

APR05-2005-000383

Abstract for an Invited Paper
for the APR05 Meeting of
the American Physical Society

Rare isotopes and thermonuclear explosions: journey through the crust of an accreting neutron star

HENDRIK SCHATZ, Michigan State University

Recent progress in nuclear astrophysics has been driven by simultaneous advances in observational astronomy, experimental nuclear physics and computational modeling. A prime example is the physics of accreting neutron stars in X-ray binaries. Nuclear reactions in the atmosphere, crust and in the liquid heavy metal ocean covering the surface of these neutron stars give rise to a range of observable phenomena such as X-ray bursts, superbursts, and millisecond oscillations, which in many cases have only been discovered recently. At the same time, a new generation of rare isotope beam accelerators has made it possible to begin to study experimentally the properties of the extremely unstable nuclei involved in these reactions. By following the fate of an accreted matter element through its journey into the deep crust of the neutron star I will review recent experimental and theoretical progress, discuss open questions, and outline avenues for the future that have the potential to achieve a better understanding of the physics of neutron stars.