SPENCER LOCKE AND HAYLEY MONSON, McMaster University
The Saturn Ring Defect for Two Colloidal Particles

The study of nematic liquid crystals and the defects that arise due to various energy configurations has been of great interest to both mathematicians and physicists alike. In particular, it has been shown in the physics literature that there are several varieties of line defects which can be studied using a plethora of mathematical and physical models. In their 2016 paper, Alama, Bronsard & Lamy showed, using the Landau-de Gennes model for liquid crystals in a particular regime, that for a single spherical colloid immersed within such a nematic material, a ring defect is formed when the particle is sufficiently small, called the 'Saturn ring defect'. They also showed that the defect is formed at the positions where there is an exchange of the dominant eigenvalues from the Q-tensor. This tensor is the solution to the Laplace equation with Dirichlet boundary conditions on the particle. In this poster presentation, we will summarize the mathematics behind the Saturn ring defect, and we will present our extended problem analyzing the ring defect(s) that may arise for two colloidal particles. We will describe how, in this case, changing the domain to bispherical coordinates allows us to obtain an analytic solution for the Q-tensor. We will conclude by demonstrating how we can use our series solution to explicitly and numerically map the structure of the defects in the planar region situated exactly halfway between the colloids. We will also pinpoint the locations of the dominant eigenvalues and find where they cross.