1135-35-1855   **Peiyong Wang*** (`pywang@math.wayne.edu`), 656 W.Kirby, 1150 FAB, Department of Mathematics, Wayne State University, Detroit, MI 48202. *Symmetry and approximate symmetry for a singularly perturbed free boundary problem.*

In this talk, we study the symmetric properties of a problem arising from energy industry. In the first step, we apply the moving plane method over a ring in a new way with an idea of adding a dominating symmetric function to overcome the lack of radial monotonicity that we thought of. In the second step, we prove the approximate symmetric in a ring-like domain. In this part, the main difficulty is the absence of the elliptic comparison principle. However, we prove a parabolic comparison principle so that we can abstract comparable radially symmetric functions through an evolution to approximate the solution over a ring-like domain. Thus proves the free boundary of the solution is restricted in a thin ring. Our two main methods as well as the results are new and seem promising in application in other related problems. (Received September 25, 2017)