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Minimal Surfaces Defined by Extremal Eigenvalue Problems

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Minimal surfaces in spheres are characterized by the condition that their embedding functions are eigenfunctions on the surface with its induced metric. The metric on the surface turns out to be an extremal for the eigenvalue among metrics on the surface with the same area. In recent decades, this extremal propertyhas been used to construct new minimal surfaces by eigenvalue maximization. There is an analogous theory for minimal surfaces in the euclidean ball with a free boundary condition. In this talk we will describe new work that generalizes this idea to products of balls. We will describe the general theory and apply it in a specific case to explain and generalize the Schwarz p-surface, which is a free boundary minimal surface in the three dimensional cube with one boundary component on each face of the cube. We will show how the method can be used to construct such surfaces in rectangular prisms with arbitrary side lengths.

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