

MECHANICAL ENGINEERING PhD SEMINAR

Thursday, September 24 2026 at 13:30, Lady Davis Building, Auditorium 250

Shaping liquids into optical components based on interfacial phenomena

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The existing methods for fabricating lenses or freeform optics rely on mechanical processing such as grinding, machining, and polishing, or on molding. The complexity of these fabrication processes prohibits rapid prototyping of optical components, and produces tremendous amounts of non-recyclable polymer waste.

In this talk, I will present a new method for optical fabrication that is based on a completely different approach - the manipulation of liquid interfaces. We will see how, under effectively weightless conditions (which we achieve in the lab using neutral buoyancy), surface tension forces can be harnessed to shape liquid volumes into useful optical components. I will show how the shape of the liquid interface can be controlled through geometrical boundary conditions and through hydrodynamic forces. I will present the fabrication process and show how a liquid volume can be shaped into a solid optical component within minutes, without the need for polishing or any other mechanical process. I will also discuss the theory behind the method, which is based on energy minimization that accounts for hydrodynamic, buoyancy, and surface tension effects, subject to geometrical constraints. Finally, I will show, both theoretically and experimentally, how this approach can be applied to the fabrication of ophthalmic lenses with any prescription.

This method has the potential to replace mechanical processing, eliminate dependence on heavy infrastructure, and provide new fabrication capabilities for both research and industrial applications, while also providing accessibility to eyewear in low resource regions of the world.

Note: the seminar will be given in English