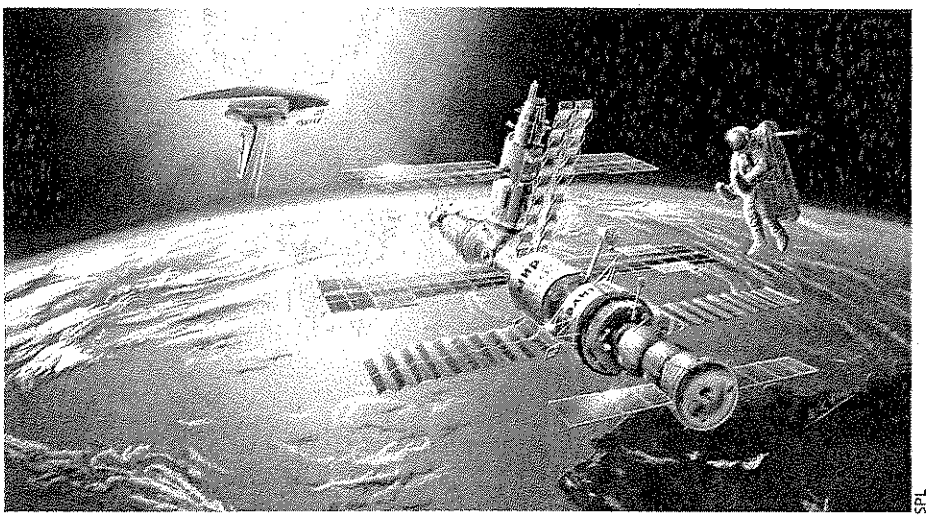
Crystals fail the microgravity test

Daniel Clery

DESPITE the many millions of dollars spent launching science experiments into the near-weightlessness of space, the results so far do not wholly justify the cost, says a group of researchers in the US.

It is nearly ten years since the first experiment to see if protein crystals grown in microgravity are better than those grown on Earth. But, say the researchers in this week's issue of *Nature*, "microgravity has not yet accomplished any significant breakthrough in protein crystal growth".

Gregory Farber of Pennsylvania State University along with colleagues from the Fred Hutchinson Cancer Research Center in Seattle, California Institute of Technology in Pasadena and the company Payload Systems of Cambridge, Massachusetts, have carried out two long-term crystal growth experiments on board the Russian Mir space station. In their experiments, only 24 per cent of the crystals grown were better than the best grown on Earth. Results from numerous experiments on the US shuttle are even worse they say: only 20 per cent showed an improvement.



SPL

Mir: a marginally better place to grow the perfect crystal

These results are important because NASA is using experiments in crystal growth as a major justification for building the international space station Freedom. Farber says it is "very hard to justify building the space station" on the strength of protein crystal growth.

But Hannes Walter, a senior scientist at ESA says: "There are a million or so proteins essential to life and we only know the structure of 300 or so. If we have results that show we can get bigger and better crystals then it is justified."

The researchers say that their success rate shows that Mir is as good a microgravity laboratory as the shuttle. Mir is also permanently stationed in space so longer experiments are possible and as the space vehicles that carry experiments to Mir are crewless, they are more reliable than the shuttle which is subject to much tougher safety provisions. Mir should have enough capacity for experiments for the foreseeable future, says Farber.

Crystals are essential for finding the proteins' structure by X-ray crystallography. The regular arrangement of protein molecules in a crystal means that when a beam of X-rays is shone through it, the rays are scattered in a predictable way that gives researchers clues to the protein's structure. But many proteins will not form crystals large enough for analysis, or will not form crystals at all. One of the problems is that convection currents in the liquid disturb crystal growth, but in the absence of gravity there would be no convection. Crystallographers hoped that microgravity would provide bigger and better crystals and even ones unknown on Earth.

Although all these things have been achieved in space, the success rate has been low and has not led to advances in crystallography. Both ESA and NASA are looking at ways to improve their experiments, says Walter. □

Island telescope

INDIA and the tiny island of Mauritius in the Indian Ocean have joined forces to build an ambitious radio telescope—without money or technical help from any industrialised country.

Situated at Bras d'Eau in the northeast of the island, the Mauritius Radio Telescope operates at the relatively long radio wavelength of 2 metres, making it unique in the southern hemisphere. It will be used to observe the centre of the Milky Way, which is inaccessible to telescopes north of the equator.

The new telescope is a collaboration between the University of Mauritius, the Raman Research Institute and the Indian Institute of Astrophysics, both in Bangalore. It has cost about $1·9 million.

The telescope is a T-shaped array of more than a thousand helical antennas. Most are fixed, but some can be moved up and down railway tracks in a technique known as aperture synthesis. This allows the array of antennas to mimic a telescope with a total collecting area 2 kilometres by 1 kilometre.

India has had a long interest in radio astronomy at long wavelengths. It already has a major telescope at Bangalore.

According to John Baldwin, a radio astronomer at the University of Cambridge, Mauritius is a particularly good place to pursue astronomy at long wavelengths because of its lack of man-made radio interference. Even India is plagued by this problem. "The only places without interference these days are the far side of the Moon—and a few isolated developing countries," says Baldwin. □

Brain drain saps Russia's space plans

RUSSIA's space programme is on the brink of crisis, according to officials who gave evidence to a special hearing at the Russian parliament earlier this month. Like other areas of science in the Commonwealth of Independent States, space research is suffering the effects of recession and the brain drain.

A third of the space industry's most experienced professionals have left for better paid jobs, said Vladimir Postyshev of the Russian Parliament's space research commission. In addition, many space research centres have received less than half their allotted budgets in the past eight months.

Postyshev complained that other republics are not contributing to the space budget, although they are using satellites for broadcasting and telecommunications. For example, he said, the Kazakh authorities pay only 6 per cent of the running costs for the Baikonur cosmodrome, the main CIS launch site. Russia has to find the rest.

Uri Koptev, director general of the Russian Space Agency, said that only 14 of the 25 civil satellite launches planned for this year had taken place. Of 70 planned military launches, 27 have gone ahead.

Launch activity peaked in 1982 with 101 launches. Efforts to commercialise the Russian space programme have met with little success. After 6 years of marketing their range of launch vehicles they have received only one major contract.

In the manned programme, Russia has firm agreements to send a number of French astronauts to the Mir space station. Negotiations for further flights are under way with the European Space Agency, Germany, Israel and South Korea. Each flight is worth up to $15 million to the Russians but this does not go far in offsetting the operating costs of the Mir space station. □