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Incredible shrinking 3D printer can make really tiny objects



Basic lab equipment can produce minuscule 3D-printed objects

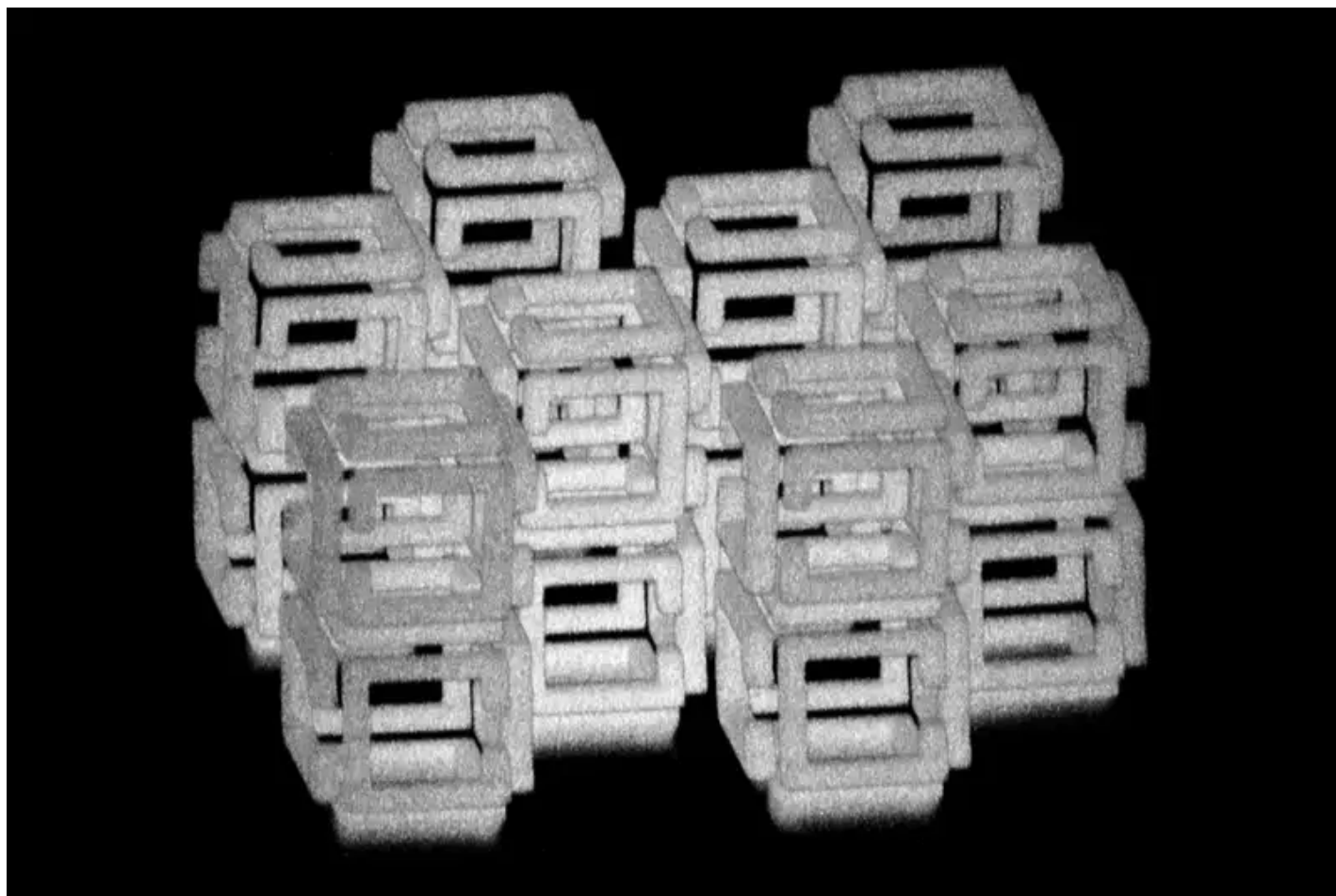
Ed Boyden and colleagues

By Douglas Heaven

Making minuscule objects is hard – far easier to make bigger things and then shrink them. That’s the idea behind a 3D printing technique called implosion fabrication.

The method can be used to produce a variety of shapes, from tiny hollow spheres to microscopic linked chains. It also works with different materials, including plastics, metals and DNA.

Most nanostructures are created in layers using 3D printing. This works for flat structures or for shapes, such as pyramids, that can be built from the bottom up, but more complex structures need a different



A 3D pattern created using implosion fabrication

Ed Boyden and colleagues

approach.

Ed Boyden at the Massachusetts Institute of Technology and his colleagues discovered they could reverse an existing technique to do the job. They previously developed a method for magnifying small details in brain tissue by embedding it in another material and then expanding it – reversing this gave them a way to make big things small.

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To test the idea, the team made scaffolds out of polyacrylate, an absorbent material used in nappies, and built centimetre-sized structures inside by sticking molecules to anchor points using lasers. These were then shrunk by to one thousandth of the original volume by applying an acid.

The researchers created objects, such as hollow linked cubes and an etching of *Alice in Wonderland*, using the method. Each was around 1 cubic millimetre in size, containing structural details of around 50 nanometres.

But Boyden thinks it can go much smaller. In a handful of tests, they were able to expand and shrink the structure by 8000 times.



Alice in Wonderland created using implosion fabrication before and after shrinking

Ed Boyden and colleagues

One immediate use of the implosion fabrication might be to make smaller, higher resolution optical lenses, such as for use in self-driving cars that will need lots of cheap and tiny cameras, says Boyden. But since the technique only requires basic lab equipment, he imagines a wide range of applications. “In the 1970s hobbyists built their own computers at home,” he says. “Maybe people can now make their own chips.”

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