



Italian delicacies served up in a neutron star crust

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The matter in the outermost layer, or “crust,” of a neutron star (the remnant of a supernova) is believed to host a variety of phases in which dense regions of nucleons are filled with voids of lower density. The presence of the phases, euphemistically referred to as “nuclear pasta” because of their resemblance to the shapes of lasagna, gnocchi, and spaghetti, may affect the emission of neutrinos, the primary mechanism by which the neutron star cools. In this work, molecular dynamics and a set of topological and geometric descriptors (volume, area, mean curvature, and its Euler characteristic—a number that represents the phase’s topology) are used to accurately identify the pasta phases predicted by dynamical simulations, a labeling scheme that could be used to directly map the shape of a pasta phase to its effect on neutrino emission and neutron star cooling.

Ref. <https://physics.aps.org/synopsis-for/10.1103/PhysRevC.86.055805>

