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Elucidating the Symmetry Energy of Nuclear Matter with Heavy-ion Reactions[1]

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The equation of state (EOS) of nuclear matter is of fundamental importance to both nuclear physics and astrophysics. While there has been significant progress in understanding the EOS of symmetric nuclear matter, there is still considerable uncertainty in the EOS of asymmetric nuclear matter. Our understanding of the density dependence of the nuclear symmetry energy is limited. Understanding the EOS for dense neutron-rich matter in neutron stars was identified as an important scientific objective in the 2002 and 2007 Long Range Plans for Nuclear Science. Heavy-ion reactions induced by neutron-rich nuclei have a crucial role to play in reaching this objective. Recent and planned experiments are setting constraints on the symmetry energy at densities and temperatures away from normal nuclear matter.

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