From Schwarzschild to General Relativity: modeling physical phenomena with the help of geometry

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Abstract: The Schwarzschild spacetime is the unique spherically symmetric static vacuum solution of the Einstein equations of General Relativity. It played an important role in the discovery of novel physical phenomena such as black holes and photon spheres. Moreover, it is used as a reference case in the mathematical modeling of physical quantities, for example in the definition of the center of mass of an asymptotically flat slice of a spacetime. In the talk, I will present three results extending and/or utilizing the properties of the Schwarzschild spacetime: a characterization of equipotential surfaces in static vacuum spacetimes, a uniqueness theorem for photon spheres in static vacuum spacetimes, and an example of a hypersurface of the Schwarzschild spacetime the center of mass of which behaves very unexpectedly. The last result is joint work with Christopher Nerz.