Japan's research

Industry imitating life tomorrow

Tokyo

A SMALL team inside Japan's Ministry of International Trade and Industry (MITI) is busy preparing the framework for a major research programme — "the human frontier project" — that will try to create a new interface between basic biological research and technological development. With luck, the programme could be launched during the summit of the leaders of the Western industrial nations in Tokyo in May.

The human frontier programme takes its fanciful name from part of a report submitted to MITI's Agency of Industrial Science and Technology by a special advisory panel. Among its members were Leon Esaki, Nobel prizewinner and head of IBM's Tokyo Research Center. The report, entitled *Technological Development and International Exchange for the 21st Century*, makes the customary criticisms of Japan as a "free rider" on the West's basic research endeavours. It goes on to propose the "human frontier" plan in that curious mixture of officialese and hyperbole, studded with fashionable high-tech words taken from the English, that seems to characterize the workings of small advisory groups. Among other things it calls for "researchers with centripetal force (!) to be collected in one place so that through repeated *burainsutomingu* (brain storming), *tema* (themes) and *conseputo* (concepts) can be clarified . . .". As with other MITI research projects, however, exotic titles and preliminaries are no guide to the seriousness of the contents.

What is being suggested is a long-term (perhaps twenty-year) programme aimed at carrying out basic research in the biological sciences but with very close attention to possible technological applications. MITI research projects, which have always been partly carried out in government research institutes and partly in industrial companies, seem just the format for this approach. And if it seems unlikely that industrial companies would be interested in basic biological research, it is worth remembering that both NEC and Mitsubishi Electric are running invertebrate neurophysiology programmes on the grounds that better computers can be built by studying the way living organisms transmit and process information.

That idea is behind one of the three main areas proposed for the human frontier programme: an attempt to imitate functioning of brain and nerve networks to find new ways of information management and control circuitry that could be implemented in new kinds of electronic materials. A second area is the imitation of chemical processes taking place within living things. The aim is to build better industrial catalysts, carry out reactions using less energy and to trap light energy with artificial photosynthesis systems. Imitation of muscles and sinews of living organisms comes third, with the aim of building energy-efficient "physiological machines". The overall philosophy is of basic research for the sake of its applications, contrasting with the popular Western concept of basic research for the sake of "the advancement of knowledge"!

The human frontier programme is not the only new project to be aired in recent weeks. A separate private advisory panel to the Prime Minister, the Advisory Group on Structural Economic Adjustment for International Harmony, is expected shortly to call for a Japanese version of the European Eureka high-technology development project. Artificial intelligence, new materials, optoelectronics and robotics are likely to be its key themes and international collaboration is to be invited.

What in part makes thoughts of such projects possible is the dramatic drop in Japan's oil bill. Two-thirds of Japan's energy needs are met by oil and every drop of it is imported. The halving of crude oil prices (not yet passed on to the consumer) gives the government an unparalleled opportunity to spend money in new ways. A second factor is the problem of Japan's participation in the US Strategic Defense Initiative (SDI) (see page 294). Public opposition to military research in Japan is strong and it is thought that major, non-military international research might sweeten the involvement in SDI that the government is clearly aiming at.

Alun Anderson

Japanese space programme

Abundance of satellites planned

Tokyo

NEW and revised plans for Japan's space programme were announced last week by the Space Activities Commission (SAC). Altogether the launch of some eleven satellites plus a couple of space experiments have been fixed for the next five fiscal years, along with development of new and more powerful launch vehicles.

SAC is a part of the Prime Minister's Office responsible for overall coordination of the space programme's two arms: the scientific programme run by the Institute of Space and Astronautical Science (ISAS) and the applications programme run by the National Space Development Agency (NASDA). On the academic side, the chief news is that a magnetosphere observation satellite "Geotail" will be launched by the end of the 1990 fiscal year. The satellite is due to be launched by the space shuttle in a cooperative programme with the United States and will make observations on the structure and dynamics of the long magnetic tail formed on the night side of the Earth.

In the nearer future, two other Japanese experiments are due to be taken up by the space shuttle. No changes in their dates have yet been announced by the US National Aeronautics and Space Administration as a result of the explosion of the Challenger. From ISAS come Space Experiments with Particle Accelerator (SEPAC). The idea is to inject charged particles from electron and ion beam accelerators into the Earth's ionosphere and magnetosphere to generate an artificial aurora which will aid understanding of the behaviour of space plasma and the generation of auroral lights. NASDA aims at a more practical application with its First Material Processing Test, to be carried on Spacelab. Various experiments for producing materials under gravity-free conditions are under development.

Three other important missions will come from ISAS. As had been expected. Astro-C will be launched this fiscal year to continue ISAS's highly successful series of X-ray observation satellites. Heavier and bigger than its two predecessors launched in 1981 and 1982, it should be able to observe X-ray sources in more distant galaxies as well as in the Milky Way. Following that, Exos-D will be launched in fiscal year 1988 to continue the series of satellites observing the upper atmosphere and aurora. Next, in fiscal year 1989, the "Muses" interplanetary probe programme will begin with the launch of Muses-A, a satellite designed to test the orientation, control and data-transmission systems needed to make possible a flight to the Moon.

The SAC plan also reveals that NASDA's H-II rocket should be ready for its maiden flight in fiscal year 1991. Using almost entirely home-developed technology, it will have two liquid hydrogen/liquid oxygen stages and be capable of putting a two-ton satellite into geostationary orbit. But before that its predecessor, the H-I, capable of handling only a 550-kg payload, should, between fiscal years 1987 and 1989, have launched six satellites. Success will of course depend upon the conclusion of the current development of the H-I's second-stage liquid hydrogen/liquid oxygen engine. Before H-I comes into operation, one more satellite will be launched by the last of the N-II liquid fuel rockets, the Mos-I marine observation satellite.

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