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A NICER View: Astrophysics and Exploration from the International Space Station

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Neutron stars are extraordinary in nearly every way. They are made of the densest stuff in the universe, their gravity is immense, and they are the most powerful magnets known. Some sweep narrow beams of radiation through space as they spin, often as fast as blender blades, appearing to flash with unrivaled regularity like cosmic timepieces. Launched in June 2017, NASA's dual-purpose Neutron star Interior Composition Explorer (NICER) mission aims to answer longstanding questions about the physics and astrophysics of neutron stars, with a telescope on the International Space Station designed to investigate their X-ray emissions and time their pulsations precisely. The mission's second purpose is a first-ever demonstration of autonomous spacecraft navigation using neutron stars as beacons in a "Galactic Positioning System." This presentation provides an overview of the NICER mission, its SEXTANT navigation demonstration, and the insights that NICER is delivering about the physics of neutron stars, black holes, and the high-energy processes that they drive.