

Numerical relativity, exotic compact objects, and fundamental physics

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In this talk I will review some recent results in the field of numerical relativity and exotic compact objects described by fundamental fields. First, I will present numerical simulations of the superradiance instability around black holes showing that the endpoint of such instability is the formation of hairy black holes. Second, I will discuss the possibility that the gravitational-wave event GW190521 is a bosonic star merger. Finally, I will show that a flux of circularly polarized gravitational waves in binary black hole mergers can trigger the spontaneous creation of photons with net circular polarization from the quantum vacuum. By solving the fully non-linear Einstein's equations with numerical relativity, we evaluate the net effect.