

**Bülent Tosun**

**Title: Symplectic and complex geometric aspects of the 3-manifold embedding problem in 4-space**

**Abstract:** The problem of embedding one manifold into another has a long, rich history, and proved to be tremendously important for development of geometric topology since the 1950s. In this talk I will focus on the 3-manifold embedding problem in 4-space. Given a closed, orientable 3-manifold  $Y$ , it is of great interest but often a difficult problem to determine whether  $Y$  may be smoothly embedded in  $R^4$ . This is the case even for integer homology spheres, and restricting to special classes such as Seifert manifolds, the problem is open in general, with positive answers for some such manifolds and negative answers in other cases. On the other hand, under additional geometric considerations coming from symplectic geometry (such as hypersurfaces of contact type) and complex geometry (such as the boundaries of holomorphically and/or rationally convex Stein domains), the problems become tractable and in certain cases a uniform answer is possible. For example, recent work shows for Brieskorn homology spheres: no such 3-manifold admits an embedding as a hypersurface of contact type in  $R^4$ , which is to say as the boundary of a region that is convex from the point of view of symplectic geometry. In this talk I will provide further context and motivations for this result, and give some details of the proof. This is joint work with Tom Mark.