



LUDWIG-  
MAXIMILIANS-  
UNIVERSITÄT  
MÜNCHEN

ARNOLD SOMMERFELD  
CENTER FOR THEORETICAL PHYSICS



# Arnold Sommerfeld Lecture Series

Professor Mehran Kardar

MIT, USA

Public Lecture:

## The Force of Nothing: Attraction and Repulsion in the Quantum Void

Quantum physics teaches us that even the emptiest vacuum is teeming with fluctuations of electromagnetic fields. When these fluctuations are confined between objects, they produce measurable forces: *the Casimir effect* describes an attraction between uncharged conductors arising solely from the confinement of the quantum void. In this talk, I will explore how this subtle quantum phenomenon connects to ideas of attraction, repulsion, and mechanical work. After introducing the origin and measurement of the Casimir force, I will discuss whether it can be made repulsive, and why true levitation remains elusive in equilibrium. Extending these ideas beyond equilibrium reveals new possibilities: radiation pressure from heat, nonreciprocal materials that generate motion and work without contact, and rotating bodies that spontaneously emit light. Together, these examples show how the restless quantum vacuum continues to surprise us.

Tuesday, January 13, 2026, 17:15 h, Room B052, Theresienstr. 39, LMU

Prof. Erwin Frey