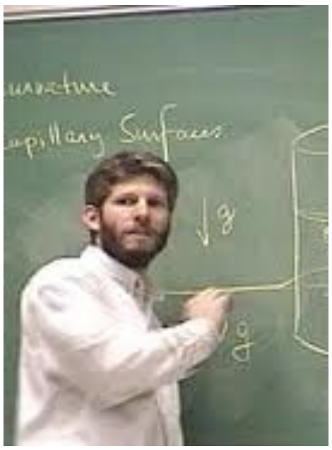
TEXAS STATE UNIVERSITY

The rising STAR of Texas

MATH DEPARTMENT COLLOQUIUM



Dr. John McCuan

Department of Mathematics

Georgia Institute of Technology

Friday, April 29, 2016

3:30 – 4:30 PM

DERR 329

Stationary partitioning in certain grain boundary problems

Certain materials form geometric structures called "grains" in which one finds distinct volumes of the same semi-solid material that touch but do not mix. This can happen with semi-molten copper and something like this can also happen with liquid crystals (which are used in some calculator display screens). People who try to analyze such systems tend to be interested in the motion of the boundaries between grains (which are often modeled by mean curvature flow) and the motions of the exterior surfaces of grains (which are often modeled by surface diffusion flow). Surfaces of constant mean curvature can be stationary for both flows and can be pieced together to obtain stationary or equilibrium configurations. The surfaces of constant mean curvature which are axially symmetric have been classified. Grain boundaries are not usually axially symmetric, but I will describe a model situation in which they are and one can study the resulting equilibria. I will give a very informal introduction to the flow problems mentioned above, describe the classification of axially symmetric constant mean curvature surfaces, and indicate some reasonable questions one can ask about such problems. This is related to joint work with Amy Novick-Cohen.

Bio: John McCuan is a mathematician who works in the areas of differential geometry and partial differential equations. He is particularly interested in two-dimensional surfaces in three-dimensional space, problems of prescribed mean curvature, and the field of equilibrium capillarity. Capillarity (in the mathematical sense) is the study of the surfaces of liquids in contact with solid structures. These surfaces typically have mean curvature prescribed by bulk field forces, like gravitational or centripetal fields, and meet the walls of rigid structures on prescribed angles. His recent interests have included the accurate modeling of floating objects subject to surface tension and energetic considerations of wetting.