Development of Cardiac Surgery in Japan

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Much of the research into cardiac surgery depends on donations from industry and individuals.

WHEN cardiac surgery was first started in 1949, research was done in the most difficult of circumstances, for the Tokyo Women's Medical College was without money and resources because of the effects of the Second World War. At that time, people were homeless and short of food and money, so financial support for medical research was out of the question. It was even necessary to convert gas masks for anaesthetic purposes. Most of the research apparatus was similarly makeshift. In the midst of all this, research on cardiac surgery still went ahead. At first hypothermia was studied, then brain cooling, and later it was found that the combined use of hypothermia and our artificial heart-lung machine made for successful surgery.

In 1953 a new disk-type centrifugal artificial heart (oxygenator) was successfully devised and used clinically. This device oxygenates the venous blood to arterial blood; it was found to need less blood for priming and its disks rotate horizontally instead of perpendicularly. It needs almost an hour of preparation time, however, so we devised the disposable-type bubble oxygenator, which we are using at present. A combination of hypothermia and the use of the oxygenator led to a useful lengthening of the inflow occlusion time—to about 3 hours in most cases.

Work on artificial heart valves eventually produced the SAM valve, first clinically used in 1965. Basic studies on the prevention, mechanism and treatment of brain embolia, pulmonary oedema, acid-base disturbance, and so on, which may appear suddenly during surgery, have also been made.

In 1965 the Heart Institute of Japan was established and specialists in cardiology, paediatric cardiology and surgery were recruited so that research in these fields could be expanded. At this time also, the first emergency ambulance, with all resuscitation facilities, and a coronary care unit were established. Doctors, nurses and assistants have been assigned to these ambulances and many acute cases of myocardial infarction have been saved. The result has been a drop in the mortality rate from arrhythmia in myocardial infarction.

These contributions to society aroused considerable public interest, and gifts of money from various industries and individuals have allowed us to set up a research fund, and thus expand our studies into cardiac diseases. For example, we are developing a scheme in which the management of post-operative patients is carried out by means of a computer. Parameters like the patient's blood pressure, pulse rate, body temperature, respiratory rate, central venous pressure, urinary volume are monitored and the computer prints out the diagnosis and treatment. The system also allows the necessary injections to be given automatically to the patient.

Another plan is to use the computer in the education of medical students—for example, the computer could display the X-ray, phonocardiogram, electrocardiogram and symptoms of a typical case of Fallot's tetralogy.

A fund has also been established from the donations made to researchers in cardiac diseases by large industries and this has been used to establish the Research Centre of the Heart Institute of Japan; it is well equipped and is open to anyone from another university who is interested in cardiac research. This kind of development helps medical progress considerably.

Pattern Information Processing System Project

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Dr Devey describes how government, industry and the universities are co-operating in a large computing project.

THE long tradition of a strong and friendly cooperative interaction between government and industry in Japan is well illustrated by the largest prescriptive research and development project, the Pattern Information Processing System (PIPS) project, being conducted under the National Research and Development Programme (NRDP) of the Ministry of International Trade and Industry (MITI). The aim of the NRDP is to develop the large scale technologies which are urgently needed for the development of Japan's economy. Such projects are under the leadership and full sponsorship of the Japanese government, with the close cooperation of industry and the universities.

The NRDP was established by the Japanese government in 1966, and one of the first projects to be launched was the Super-high Performance Electronic Computer System project, which ended on March 31, 1971. The budget was $27.78 million. The new PIPS project is in part an extension of this project, but there is a significant difference between the two.

Scientists at the Electrotechnical Laboratory (ETL), part of MITI, concluded that much more knowledge is needed about pattern recognition and artificial intelligence, and a plan for a research and development programme in these areas was submitted for approval. The Japanese electronics industry knew of the plan and countered with one of their own; namely, that the basic studies to be conducted by the ETL should become a part of a large scale research and development project oriented towards specific needs and objectives. Industrial influence is strong in Japan, so its view prevailed and the PIPS project began in July 1971. It is scheduled to end on March 31, 1978, and is being coordinated by the ETL.

The investment to be made by the Japanese government during the eight year period is 35,000 million yen, or $100 million at the exchange rate of 1971. The ETL seems to control $20 million while Japanese industry, through the Agency of Industrial Science and Technology (a part of MITI), will support contract research to the approximate tune of $80 million. Additionally, industry is required to contribute $80 million to the project. Thus the project represents a total