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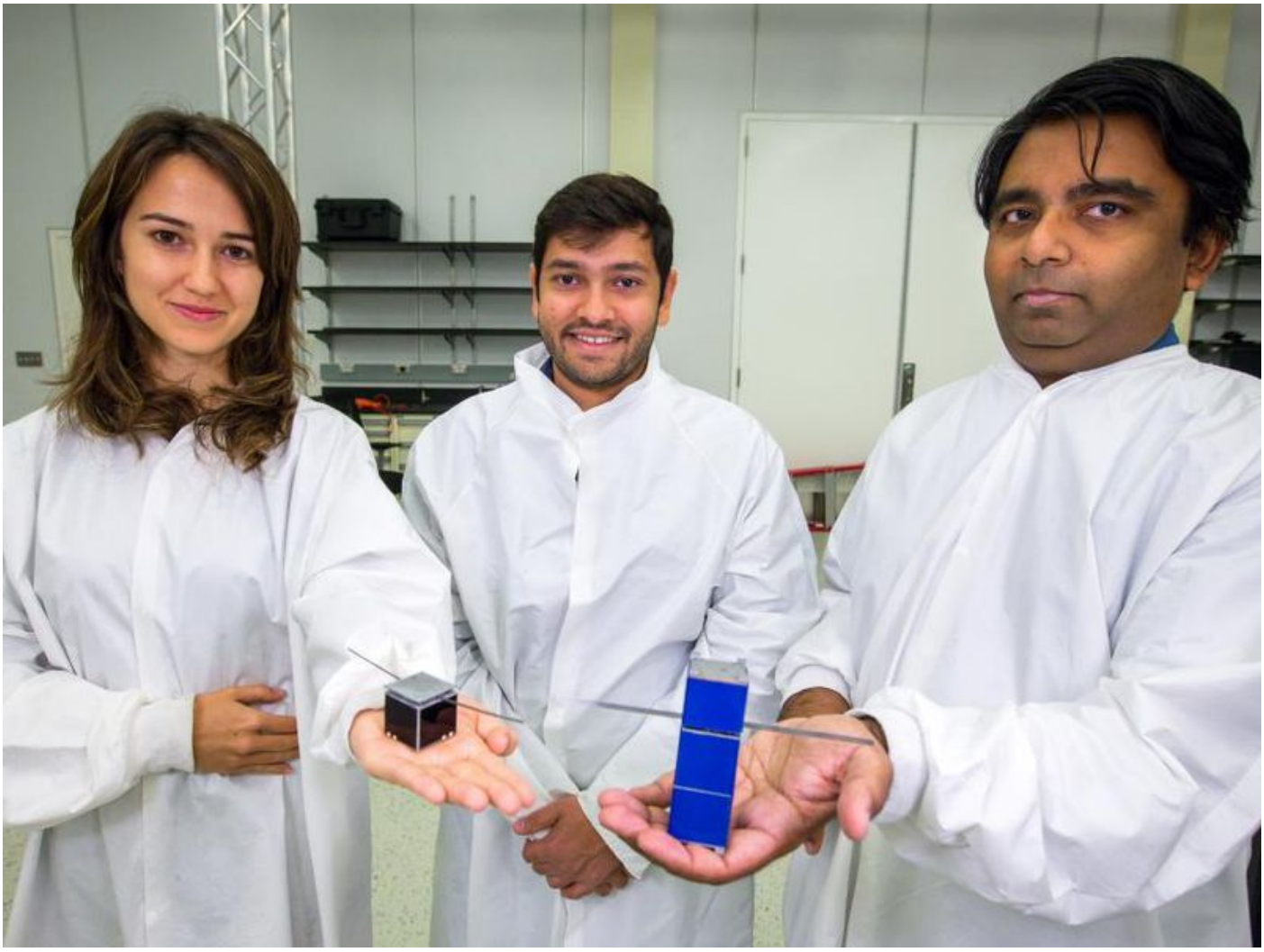
These Tiny Satellites Can Be Launched Into Space for as Little as $1,000

Researchers at Arizona State University may be paving the way for consumer satellite flight



Jekan Thanga (right) and students holding FemtoSats (ASU)

By Emily Matchar

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Making the cut for NASA's astronaut program isn't a prerequisite for doing outer space research. A team of students at Arizona State University have created tiny satellites that can be launched into space for as little as $1,000, hundreds of times cheaper than traditional satellites. The 3-centimeter-wide devices, called SunCube FemtoSats, could make the barrier for space research much, much lower.

“We’ve been constantly in the mode of trying to miniaturize space electronics,” says Jekan Thanga, assistant professor at Arizona State's School of Earth and Space Exploration and head of the Space and Terrestrial Robotic Exploration (SpaceTREx) Laboratory. “About six months ago, we realized we could get to some incredible price points…that was very compelling for us.”

The solar-powered FemtoSats, which can be sent to space as cargo from any facility with launch capabilities, come equipped with power systems, tiny computers, radios and cameras. As Thanga explains, they could work alone or in swarms. Alone, they could carry individual experiments into space. In a swarm, they could provide real-time looks at, say, a damaged spacecraft, enabling engineers to see necessary repairs. Thanga envisions swarms of FemtoSats travelling aboard larger spacecraft on interplanetary missions, to be deployed as helpers at critical moment, such as when the spacecraft unfurls a telescope.

In the immediate term, Thanga has four main goals for the FemtoSats. First, he’d like to see them used in STEM education, with students as young as middle schoolers designing and launching their own experiments.

“For students, having the ability to build their own spacecraft I think will be a quite a compelling experience,” he says. “We hope that will produce some unique skills. The small space sector needs all the people it can get. This is really a method to train the next generation.”

Second, Thanga sees the satellites as being useful for miniaturized versions of current experiments. Third, the cubes could be used to perform artificial gravity experiments, which are important for biochemical and pharmaceutical research into how humans fare in outer space. Fourth, the cubes could be used as personal space cameras, letting ordinary people explore space and see Earth from above.

Eventually, the FemtoSats could be commercially available. Thanga speculates that perhaps they could be purchased on sites, such as Amazon, as part of a pre-paid package—a set fee would get a user the satellite plus a spot on a future launch.

Thanga hopes to get a prototype of the FemtoSats into space within the next year or so. If the first trials don’t work, the team can simply try again, something that would be unfeasible with more expensive satellites.

“There are still a lot of unknowns. There are high risks of failure, and so the ability to send and then resend literally makes this a sandbox that can help accelerate the field,” Thanga says.

Thanga’s team is also working on technologies that will help increase the FemtoSats’ volume. They might use mechanical devices that unfurl or telescope out of the satellite cube. They’re also looking at inflatable devices that carry a powder that becomes gas once in outer space, expanding the inflatable into a larger space. This would allow the FemtoSats to carry larger-sized experiments, or to take advantage of larger antennae or other in-space devices.

In the future, Thanga imagines FemtoSats as an army of observation devices that watches Earth’s surface at a much more granular level than larger, more expensive satellites. For instance, FemtoSats riding on larger spacecraft could monitor planetary activity, such as volcanic eruptions on Jupiter’s innermost moon, Io; track rare animals; or look out for minor meteorite hits. They could also watch for rare, scientifically interesting weather phenomena, such as “gigantic jets,” or lightning that strikes from the Earth’s mid-atmosphere up towards space.

“They’re eyes in space,” Thanga says.

About Emily Matchar

Emily Matchar is a writer based in Hong Kong and Chapel Hill, North Carolina. Her work has appeared in *The New York Times*, *The Atlantic*, *The New Republic*, *The Washington Post* and other publications. She is the author of .