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# Erwin Schrödinger Lecture

**Douglas N. Arnold** / University of Minnesota

## Wave localization and its landscape

**Monday, December 16, 2019, 17:00**

Boltzmann Lecture Hall

Erwin Schrödinger Institute



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**Douglas N. Arnold** is the McKnight Presidential Professor of Mathematics at the University of Minnesota. He is a research mathematician and educator specializing in computational mathematics. Prof. Arnold's research interests include numerical analysis, partial differential equations, mechanics, and in particular, the interplay between these fields. From 2001 through 2008, Prof. Arnold served as director of the Institute for Mathematics and its Applications (IMA) and, in 2009 and 2010, as President of the Society for Industrial and Applied Mathematics (SIAM).

### Abstract

The puzzling phenomenon of wave localization refers to unexpected confinement of waves triggered by disorder in the propagating media. Localization arises in many physical and mathematical systems and has many important implications and applications. A particularly important case is the Schrödinger equation of quantum mechanics, for which the localization behavior is crucial to the electrical properties of materials. Mathematically it is tied to exponential decay of eigenfunctions of operators instead of their expected extension throughout the domain. Although localization has been studied by physicists and mathematicians for the better part of a century, many aspects remain mysterious. In particular, the sort of deterministic quantitative results needed to predict, control, and exploit localization have remained elusive. This talk will focus on major strides made in recent years based on the introduction of the landscape function and its partner, the effective potential. We will describe these developments from the viewpoint of a computational mathematician who sees the landscape theory as a completely unorthodox sort of a numerical method for computing spectra.

The Erwin Schrödinger Lectures are directed towards a general audience of mathematicians and physicists. In particular it is an intention of these lectures to inform non-specialists and graduate students about recent developments and results in some area of mathematics or physics. The lecture will be followed by a reception.

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