PHYSICAL MATHEMATICS SEMINAR

Fluidic Shaping of Optical Components on Earth and in Space

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ABSTRACT:

Current methods for fabricating lenses or mirrors rely on mechanical processing - such as grinding, machining, and polishing. The complexity of these fabrication processes and the required specialized equipment prohibit rapid prototyping of optical components, and puts a very high price tag on large lenses and freeform optics.

I will present a theoretical and experimental study where we leverage the basic physics of interfacial phenomena for rapidly fabricating a variety of lenses and freeform optical components with optical-grade surface quality and without the need for any mechanical processing. A key component in the process is the elimination of body forces through neutral buoyancy conditions yielding a method that is scale-invariant: it can be used to produce lenses of any size, while preserving the surface quality. I will show that the steady-state shape of fluidic lenses near neutral buoyancy conditions can be obtained by minimizing the free energy functional of the system, allowing to design various freeform optical topographies.

Lastly, I will discuss our collaboration with NASA on the use of this technology of in-space fabrication of optics and for the creation of large space telescopes that overcomes launch constraints.

TUESDAY, SEPTEMBER 21, 2021
2:30 PM – 3:30 PM
Building 2, Room 449

https://math.mit.edu/sites/pms/

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- **remember to keep your mask on while inside buildings**
- **eating food is not allowed within lecture rooms**

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