

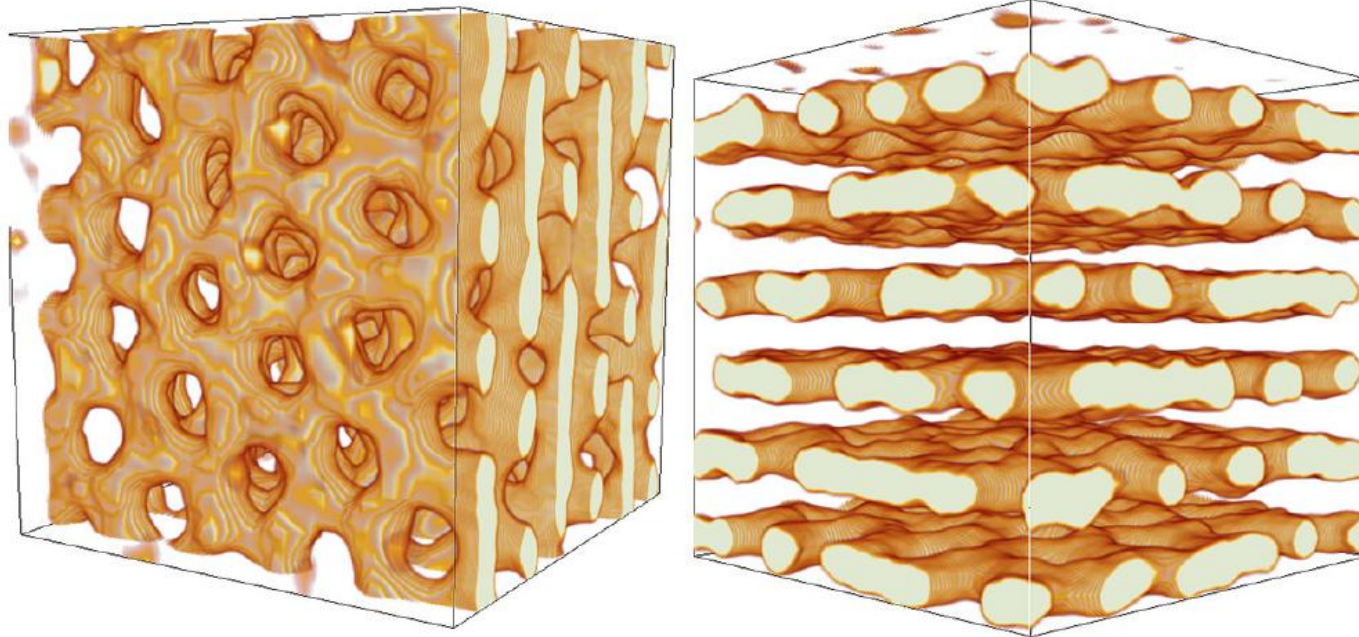
# Nuclear Waffles in Neutron Star Crust

## Objectives

- Use large scale GPU computing to perform detailed MD simulations of dense neutron rich matter.
- Explore complex nuclear pasta phases in the crust of neutron stars.

## Impact

- Complex structures reduce thermal and electrical conductivities of crust impacting radio and X-ray observations of neutron stars.
- Popular article in New Scientist: [“Inside exotic dead stars are piles of waffles”](#)



(Image: Andre Da Silva Schneider)

## Accomplishments

1. MD simulations with 50,000 to 400,000 nucleons for up to  $10^8$  time steps.
2. Found new complex pasta phases including “waffles” of flat plates with two-d arrays of holes, caused by interplay between nuclear attraction and Coulomb repulsion.



U.S. DEPARTMENT OF  
**ENERGY**

Office of  
Science

**NUCLEI**  
Nuclear Computational Low-Energy Initiative

**Reference:** ArXiv.org/abs/1409.2551

**Contact:** C. J. Horowitz, horowit@indiana.edu