US–Soviet collaboration on biosatellite is a success

Mountain View, California

US and Soviet scientists last week gathered at the NASA (National Aeronautics and Space Administration) Ames Research Center to announce the results of their most successful collaborative effort so far in the life sciences, and to make plans for future collaboration. The most recent mission, Cosmos 1887, has paid off, with new insights into the physiological changes induced by prolonged weightlessness.

NASA has been looking for opportunities to raise its profile in the life sciences. Several agency surveys in the last year have stressed the need for expanded biomedical research, although funds have not been forthcoming from Congress. The research, however, is "absolutely essential . . . for long duration human exploration, either back to the Moon, or on to Mars", according to Noel Hinners, NASA's chief scientist.

The United States has participated in six Soviet biosatellite missions since 1975, under the terms of a 1971 bilateral agreement for scientific collaboration in space. The programme has been a bargain for NASA, as all flight costs are paid by the Soviet Union. NASA spent $1 million on ground-based laboratory analysis for Cosmos 1887, but has now invited Soviet participation in the first space shuttle mission dedicated to the life sciences, due to fly in June 1990.

Cosmos 1887 orbited the Earth for two weeks in October 1987, carrying two rhesus monkeys, 10 male rats and a collection of fish, amphibians, birds and mammalian cells in tissue culture. It achieved notoriety when one of the monkeys on board freed his left arm and tampered with experiments within his reach. The Soviet director of the Cosmos biosatellite programme, Eugene Ilyin, shed some light on that incident, attributing the monkey's misbehaviour to a failure in the equipment that was supplying its food.

A failure in the craft's braking system caused it to land 3,000 miles off course, in eastern Siberia, and resulted in a 2-day delay in tissue analysis. Nevertheless, the mission provided the most detailed data yet on the physiological effects of weightlessness. Among the findings were a 40 per cent shrinkage in rat muscle fibres, accompanied by a 60 per cent drop in contractile protein. The rats' bones showed a 30 per cent decrease in their ability to resist bending and breaking, apparently due to a redistribution of minerals away from the midshaft of the bone, said Richard Grindeland, biospecimen programme manager for NASA.

The rats also showed a 50 per cent reduction in their circulating levels of growth hormone, which normally plays a role in the maintenance of both bone and muscle. Grindeland says this may mean that the bone and muscle wastage common to space travellers and thought to be caused by lack of use may be caused partially by hormonal changes.

Neurological studies of the rhesus monkeys have found an increased excitability of the vestibular nerve, which could explain the 'space sickness' or nausea that astronauts and cosmonauts often experience, said Ilyin. Weightlessness was also found to take a toll on the immune system. Adrian Mandel of NASA-Ames said the rats showed a loss of helper T cells, leading to a reversed T4 to T8 cell ratio, reminiscent of that found in AIDS. Because the animals were killed within days of the spacecraft's return, the course of recovery from the immune suppression is not known.

Grindeland said none of the results obtained so far would rule out the possibility of long-term space travel, although they point to the need for further research, especially into whether the effects observed with rats occur in monkeys as well. Muscle biopsies will be taken from the monkeys on the next Cosmos mission. Grindeland said he expects that further research will guide the design of special exercise and pharmacological regimens to counteract the deleterious effects of weightlessness.

Marcia Barinaga

Europeans join forces to design a bigger and better chip

Munich

WEST German Research Minister Heinz Riesenhuber last week announced plans for six European countries to cooperate with three large electronics companies in developing a new generation of 64-megabit silicon memory chips.

The project represents European cooperation in microelectronics on an unprecedented scale — the estimated budget is DM8,000 million over seven years. It follows a bilateral West German–Dutch collaboration to design and produce a 4-megabit chip. The West German contribution would be about DM3,000 million, one-third of which would come out of the budget of the Research and Technology Ministry (BMFT), the rest from industry.

Riesenhuber warned of the "danger" that would threaten European industry if it were to become dependent on its foreign competitors for memory chips. He urged the European Community to act quickly in approving the project, named JESSI for Joint European Submicron Silicon.

JESSI is divided into linked sections. The largest share of the proposed budget — nearly one-third — would be spent on the development of 'designer chips' for specific applications and of tools for computer-aided design. Basic research will focus on developing design and integration methods for the new chips. Under the plan, logic circuits and production engineering will be developed specifically for the new chips, as will be the large-scale production facilities such as lithographic equipment and 'clean rooms'.

The six nations involved are West Germany, Britain, France, Belgium, the Netherlands and Italy. West Germany is the first country to give its official approval to the project. The companies involved are the West German microelectronics giant Siemens, its Dutch competitor Philips, and the French–Italian conglomerate SGS-Thomson. Siemens and Philips have been working together to produce the 4-megabit chip.

The European Community's response to the project is critical, say sources in West German government and industry. Organizers hope that the Community will agree that JESSI be run as a EUREKA project, which would allow the individual member states and companies to make independent decisions. There would be disastrous consequences, say the participants, if the Community were to set up a competing research programme under its own auspices.

An official in Brussels who insisted on anonymity offered reassurance to the worried West Germans: "there is no misunderstanding" of the importance of JESSI, and the Community plans to work with the six member states "like seven fingers on one hand". But the official could not say when the decision would be made.

Riesenhuber's early announcement is one way of staying one jump ahead of West German critics of JESSI. Criticism is likely to come from those who oppose spending public money on applied research or on research that will benefit large companies. There is a strong lobby in West Germany for companies of small and medium size, which form the backbone of West German industry.

Riesenhuber emphasized that small industry will benefit at least indirectly from JESSI, but admitted that details about how small companies can participate have yet to be worked out. **Steven Dickman**