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Matter under extreme conditions and its role in explosive astrophysical phenomena

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Neutron stars host some of the most spectacular explosions in the universe. These include core-collapse supernova, thermonuclear bursts on accreting neutron stars, and flares on highly magnetized neutron stars called magnetars. Over the past decade attempts to model these phenomena have helped us understand how the properties of matter at extreme density shape these explosions. In my talk I will describe recent progress in theories of dense neutron star matter and how they influence explosive phenomena on neutron stars. The interplay between dense matter theory, astrophysical simulations and observations can test theoretical predictions for the phase structure and properties of matter at extreme density. I will briefly describe the connection between observations that can tell us mass, radius and temperature of neutron stars and the dense matter equation of state.