects the physical processes that both (1) heat and ionize the gas on microscales, and (2) shape the morphological structure on arcminute and larger scales. All this may suggest the presence of a type of interstellar gas—the Faraday Rotation Medium—that produces large Faraday Rotation but is otherwise almost undetectable.

Monday, November 21st

3:30 - 4:30 p.m.

Zoom only

Carl Heiles

University of California-Berkeley