

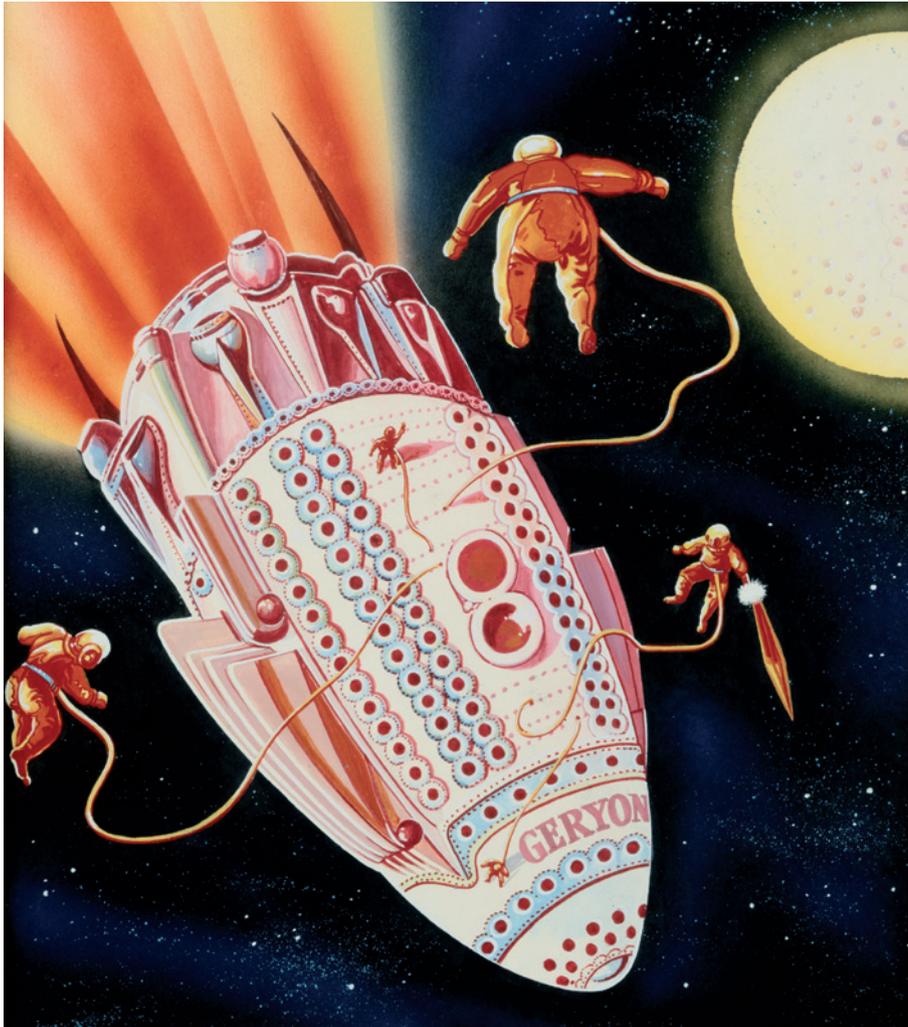
CAREERS

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COMMERCIAL SPACE FLIGHT

Scientists in space

Adventure-seeking researchers could benefit from NASA's exit from manned space flight.

BY KATHARINE SANDERSON

Jason Reimuller has always dreamed of being an astronaut for NASA. "I grew up with an aviator — my grandfather was an air-force general who flew B-25 aircraft in the Second World War," he says.

Reimuller, a climate researcher at the

University of Colorado at Boulder, never gave up on that dream. He studies high-altitude clouds from a plane in desolate polar regions, which feeds his love of science and adventure. He also applied for NASA's astronaut programme and made it to the last round, but was unsuccessful. So in 2010, Reimuller applied to train with Astronauts4Hire (A4H). The

non-profit group, registered in Tampa, Florida, aims to train scientists to do research in space, and link them with groups that need such skills.

"The prospects of becoming an astronaut through the traditional route, through space agencies, are slim," says Brian Shiro, chief executive of A4H and a geophysicist at the US National Oceanic and Atmospheric Administration's Pacific Tsunami Warning Center in Ewa Beach, Hawaii. "The opportunities are probably better in the commercial sector."

In 2010, NASA cancelled its Constellation programme, which would have developed rockets to take people to the Moon; in July, the agency flew its last space-shuttle mission. Commercial companies are hoping to fill the void by developing rockets to carry humans into orbit, and firms and organizations such as A4H hope to supply the astronauts. Researchers, most with full-time jobs, train in their spare time — for now. Eventually, A4H hopes to be a fully fledged, professional training body for commercial astronauts, with full-time staff.

A4H has grown quickly since it launched last year. The team now includes 22 flight members (trainee astronauts) from around the world, and a growing number of associate members, who support and get involved in its activities. At the basic level, trainees take a three-day course on which they learn to cope with low oxygen levels, go through centrifuge training to simulate the high and low G-forces experienced on suborbital parabolic flights, and learn some relevant human physiology. The next level requires experience in scuba diving, piloting a plane and running experiments in microgravity. Training costs start at US\$10,000.

Once flight members have completed their training, academic principal investigators or companies interested in microgravity research will be able to hire them to fly research payloads on suborbital aircraft flights or — eventually — into orbit. Members will be paid directly by clients and might spend months with them, developing and learning about an instrument. A4H already has its first paying customer: a collaboration between Saber Astronautics Australia in Sydney and the 4 Pines Brewing Company in Manly, Australia, which in February tested the effects of microgravity on a beer developed for consumption in space.

A4H is not the only group teaching scientists to work in space. The Southwest Research Institute (SwRI) in Boulder, Colorado, offers microgravity training without the more rigorous wilderness training or pilot experience demanded by NASA and A4H. A4H's ►

NETWORKING

Contacts help men most

Fewer women than men secure jobs informally through workplace social contacts, a study says. Author Steve McDonald, a sociologist at North Carolina State University in Raleigh, analysed results from a US Bureau of Labor Statistics study of 3,200 people between 1979 and 1998, in which respondents specified how they made job transitions. He found that as men accumulate time in a field, they become more likely to be recruited for new jobs by their workplace contacts. Women are not recruited in the same way, possibly because their social workplace interactions focus less on work, and because their contacts don't have recruiting and hiring authority, McDonald suggests. The study will be published in *Social Science Research* in November.

NOBEL LAUREATES

Top status doesn't linger

Nobel laureates' celebrated status within the scientific community wanes sooner than one might expect, says a study led by Christine Charyton, a visiting neurologist at Ohio State University in Columbus. The analysis, based on citations and other metrics, shows that after a peak, most laureates' later work involving the Nobel-winning idea is no more accepted than their earliest articles. The study measured the impact of articles by 187 researchers who won Nobel Prizes in physics, chemistry or medicine between 1980 and 2009. Charyton, who presented the paper on 6 August at the American Psychological Association Convention in Washington DC, suggests that later papers expand on and diverge from the Nobel-winning idea.

ACADEMIC-INDUSTRIAL PARTNERSHIPS

Cooperation increases

Industrial sponsors invested US\$4.3 billion in research at US universities in 2010, up 5.6% from 2009, according to a survey of university technology-transfer activities by the Association of University Technology Managers in Deerfield, Illinois. Robin Rasor, president of the group, says that there has been an increase in partnerships because firms have cut back on in-house early-stage research to reduce costs, and are focusing on development. "Companies are looking more to universities for cutting-edge innovations," she adds. Collaborations could lead to industry jobs for PhD students and postdocs working on those innovations, says Rasor.



John Pojman of Louisiana State University works on an experiment on a low-gravity suborbital flight.

► model, admits Dan Durda, a space scientist at the SwRI, does decrease the likelihood that the rigours of flight will scare away trainees when it's time to go up, something that he has seen happen. But only time will tell whether there will be a large academic demand for astronauts, and Durda is not worried about the competition. If A4H offers another way for people to get off the planet, all the better, he says, adding, "we're all in this business because we want to fly in space".

A SHIFT IN SPACE SCIENCE

A4H's scientists will still need to find a ship, and several companies provide options. Virgin Galactic, based in Las Cruces, New Mexico, offers tourists and scientists seats on its suborbital craft *SpaceShipTwo* for \$200,000 each and claims its first flight could be as early as 2013. This year, it contracted to fly SwRI scientists into space — Durda has secured a place. Zero-G in Vienna, Virginia, also offers suborbital flights; A4H uses the company's facilities in its training programme. SpaceX in Hawthorne, California, is making a reusable vehicle to transport people and supplies into orbit, and Bigelow Aerospace in North Las Vegas, Nevada, is developing a modular space station that it hopes to launch in 2014. On 9 August, NASA awarded two-year contracts to seven companies to take technology and people on suborbital flights.

The costs of getting into orbit promise to fall to less than \$100,000 for a spot on a flight, some claim, and the number of seats and amount of lab space available will increase as more companies get their hardware working. Eventually, scientists might be able to charter a space flight for a course of experiments, much like booking a slot at a synchrotron light-source facility.

Research might include atmospheric science, exploring the effects of microgravity on human physiology or studying changes in gene expression induced by microgravity,

which could offer clues to potential drug targets. But experiments will have to be carefully crafted and expectations limited, warns Walter Peeters, dean of the International Space University in Strasbourg, France. Scientists "only have a few minutes of microgravity time", he says. Even so, he sees opportunities for pharmaceutical companies, among others.

John Pojman, a materials chemist at Louisiana State University in Baton Rouge, who researches how polymers behave in microgravity, foresees a demand for technicians to run experiments on suborbital or orbital flights. But he cautions that it isn't yet clear how such research will be financed, particularly in terms of hardware and instrument development. No major US funding agency has yet announced a programme.

Despite that, prospects for aspiring commercial astronauts are better in the United States than in Europe or elsewhere, says Jack van Loon, a gravitational biologist at the Free University in Amsterdam. "The commercial space flight that is developing is very much an American activity," he laments, noting that it is likely to generate jobs and business.

In July, A4H's first class of trainees graduated with qualifications in doing science on suborbital flights. Reimuller was among them. "I hope I will get the opportunity and I hope that I will provide returns, in terms of the data and science I bring back, that will justify the expense involved," he says.

Shiro does not claim that these astronauts for hire will be as highly qualified as NASA astronauts, but points out that it is still early days. "If our training programme gets respected enough and gets mature enough and we get enough experienced people on board," he says, "over time it could certainly become just as effective as what NASA has." ■

Katharine Sanderson is a freelance journalist in Toulouse, France.