~Emily

Discovery of a Thorne-Zytkow Object Candidate in the Small Magellanic Cloud

Thorne-Zytkow objects (TZOs) are a theoretical class of star in which a compact neutron star is surrounded by a large, diffuse envelope. Supergiant TZOs are predicted to be almost identical in appearance to red supergiants (RSGs), with their very red colors and cool temperatures placing them at the Hayashi limit on the H-R diagram. The best features that can be used at present to distinguish TZOs from the general RSG population are the unusually strong heavy-element lines present in their spectra. These elements are the unique products of the star's fully convective envelope linking the photosphere with the extraordinarily hot burning region in the vicinity of the neutron star core. As part of a recent high-resolution spectroscopic search, my collaborators and I have discovered a TZO candidate in the Small Magellanic Cloud. It is the first star to display the distinctive chemical profile of anomalous element enhancements thought to be unique to TZOs. The positive detection of a TZO would provide the first direct evidence for a completely new model of stellar interiors, a theoretically predicted fate for massive binary systems, and never-before-seen nucleosynthesis processes that would offer a new channel for heavy-element production in our universe.