

# Opening a Liquid Route to Fusion

A laser experiment provides a proof-of-principle test for an alternative fusion concept that uses targets made with liquid fuel rather than conventional frozen fuel.

By **Michael Schirber**

Inertial confinement fusion (ICF) generates nuclear reactions by focusing multiple laser beams on a small hydrogen-fuel target. The conventional method calls for the fuel to be frozen into a spherical shell, which collapses and ignites under bombardment by the laser pulse. The fabrication of frozen shells is difficult and costly, prompting researchers to propose an alternative method in which liquid fuel is injected into a foam capsule. The target is expected to develop into a spherical shell when struck with a sequence of laser pulses, before collapsing and igniting as frozen targets do. A new experiment represents a preliminary test of this dynamic shell formation (DSF) concept, showing that firing laser beams at a foam capsule—without fuel—does indeed form a shell [1].

Recent ICF experiments have crossed milestones (see [Research News: Gaining Ground in Nuclear Fusion](#)), but the technology is still far from being a source of clean energy. One of the main roadblocks is target fabrication. “An ICF power plant will require

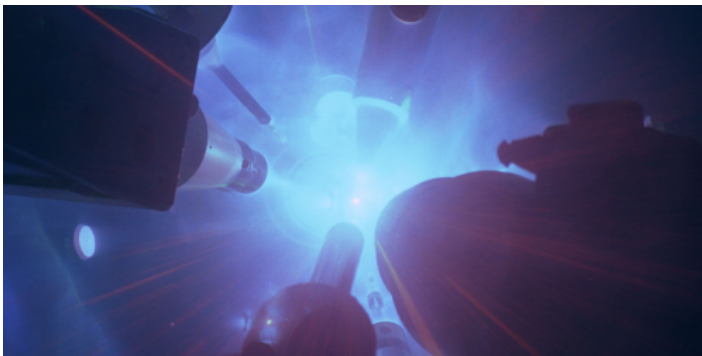
nearly a million targets per day,” says Igor Igumenshchev from the University of Rochester in New York. Current frozen targets are too costly and impractical for mass production. DSF liquid targets, by contrast, should be less demanding to make.

In their preliminary test, Igumenshchev and colleagues placed a spherical piece of foam in the target region of the OMEGA laser facility at the University of Rochester. They showed that a carefully selected sequence of pulses concentrated the foam into a spherical shell, as envisioned in the DSF scheme. The current setup is unable to generate fusion—such a test will have to wait for future laser facilities that can provide longer, more energetic pulses.

Michael Schirber is a Corresponding Editor for *Physics Magazine* based in Lyon, France.

## REFERENCES

1. I. V. Igumenshchev *et al.*, “Proof-of-principle experiment on the dynamic shell formation for inertial confinement fusion,” *Phys. Rev. Lett.* **131**, 015102 (2023).



Credit: University of Rochester Laboratory for Laser Energetics