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## **Minimal Surfaces with Free Boundary and Geometric Applications**

Minimal surfaces have been a very useful tool in studying 3-manifold topology and geometry since the pioneering work of Schoen–Yau. When the 3-manifold  $M$  possesses a boundary, it is natural to look at minimal surfaces with free boundary. In this talk, I will first describe a very general existence result for properly embedded minimal surfaces with free boundary. When the 3-manifold satisfies some curvature and boundary convexity assumptions, we show that the space of these minimal surfaces with a fixed topological type is compact in a very strong sense. As a geometric application, we prove a rigidity result for bounded convex domains in  $\mathbb{R}^3$  in terms of the area of a minimal surface which realize the “width” of the convex domain. If time permits, I will indicate some potential applications to mean curvature flow in  $\mathbb{R}^3$ .