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Regularization of instabilities in gravity theories FETHI M RAMAZANOGLU, Koc University — Known experimental bounds require any alternative theory of gravity to closely imitate general relativity (GR) in the weak-field regime. On the other hand, the limited precision of gravitational wave parameter estimation prefers modifications with large deviations in strong fields for ease of detectability. Spontaneous scalarization phenomenon in scalar-tensor theories is a well-known alternative to GR that satisfies both criteria. In this case, neutron stars grow large scalar fields due to a tachyonic instability that lead to order-of-unity deviations from GR, whereas they die off away from the star satisfying weak field limits. I will explain how the underlying mechanism of spontaneous scalarization, an instability regularized by nonlinear effects, can be generalized to other fields such as vectors, and other instabilities such as ghosts. This family of theories has the desired behavior in both weak and strong fields, and makes connections to Horndeski theories and massive gravity. These novel theories have the appeal of near-future detectability using gravitational waves, and I will discuss how compact object mergers can be used to test them.

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