



# “I’m reaching for the stars”

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**Dr. Andrea “Annie” Kritcher** is a nuclear engineer and physicist on the National Ignition Facility at Lawrence Livermore National Laboratory in California. For the December 2022 experiment, she designed the capsule that contained the deuterium and tritium fuel

I’ve always wanted to do something that benefits humanity, and Lawrence Livermore National Laboratory is where I found the opportunity. Nuclear fusion is considered the holy grail of the quest to generate potentially unlimited amounts of clean energy. My team and I have recently come one decisive step closer to this vision.

Nuclear fusion reactions cause stars like the sun to radiate energy. So in our experiments, it’s a bit like igniting a miniature sun in the lab. Late last year, we fired 192 lasers at a peppercorn-sized capsule filled with a fuel composed of the hydrogen isotopes deuterium and tritium. The material was heated to 140 million degrees Celsius—ten times hotter than the interior of the sun. The heat causes the fuel capsule to collapse further and further in on itself. The resulting pressure is so enormous that the hydrogen nuclei fuse together to form helium. This all happens in fractions of a second and releases huge amounts of energy.

What’s special about our experiment is that, for the first time, the fusion of atomic nuclei has succeeded in releasing more energy than was needed to trigger the reaction. This means that fusion power plants have the potential to reduce our dependence on fossil fuels. In addition, they do not release greenhouse gases. There are also no supply bottlenecks: Deuterium is found in large quantities in seawater, and tritium can be produced in the fusion reactor.

When I was a child, I never thought I would literally reach for the stars. The fact that I can do this today is mainly thanks to my parents, who have always supported me in pursuing my goals. The task now is to further increase the efficiency of nuclear fusion in order to come another step closer to creating a sustainable nuclear fusion reactor. —