The talk begins with an introduction to the basics of Ricci flow equation for Riemannian metrics on a smooth manifold originally introduced by Hamilton. Perelman was able to use this equation to prove a conjecture of Thurston's about the nature of all 3-dimensional manifolds.

The main technical issue that Perelman had to overcome is the existence of finite-time singularities. He gave a qualitative, geometric result about the nature of the regions near these singularities. From this he was able to see how to do surgery, cutting out the singularities as they develop, allowing him to continue the flow for all forward time. Perelman went on to show that at infinity the metric is sufficiently homogeneous that one can deduce the structure of the manifold, leading to a complete topological classification on 3-manifolds.