**Title:** Exploring symplectic embeddings and symplectic capacities

**Project Leader:** Kyler Siegel

**Abstract:** Given a domain (e.g. a ball) in Euclidean space, we can ask what is its volume. We can also ask when one domain can be embedded into another one without distorting volumes. These questions are quite classical and considered well-understood. On the other hand, symplectic geometry provides new and interesting twists on these questions. Symplectic geometry is a type of geometry which lies at the crossroads of topology and differential geometry and describes classical mechanical systems and many other physical systems.

For a domain in Euclidean space, we can talk about its "symplectic capacity". The symplectic capacity of a domain is formally similar to volume but much more mysterious, related to fundamental constraints on physical systems which have been emerging in the last few decades. We can also ask when one domain "symplectically embeds" into another one. There are some very deep results about when when one domain symplectically embeds into another one, but this question is still largely open, even for very simple domains. Luckily, we have many powerful tools to answer these questions, including recently discovered methods for algorithmically computing sympletic capacities. In this project, we will explore these questions in lots of examples and try to prove new results.

Depending on the interests of the group, we may pursue theoretical techniques and/or computer methods.