

for three years. Gates is also an investor in a firm named Intellectual Ventures that is promoting a scheme called StratoShield, which would pump sulphur dioxide into the upper atmosphere through a hose held aloft by blimps.

Richard Branson has also set up his own “war room” to do battle with global warming using “market-driven solutions”, including geoengineering.

The Carbon War Room website promotes a paper co-authored by Lee Lane of the American Enterprise Institute, well known for its climate scepticism. It argues that the benefits of geoengineering vastly outweigh the costs. The authors worry that ethical objections from environmental groups may block deployment, before noting with relief that “in reality, important economies remain largely beyond the influence of environmental advocacy groups”.

Geoengineering is not something we should enter into lightly or without proper public consultation. If we resort to it, then the concentration of carbon dioxide will continue to rise. It would then become impossible to call a halt to sulphur injections, even for a year or two, without an immediate jump in temperature.

It's estimated that if whoever controls the scheme decided to stop, the greenhouse gases that would have built up could cause warming to rebound at a rate 10 to 20 times that of the recent past – a phenomenon referred to, apparently without irony, as the “termination problem”. Once we start engineering the atmosphere we could be trapped, forever dependent on sulphur injections. More than a painting, *The Scream* would become a prophecy. ■

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One minute with... Brian Shiro

The president of Astronauts4Hire on how the commercial space race is changing what it means to be an astronaut

What's the idea behind Astronauts4Hire?

Our aim is to train a highly qualified group to become the first scientist-astronauts for hire by researchers wanting to fly experiments in space. People will be able to go to our website and search for astronauts with the type of scientific and flight expertise they want.

Why is now the right time for this service?

Since 2004, when SpaceShipOne became the first commercial spacecraft to take a person up into space, there has been a mad dash to develop sub-orbital spacecraft. Their flights will be geared towards space tourism, but there is also a massive opportunity for scientists to send their experiments up on these flights. A group of colleagues and I walked away from the Next-Generation Suborbital Researchers Conference in February this year saying, “We have to seize this.”

Are commercial space flights really such a big deal for science?

Even if you had just one science experiment in each craft, that's a lot of data, especially because these flights will be going up frequently, perhaps daily. There is also the cost factor. Some people estimate that the cost of space flight will drop tenfold or even 100-fold compared with today.

What kind of science does sub-orbital flight allow you to do?

Fundamental physics and chemistry studies in microgravity, astronomy, planetary science. It's a unique vantage point that we haven't explored yet, as it's much lower than the space station but much higher than the altitude reached by most sub-orbital uncrewed rockets. There could be medical studies too. With thousands of space tourists, you could also do physiological studies on how different people react to space flight.

You co-founded Astronauts4Hire in April. How's it doing so far?

Right now we are reliant on sponsors and donors to help fund our training. In the meantime we've had our first request for one of our members to



PROFILE

As a child, Brian Shiro spent his summers at space camp. Now he is a geophysicist at the Pacific Tsunami Warning Center in Hawaii and president of the group Astronauts4Hire

conduct an experiment aboard an upcoming zero-g flight.

Being an astronaut is one of the pinnacles of human achievement today, but will it become a lot more like a regular job in future?

I hope so. Commercial space companies are commoditising the sub-orbital and the low-Earth orbit realms, just like what happened a century ago with aviation. Today, only 500 or so people have flown to an altitude of 100 kilometres, most of them highly qualified test pilots or scientists. With this new revolution, if you have the money, or if you have the funding for an experiment, you can go. Or, as we are hoping, you have the experiment and you hire us and we will do it for you.

If I were a scientist, I'd want to go myself. Why would anyone pay to send you?

Maybe they need to be on the ground to monitor the experiment. Maybe the person doesn't want to go on what is considered an experimental aircraft and be one of the guinea pigs in this new industry.

Interview by Celeste Biever

BRIAN SHIRO