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The Golden Age of Neutron Stars

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Neutron stars were first posited in the early thirties, and discovered as pulsars in the late sixties; however we are only recently beginning to understand the matter they contain. I will describe the ongoing development of a consistent picture of the liquid interiors of neutron stars, now driven by ever increasing observations as well as theoretical advances. These include in particular observations of at least three heavy neutron stars of about 2.0 solar masses and higher; ongoing simultaneous inferences of masses and radii of neutron stars by the NICER telescope; and past and future observations of binary neutron star mergers, through gravitational waves as well as across the electromagnetic spectrum. Theoretically an understanding is emerging in QCD of how nuclear matter can turn into deconfined quark matter in the interior, and be capable of supporting heavy neutron stars, which I will illustrate with a discussion of modern quark-hadron crossover equations of state.

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