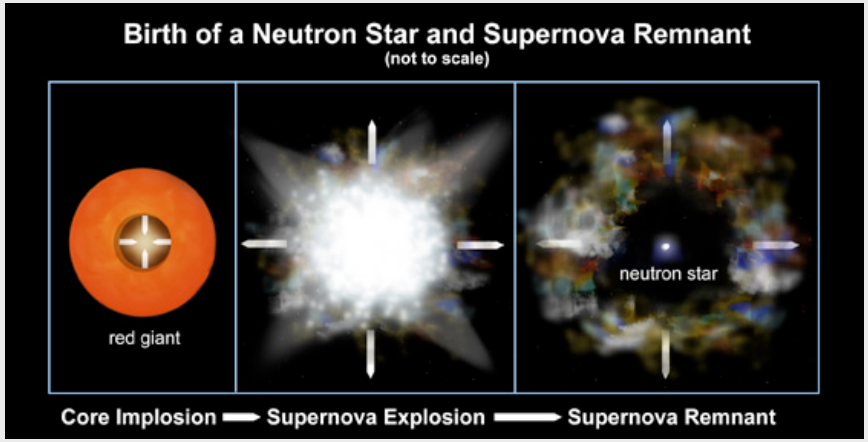
Learning from the Stellar Elderly: Gravitational Waves from Neutron Star Oscillations

Carlos F. Sopuerta (NSF Center for Gravitational Wave Physics**) and collaborators have developed a new tool to investigate oscillations in neutron stars born in supernova explosions. These oscillations are a potential source of gravitational radiation for the NSF's LIGO gravitational wave observatory.**



Credit: NASA/Chandra X-ray Center/Penn State University. Image not from the this work.

- "Since the discovery of pulsars in the sixties neutron stars have acquired a special status in physics: as supernovae remnants they are fundamental to our understanding of the final stages of evolution and fate of upper main sequence stars: as the most compact observed objects they are a test-bed for strong-field gravity. Either as isolated objects or in binary systems neutron stars are important gravitational wave sources."

- A supernova explosion leaves the resulting neutron star ringing with pulsations primarily in the radial direction. "Radial pulsations of a spherical compact object do not *per se* emit gravitational waves, but if the coupling is efficient in driving and possibly amplifying the non-radial modes, gravitational radiation could then be produced to a significant level."

Quoted excerpts from Passamonti, Bruni, Gualtieri and Sopuerta, gr-qc 0407108, 2004.

What Next? - The formalism which resulted from this effort will be numerically implemented to better understand if the radial and non-radial coupling can lead to new effects that produce a significant amount of gravitational radiation.

The NSF Center for Gravitational Wave Physics at The Pennsylvania State University
is supported under cooperative agreement PHY 01-14375, L.S. Finn P.I.