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Mean curvature flow through singularities

A family of surfaces moves by mean curvature flow if the velocity at each point is given by the mean curvature vector. Mean curvature flow first arose as a model of evolving interfaces and has been extensively studied over the last 40 years. In this talk, I will give an introduction and overview for a general mathematical audience. To gain some intuition we will first consider the one-dimensional case of evolving curves. We will then discuss Huisken's classical result that the flow of convex surfaces always converges to a round point. On the other hand, if the initial surface is not convex we will see that the flow typically encounters singularities. Getting a hold of these singularities is crucial for most striking applications in geometry, topology and physics. In particular, we will see that flow through conical singularities is highly nonunique, but flow through neck singularities is unique. Finally, I will report on recent work with various collaborators on the classification of noncollapsed singularities in R^4.