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Simulations of the Neutron Gas in the Inner Crust of Neutron Stars[1] ELIZABETH VANDEGRIFF, Taylor Univ, CHARLES HOROWITZ, MATTHEW CAPLAN, Indiana Univ — Inside neutron stars, the structures known as "nuclear pasta" are found in the crust. This pasta forms near nuclear density as nucleons arrange in spaghetti- or lasagna-like structures to minimize their energy. We run classical molecular dynamics simulations to visualize the geometry of this pasta and study the distribution of nucleons. In the simulations, we observe that the pasta is embedded in a gas of neutrons, which we call the "sauce." In this work, we developed two methods for determining the density of neutrons in the gas, one which is accurate at low temperatures and a second which justifies an extrapolation at high temperatures. Running simulations with no Coulomb interactions, we find that the neutron density increases linearly with temperature for every proton fraction we simulated.

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