**Ancient solutions of mean curvature flow**

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Ancient solutions appear as singularity models of mean curvature flow. In this talk, I will discuss the classification of some ancient noncollapsed solutions of mean curvature flow, which are flows of certain convex hypersurfaces driven by mean curvature vector and are defined from negative infinity time. The problem of classifying ancient mean curvature flow can be regarded as the parabolic version Bernstein problem whose elliptic version is stated for minimal surfaces. First, the classification program splits into cases according to the rank of cylindrical matrix appearing in the sharp asymptotics of profile functions (joint work with Robert Haslhofer and my joint work with Jingze Zhu). Then, I will discuss classification in the vanishing rank case (joint with Robert Haslhofer and joint with Jingze Zhu), and classification in the full rank case in $\mathbb{R}^4$ (joint with Beomjun Choi, Toti Daskalopoulos, Robert Haslhofer and Natasa Sesum). In the first case the ancient solutions are either cylinders or some lines times round bowl. In the second case the ancient solutions are called as 2-ovals (aka bubble-sheet ovals) in $\mathbb{R}^4$ and they are either the unique $O(2) \times O(2)$-symmetric ancient oval constructed by White, Haslhofer-Hershkovits or belong to the one-parameter family of $Z_2^2 \times O(2)$-symmetric ancient ovals constructed by Robert Haslhofer and myself. In the end, I will also point out some future directions.