

## MECHANICAL ENGINEERING STUDENT SEMINAR

**Thursday, July 17 2025 at 13:30**, D. Dan and Betty Kahn Building, Room 217.

**Online:** <https://technion.zoom.us/my/lomer>

### **Experimental approaches for the creation and real-time metrology of liquid lenses and mirrors in microgravity**

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Optical components are essential for space applications, yet their fabrication remains constrained by Earth-based manufacturing methods. In this seminar, I will present recent advances in creating and characterizing liquid-based optical elements directly in microgravity, focusing on the experimental formation and real-time metrology of liquid lenses and mirrors.

I will first discuss parabolic flight experiments where we formed liquid lenses by injecting optical liquids into circular frames during microgravity. In these flights, we successfully created more than twenty lenses and measured them *in-situ* using resolution target imaging and Shack–Hartmann wavefront sensing. These measurements confirmed the lenses' spherical geometry and optical functionality within the short duration of each microgravity maneuver.

I will then describe our creation and characterization of liquid mirrors, including reflective surfaces made of gallium alloys and ionic liquids, formed under microgravity in the Fluidic Telescope (FLUTE) project. Using specialized experimental capsules and integrated optical metrology systems, we validated that pinned liquid mirrors achieved the expected spherical shapes, demonstrating their feasibility for future large-aperture space telescopes.

Finally, I will present results from experiments aboard the International Space Station, where UV-curable liquid lenses were fabricated and solidified in orbit, alongside demonstrations of large-scale water lenses.

Together, these works establish the potential for manufacturing optical elements in space while simultaneously performing *in-situ* optical characterization—a capability that could enable on-demand fabrication of optics in space and support the construction of next-generation liquid-based telescopes beyond current launch constraints.

Note: the seminar will be given in English