I will present recent work of Bruce Kleiner and myself in which we classify the homotopy type of all spherical and hyperbolic 3-manifolds, with the exception of $\mathbb{RP}^3$ in the spherical case. This partially resolves the Generalized Smale Conjecture in the spherical case and reproves a theorem due to Gabai in the hyperbolic case.

Our proof is based on a new uniqueness theorem for singular Ricci flows, which we have established in previous work. Singular Ricci flows were introduced by Kleiner and Lott and are similar to Perelman’s Ricci flows with surgery, as used in his resolution of the Poincaré and Geometrization Conjectures. In contrast to Perelman’s surgery process, which is carried out at a positive scale and depends on a number of auxiliary parameters, a singular Ricci flow is more canonical, as it “flows through surgeries” at an infinitesimal scale. Our uniqueness theorem allows the study of continuous families of singular Ricci flows, providing important information on the diffeomorphism group of the underlying manifold. (Received August 13, 2018)