

Phases of Neutron Star Matter

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Rm 184 NSH

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Neutron stars are unique laboratories for nuclear physics. While the outer crust of the neutron star is expected to be a lattice of ions, the core is expected to be uniform nuclear matter. In the inner crust, near the nuclear saturation density, a nuclear phase transition must exist where nuclei are deformed and adopt exotic geometries. These geometries include long cylinders and slabs, and are called 'nuclear pastas.' In this talk, I will describe the theory of nuclear pasta structures and our recent efforts to study them with molecular dynamics simulations. Specifically, I will discuss how pasta might impact oscillations and crust breaking phenomena, magnetic field decay and star cooling, and r-process nucleosynthesis in neutron star mergers.