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Bridging Nuclear Physics and Astrophysics with the Nuclear Symmetry Energy[1]

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The nuclear symmetry energy, a critical input for nuclear structure, heavy-ion collisions, and several astrophysical processes, is the most uncertain aspect of the nucleon-nucleon interaction. In this talk, I describe how recent experiments and observations are constraining the symmetry energy and building bridges between terrestrial experiments and astronomical observations. From the observational side, neutron star cooling, mass and radius measurements, and oscillations in magnetar flares will be discussed. These astrophysical properties are connected, through the nuclear symmetry energy, to the structure of neutron-rich nuclei, intermediate-energy heavy-ion collisions, and the neutron skin thickness of lead. As a result of these connections, a clear preference for a softer symmetry energy and smaller neutron star radii will be demonstrated. Most importantly, I will show that future experiments and observations can quantitatively improve our understanding of the symmetry energy and thus the nucleon-nucleon interaction.

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