

BI-CO MATHEMATICS COLLOQUIUM

Dr. Bülent Tosun

Institute for Advanced Study (Princeton)
and the University of Alabama



“From Unknotted Curves on Seifert Surfaces to Contractible 4-manifolds”

Monday, April 8, 2024

Talk at 4:15 PM – Park 245

Reception at 4:00 PM – Park 361, Math Lounge

Abstract:

It is a fundamental result in geometric topology that every closed 3-dimensional manifold can be realized as the boundary of a 4-dimensional manifold, and many 4-dimensional manifolds with different topology can have the same boundary. A difficult problem, for a given closed 3-dimensional manifold, is to find a 4-dimensional manifold with the smallest possible topology (e.g. contractible) that the 3-manifold bounds. This fits under the problem of embedding 3-dimensional manifolds into 4-dimensional Euclidean space which has a rich history and proved to be tremendously important for the development of geometric topology since the 1950s.

In this talk, I will provide further context and motivations for the problem above. Next, I will introduce a seemingly different problem where we will try to understand curves on Seifert surfaces of knots in three-dimensional sphere (lots of pictures, lots of fun). Finally, we will see how the progress in the previous step will help us to construct many 3-manifolds that bound contractible 4-manifolds. The talk will feature some recent results which were obtained with REU students at the speaker's home institution.

BRYN MAWR COLLEGE