

MITI maps out the sixth generation computer

- Fuzzy networks a key component
- Project may be international

Tokyo

JAPAN'S Ministry of International Trade and Industry (MITI) has taken its first tentative step towards mapping out plans for a follow-up to its fifth-generation computer project which ends next year. Details of the new project remain obscure (and in fact are undecided) but it is clear that MITI has set its sights on developing a new generation of massively parallel computers with 'flexible' brain-like information processing systems, including both neuro- and optical computers.

The goals of the new project, which is expected to start in 1992, are described in a report released last month by MITI's Research Committee on New Information Processing Technology, a committee of more than 100 scientists drawn from industry, universities, and MITI's Electro-technical Laboratory (ETL) in Tsukuba.

Unlike the fifth-generation computer project, which concentrated on the development of a highly parallel computer based on existing predicate logic, a key aim of the new project will be to lay down new theoretical foundations for parallel computing. Shunichi Amari of Tokyo University, who developed some of the mathematical theory behind neural network models in the 1960s and 1970s, is an adviser for the project and a strong advocate of such theoretical work.

The theoretical part of the project will set out to establish 'soft (flexible) information processing systems' capable of handling ambiguous or incomplete information in the form of patterns or symbols as well as numbers, with the capacity of learning and self-organization, and that can deal with "approximately correct problem solving" and the "integration of mass information". The research will include and expand on the theory of fuzzy computing and neural network processing, according to Taizo Nishikawa, deputy director of MITI's industrial electronics division.

On the technological side, the project will develop massively parallel computers by looking at various types of new devices, computer architecture and software. The committee has not set its sights on a specific type of parallel computer.

The report includes diagrams of an optical digital computer and a picture of a small piece of hardware that contains one thousand million 'neurons' and a hundred million million transistors on 8-inch wafers stacked 50 centimetres high on a board only one metre square (the commit-

tee sees wafer-scale integration as one possible route to the development of massively parallel computers). But with a power consumption of 160 kW, cooling such a pile of hardware will be just one of many technical problems to overcome.

Although MITI officials are not prepared to comment on the size of budget for the project, it is widely expected that it will be similar in scale to the fifth-generation computer project which will have consumed about ¥50,000 million (\$325 million) over ten years by the time it ends next year.

ETL researchers who were involved in planning both projects are determined that the new project should not be organized along the same lines as the fifth-generation computer project. Their reason is simple. ETL did not get a penny out of the fifth-generation computer. (Similarly, people in industry are not happy because their best people have been tied up in the project for small financial returns.) ETL belongs to MITI's Agency of Industrial Science and Technology. But the fifth generation computer project comes under the jurisdiction of MITI's Machinery and Information Industries Bureau (to which Nishikawa's industrial electronics division is attached). Such is the internal bureaucracy of MITI that despite early attempts ETL could not receive any fifth-generation computer funds.

One way to surmount infighting might be to make the new project international. Nishikawa in fact says that it is "imperative" that the project be international, and he and some of the committee members have already visited government officials and academics in the United States and Europe to explain the goals of the new project. Nishikawa hopes to include foreign representatives (from both government and industry) who will be based in Tokyo as many of the present committee members would prefer to communicate in Japanese.

Nishikawa expects that the new international planning committee will hold its first meeting in June or July. The main aim of the committee will be to decide how the goals mapped out in last month's report can be achieved. Next year the project will enter the 'feasibility study' stage and although Nishikawa is not prepared to comment on the budget for fiscal year 1991, ETL researchers expect the project to get several hundred million yen (a few million dollars). **David Swinbanks**

ENVIRONMENT

Compromise at Bergen conference

London

ALTHOUGH dismissed as vague by environmentalist groups, the ministerial declaration from last week's conference on sustainable development in Bergen, Norway, should help progress towards the more definite international agreements on environmental protection expected to be reached at the global United Nations conference in 1992.

In line with Norwegian proposals, delegates agreed that lack of "full scientific certainty" over threats to the environment should not postpone preventive measures. But, at the insistence of the United States (see *Nature* 345, 193; 17 May 1990), commitments to rigid targets for reduction of carbon dioxide emissions and for financial aid to developing countries to phase out chlorofluorocarbons (CFCs) were excluded.

Ministers from 34 countries (including Western and Eastern Europe, plus the Soviet Union, the United States and Canada) agreed to draw up national strategies for carbon dioxide controls after they receive the report that will soon be completed by the Intergovernmental Panel on Climate Change (IPCC). The report will be considered next week by the scientific working group of IPCC at a meeting near Windsor in the United Kingdom. A draft of the report has already been leaked to the media (see *Nature* 344, 577; 2 April 1990). The Windsor meeting will be followed in the next few weeks by meetings of the working groups on the impact of climate change and policy to combat climate change in Moscow and Geneva.

UK environment minister David Trippier, attacked before the conference over British support for the US position on carbon dioxide emissions, said the United Kingdom will establish its national strategy before the world climate conference in Geneva in November. But he warned that solving the greenhouse problem could cause "pain and anguish" to the British electorate.

At Bergen, the United States was once again attacked for its reluctance to help developing countries meet the costs of using alternatives to CFCs, just as it was at the Geneva conference on CFCs earlier this month (see *Nature* 345, 193; 17 May 1990). The Bergen declaration calls on the Montreal Protocol meeting in London next month to strengthen international action to protect the ozone layer, but inserts "for example" before the key phrase "through additional resources and technology transfer".

Observers hope the compromise wording will avert the threatened Indian boycott of the London meeting. India and many other developing nations have not yet signed the Montreal Protocol. **Peter Aldhous**