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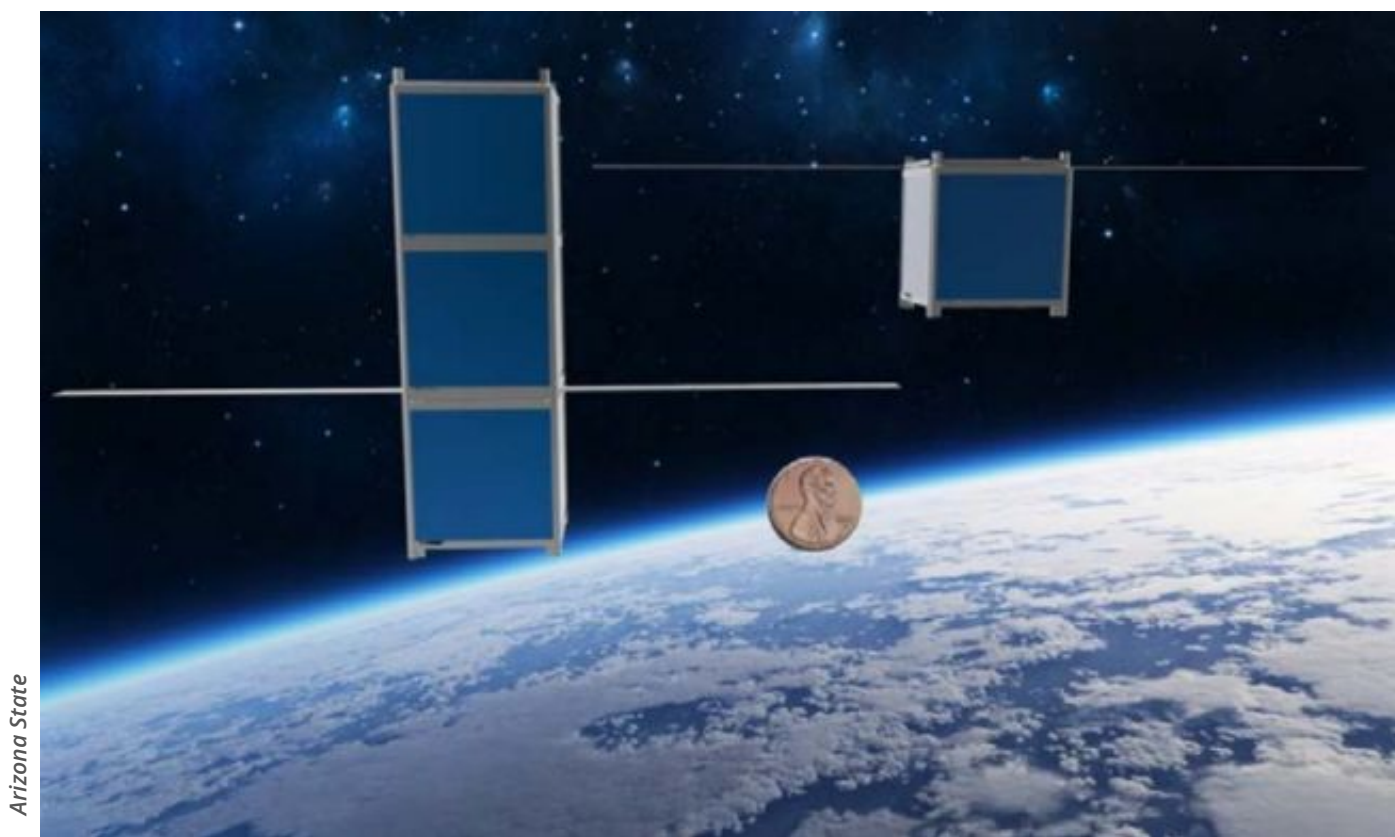
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SCIENCE —

The next big thing in space may be really, REALLY small satellites

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ERIC BERGER - 4/7/2016, 8:27 AM



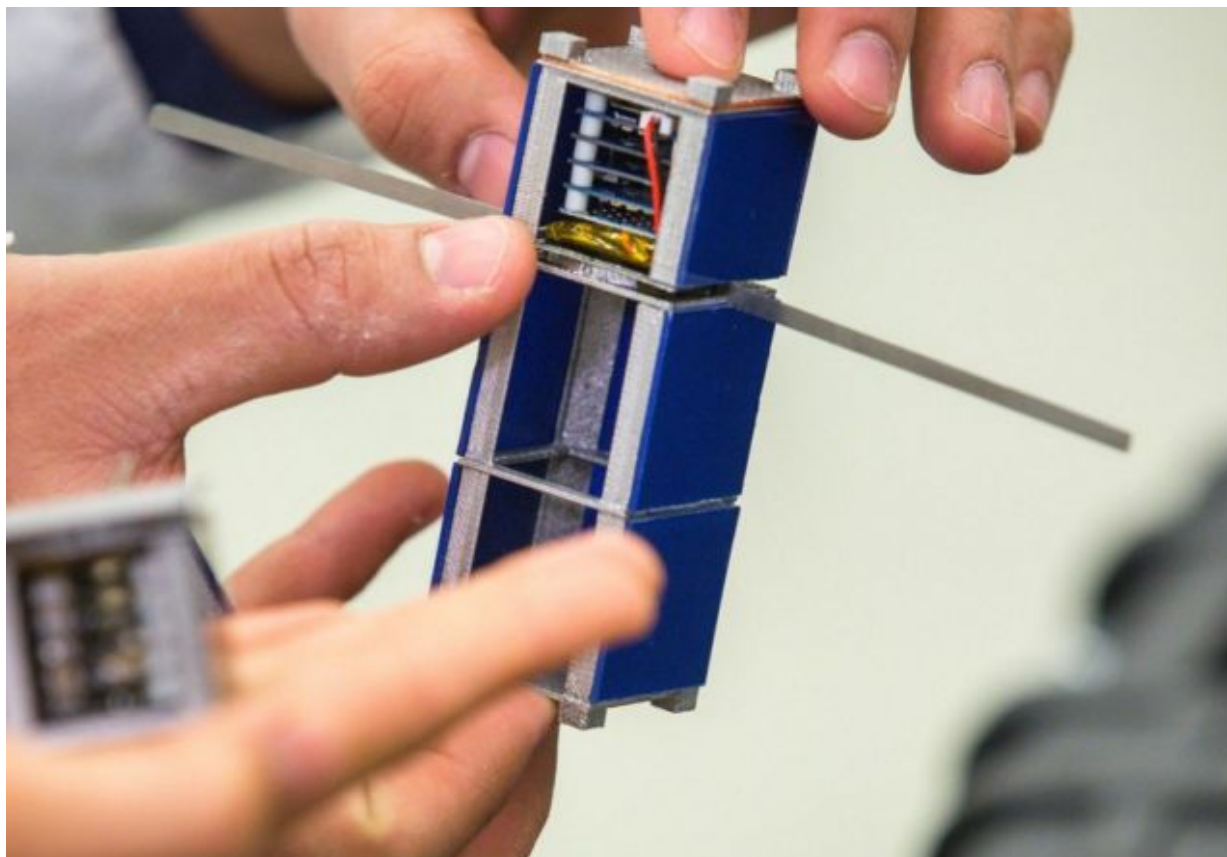
A proposed FemtoSat is shown in space, with a penny for scale.

The miniaturization of space continues, unabated. First came CubeSats, measuring about 11cm long and weighing no more than 1.33kg. These small research payloads have helped spur the development of a small satellite launch industry, and using the International Space Station to deploy them has become one of the national lab's hottest commercial activities.

However, the evolution of satellites downward from thousands of kilograms, down to a single kilogram, does not seem to be stopping. On Thursday, Arizona State University announced it is developing **FemtoSats**, a 3cm cube with a mass of just 35g. These "SunCubes" grew out of a research project begun in 2014 by Jekan Thangavelautham, a professor in the university's School of Earth and Space Exploration.

The FemtoSats will deploy in an almost matryoshka doll-like manner—from a CubeSat fitted with a Jack-in-the-box-like spring. According to the developers, this mechanism will allow the FemtoSat standard to be bootstrapped to the CubeSat standard, allowing FemtoSats to be carried as additional payloads on CubeSat missions. A single deployer could release 27 FemtoSats.

The drive toward smaller payloads is being driven by launch costs. Even with their smaller size it costs about \$100,000 to deliver a CubeSat to orbit and perhaps \$10,000 to \$50,000 to develop and prepare one for launch. According to the Arizona State developers, it will cost about \$1,000 to deliver a FemtoSat to the International Space Station for deployment and \$3,000 to send them directly to low-Earth orbit for deployment. Launch costs for escaping Earth's orbit will be about \$27,000.



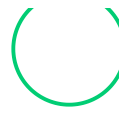
Charlie Leight/ASU Now

[Enlarge](#) / A single, a three-tiered version of a FemtoSat.

"By reducing the launch cost, it is hoped a wider community of educators, researchers, and hobbyists can develop their own spacecraft," the developers write [in a paper](#) describing design specifications for the FemtoSats. "The standard is targeted towards personal, scientific, private, and government payloads."

Thangavelautham said he envisioned at least four principal uses for FemtoSats: providing a hands-on design, integration and testing experience for students from middle school to university age; miniaturized versions of current experiments; experiments with small centrifuges to perform artificial-gravity experiments, with fluids, solid particles and for biochemical and pharmaceutical research; and imaging. "It's like your own GoPro in space," [he said](#). "That would give you quite the front-seat view in space."

According to the Tauri Group the global satellite market has grown from \$89 billion in 2005 to \$203 billion in 2014. The group's report also noted the dramatic growth in the CubeSat industry, from less than 20 deployments in 2011 to 130 in 2014. However another market report by SpaceWorks predicted that, in the coming years, the biggest growth would not come in CubeSats but rather in satellites from 1kg to 10kg. Those could carry still small, but more capable payloads.



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Arizona State, however, does not seem to be aiming for world domination of the space satellite business. Rather, with its low-cost FemtoSat program and relatively simple payloads, the university researchers seem to be motivated mostly by making space accessible to all, from the garage hobbyists to college students to, perhaps, even middle schoolers with ambitious science fair projects.

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ERIC BERGER

Eric Berger is the senior space editor at Ars Technica, covering everything from astronomy to private space to NASA. A certified meteorologist, Eric lives in Houston.

EMAIL eric.berger@arstechnica.com // TWITTER [@SciGuySpace](https://twitter.com/SciGuySpace)



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