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Quantum fluctuations in space, science, exploration and other cosmic fields... served up regularly by MSNBC.com science editor Alan Boyle since 2002.



Alan Boyle covers the physical sciences, anthropology, technological innovation and space science and exploration for MSNBC.com. He is a winner of the [AAAS Science Journalism Award](#), the [NASW Science-in-Society Award](#) and other honors; a contributor to "[A Field Guide for Science Writers](#)"; and a member of the board of the [Council for the Advancement of Science Writing](#).

Check out Boyle's [biography](#) or send a message to Cosmic Log via [cosmiclog@msnbc.com](mailto:cosmiclog@msnbc.com).

### SPACE SCIENCE ON A BUDGET

## Space science on a budget

**Posted: Thursday, October 22, 2009 8:35 PM by Alan Boyle**

For decades, the cost of doing space science has been astronomically high, but all that will change when suborbital spacecraft start flying next year. Off-the-cuff calculations suggest doing low-cost research on commercial rocket ships could eventually amount to \$100 million a year.

At least that's the way it adds up for Alan Stern, a planetary scientist at the Southwest Research Institute who is helping suborbital science get off the ground. During today's session of the [International Symposium for Personal and Commercial Spaceflight](#) in Las Cruces, N.M., Stern figured that private-sector spaceships could accommodate 1,000 small-scale research missions annually at \$100,000 each.

The resulting total - \$100 million a year - is roughly equivalent to the fares that would be paid out by 500 high-rolling passengers on Virgin Galactic's [SpaceShipTwo](#) rocket plane. Those potential profits have led Stern to assert that research could be more of a "[killer app](#)" for suborbital space ventures than tourism.

But are those figures realistic? The price tag would be perfectly reasonable: Suborbital spaceships would offer the cheapest way to fly experiments at altitudes of 75 to 140 kilometers (45 to 87 miles). That takes in a region of Earth's environment that has been nicknamed the "[ignorosphere](#)" because it's too high for balloon-lofted experiments and too low for satellite probes.

It costs millions of dollars to send a sounding rocket to that region, so even a \$500,000 price tag might look like a bargain to a researcher. That's how much XCOR Aerospace is planning to charge for deploying a 22-pound (10-kilogram) nanosatellite from its [Lynx rocket plane](#), according to Andrew Nelson, the company's chief operating officer.

What about flying 1,000 missions a year? Stern said that flight rate was eminently achievable if companies such as XCOR, Virgin Galactic and Blue Origin followed through on their rocketship plans. Blue Origin, which is backed by Amazon.com billionaire Jeff Bezos, [has been secretive about its progress](#), but Stern said the venture was anticipating a flight rate that was "very high by any standard that we're used to."

Armadillo Aerospace, which is [currently in the lead](#) to win \$1 million of NASA's money in the Northrop Grumman Lunar Lander Challenge, has already committed to flying [shoebox-sized physics experiments](#) on unmanned test rockets for free, Purdue professor Steven Collicott pointed out. And NASA plans to set aside \$1 million to \$2 million for similar suborbital experiments in its budget proposal for fiscal 2011, said Yvonne Cagle, program manager for the space agency's [Commercial Suborbital Research Program](#).

If the plan goes through, NASA experiments could be flying on private-sector rocketships as early as this time next year, she told me.

But is there enough science to support doing 1,000 missions a year? A panel of researchers laid out a long list of potential study subjects:

- Dust particle collisions in zero-G. Such studies could help explain how the rings around Saturn and other planets were formed and why they endure.
- Observations of astronomical objects in wavelengths that are filtered out by Earth's atmosphere and thus can't be seen by ground-based telescopes.
- Behavior of fluids and grains in microgravity on time scales that are longer than what can be achieved during zero-G airplane flights. Such studies could help physicists understand how earthquakes shake up soil.
- Studies of how organisms ranging from microbes to men and women are affected by the first few minutes of zero-G conditions. Such studies aren't done on shuttle astronauts because they're occupied with the ascent to orbit - but the studies could suggest ways to combat the "[space sickness](#)" experienced by half of all astronauts.
- Space studies involving radiation sources, free-flying insects, pathogens and other materials that are usually not allowed on the space shuttle.
- Close-up studies of atmospheric phenomena in the "ignorosphere" - such as [polar mesospheric clouds](#), which some scientists consider a harbinger of global climate change.

The most serious limiting factor may well be the imaginations of scientists who have not yet realized that new opportunities are coming up. When Stern asked attendees in Las Cruces to indicate whether they could have an experiment ready to fly on a suborbital spaceship in the next year, all of the scientists on stage (including Stern) raised their hands. Hardly any hands went up in the audience.

To get the word out, Stern is planning a [suborbital science conference](#) in February - a meeting designed to bring researchers together with potential funders and fliers. As time goes on, the tools of microgravity research should become increasingly available to all comers.

The bottom line? When it comes to space science, NASA isn't by any means the only game in town, Collicott said.

"A low-gravity laboratory is becoming more like a mass spectrometer," he told his colleagues. "You buy mass spectrometers from different places, with different agencies' funding. You buy oscilloscopes from different places, on different agencies' funding.

"Microgravity, as a research environment, is now becoming something that's going to be available to anybody with the money - for any purpose, be it pleasure, research, industry or what have you - from a number of sources," Collicott said. "We need to stop thinking about microgravity research as being solely a NASA topic."

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## 🗨️ Comments

Rocket Lab in New Zealand is launching its first suborbital rocket end of November this year. 2kg scientific payloads to suborbital space start out at USD\$20,000, so this will be another option to consider for research scientists.

[Mark Rocket, Christchurch, New Zealand](#) (Sent Thursday, October 22, 2009 11:06 PM)

Laurie Garver has known the proper response to this for nearly 2 decades and I haven't heard the trumpets blaring it:

<http://groups.google.com/group/sci.space/msg/010fe7a207f62631>

Whats going on over there at NASA nowadays?

[James Bowery, Shenandoah, IA](#) (Sent Friday, October 23, 2009 1:53 AM)

An article that belongs in the Ignorosphere Alan? I think that we're wasting money doing the suborbital space flight stuff that's basically just tourism for the rich and greedy. We need to spend more money on NASA which does the real space exploration stuff. When commercial space companies can put a shuttle up in space and build a space station or send men to the moon then I'll be impressed with commercial space flight. Until then it's just a distraction and waste of resources. Time to increase funding for NASA so it can do the real space exploration we need.

[Eric, Salinas, CA](#) (Sent Friday, October 23, 2009 9:32 AM)

Cool. Hadn't heard the term "ignorosphere" before.

[Loren, SF Bay Area, CA](#) (Sent Friday, October 23, 2009 10:47 AM)

I wonder what a Moon rover would bring to light in terms of studying trapped water ice within the soil particals? If they can create Spirit to do the job on Mars why not the Moon to answer some long term questions? I think we can get a rover there much cheaper and discover much more about the surface over time with more real-time results, transient response time, and certainly more solar engery opportunity with no atmospheric hurdles during Winter Sol season; rather than throwing our trash onto the surface and hoping for a visual. Imagine the pictural opportunities!

[Len Rowe, Denver, Colorado](#) (Sent Friday, October 23, 2009 11:43 AM)

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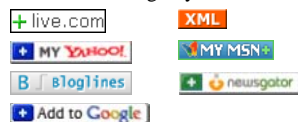
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