

# Colloquium

University of Notre Dame  
Department of Mathematics

**Speaker:** Mikhail Karpukhin

California Institute of Technology  
(CALTECH)

**Will give a lecture entitled**  
Eigenvalues and minimal surfaces

**Date:** Tuesday, February 1, 2022

**Time:** 4:00 PM

**Location:** Zoom

**Zoom URL:** [notredame.zoom.us/j/99689681370?  
pwd=LzdlbXI2d2hZdHBrouZmOEJYbHhqQT09](https://notredame.zoom.us/j/99689681370?pwd=LzdlbXI2d2hZdHBrouZmOEJYbHhqQT09)

**Departmental Tea:** Tea in Room 257 (lounge in Hurley Hall) at 3:30 p.m.

## Abstract:

Eigenvalues of the Laplace operator of Euclidean domains govern many physical phenomena, including heat flow and sound propagation. In particular, various inequalities for Laplace eigenvalues have fascinated mathematicians since XIXth century. The following question was first formulated by Lord Rayleigh in his “Theory of sound”: which planar domain of given area has the lowest first Dirichlet eigenvalue? This is an example of an isoperimetric eigenvalue problem for planar domains. The focus of the present talk is on more general isoperimetric problems, where one considers surfaces equipped with Riemannian metrics. More specifically, sharp upper bounds for Laplace and Steklov eigenvalues have been an active area of research for the past decade, largely due to their fascinating connection to fundamental geometric objects, minimal surfaces. We will survey recent results exploring the applications of this connection both to minimal surface theory and to isoperimetric eigenvalue problems, culminating in a surprising link between Laplace and Steklov spectra.

