

# South Korea sets sights on G-7 status

## Seoul

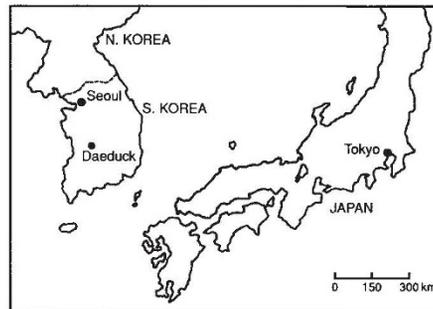
WITH commercial achievements that parallel Japan's success in the 1970s, South Korea has already achieved a reputation as one of Southeast Asia's economic "little dragons", along with Taiwan, Hong Kong and Singapore. Now the country hopes to follow in Japan's footsteps by establishing itself as a scientific and technological power.

To do that, the South Korean government is planning to launch a \$7,000-million research-and-development project next year with the goal of bringing the country's technological capabilities up to the level of the world's leading industrial nations by 2000. Named the 'G-7 project' after the G-7 group of Western summit nations (the United States, Japan, Germany, France, Italy, Canada and the United Kingdom), the project would be by far the largest single investment ever made in science and technology by the Korean government.

Before the project can get under way officially, the Korean parliament will have to pass the G-7 budget request for fiscal year 1992 (which begins on 1 January), a move that should come in the next few

weeks. Government researchers say that science-related budgets undergo only minor modification during the parliamentary process, so the project is certain to go ahead. The biggest hurdle was overcome earlier this year when the Ministry of Science and Technology and other science-related ministries, such as the Ministry of Trade and Industry, decided to launch the project in 1992.

South Korea hopes that by bringing the



level of its science and technology up, it will be able to join the powerful G-7 group early next century. The political process of democratization in South Korea from 1987 has dramatically increased wage levels and the demand for welfare, pushing

up the cost of production and reducing the international competitiveness of Korean export products. Furthermore, heightened protectionism of technology by advanced nations is restricting the advance of Korean industry, and the only way forward is for the country to catch up with the advanced nations by developing its own indigenous high technology to make value-added products for export. The target of catching up by 2000 may seem ambitious, but over the past three decades South Korea has shown a remarkable ability to develop its science and technology infrastructure.

With the partitioning of Korea at the 38th parallel at the end of the Korean war in the early 1950s, the southern half of the country was left with a largely agricultural economy, few natural resources, a meagre industrial base and very few facilities for research and development. In 1965, government and industry spending on research and development amounted to less than 0.3 per cent of the nation's then-tiny gross national product (GNP).

But as a result of a concerted effort by government and industry, annual investment in science and technology now stands

## White lab coats and greasy hands

### Seoul & Daeduck

THE quest to secure economic competitiveness has pushed South Korea to establish a number of scientific and technical institutes. Most recently, it has decided that more of its researchers need to get their "hands greasy" if the country is to keep its edge.

The Korea Institute of Science and Technology (KIST) opened in Seoul in 1996 to carry out contract research for industry. By the 1980s its industrial contracts had diminished considerably, as large-scale industries in Korea began to do their own research, so KIST concentrated on longer-term research of national interest. In 1981, it merged with the Korea Advanced Institute of Science (KAIS), a graduate school for scientists and engineers established in 1971 to attract Korean scientists back from the United States and Europe, and to keep the most promising Korean students in the country.

The merged institution, the Korea Advanced Institute of Science and Technology (KAIST), has become a successful university based in the new science town of Daeduck, south of the capital. Its faculty has grown from 30 members in the 1970s to more than 300 now, and it currently turns out each year about 700 doctoral and masters scientists and engineers — 20 to 30 per cent

of South Korea's total output.

KIST — which in 1989 once again became independent from KAIST — has been equally successful, but in a different way. Several new institutes have been created from it, including the Korean Ocean Research and Development Institute, the Centre for Science and Technology Policy, the Systems Engineering Research Institute and the Genetic Engineering Research Institute in Daeduck.

There have been, however, a number of criticisms that KIST and KAIST are not serving the immediate interests of industry, and, partly in response to these complaints, the Korean government established the Korea Academy of Industrial Technology (KAITECH) in 1989. The academy, which currently receives government funds of about \$200 million a year, exemplifies an ongoing change in government science policy: ministries other than the Ministry of Science and Technology — which until now has had the role of being the lead science and technology ministry — are getting deeply involved in research and development policy.

"For twenty years we have tried to adopt the American way of doing research by setting up high-class academic research organizations like the Korea Institute of Science and Technology," says KAITECH president Young Wook Kim, but what is needed, as Japan has shown, is "produc-

tion engineering".

Kim complains that "80 per cent of PhDs in Korea don't contribute to industry. They just play with chalk on blackboards." Instead, he would like scientists to "take off their white coats, put on some blue overalls, and get down among the grease".

KAITECH is offering powerful financial incentives to entice Korea's PhDs to get their hands greasy. The academy will provide 70 per cent of funds, in the form of zero-interest loans, for near-market joint research by academics and industry on such projects as high-definition television. The remaining 30 per cent will come from the companies involved in the research.

If the research is successful in producing a commercial product, the company (or companies) has to pay back 70 per cent of the research funds received from the government. An unusual characteristic of KAITECH support is that forty per cent of these returned funds will go to the individual researchers involved in the successful research project in the form of grants to support the research of their choice.

The idea is to get academics involved in near-market research by offering them the incentive of obtaining research funds from industry for their own academic pursuits.

David Swinbanks

## A science tax?

### Seoul

THE world's scientists, who often feel they do not have enough money to support their research, will certainly appreciate an idea making the rounds in the South Korean government — a tax levied specifically to raise research funds for science and technology.

As Korea tries to catch up with the technology of the advanced nations of the world, government bureaucrats are giving serious consideration to the introduction of a 'science tax'. Although such a tax is unprecedented, the general scheme of assessing taxes for specific purposes is well established — in the past, the South Korean govern-

ment has put extra taxes on corporations and its citizens to raise funds for defence. So why not, the bureaucrats ask, have a tax to aid Korea's bid to catch up with the technology of Japan and the West?

Among those monitoring science policy in Seoul, the science tax is the talk of the town, but no one can say whether it will ever be levied. It is bound to be unpopular with the general public, and government researchers say that one thing is certain: no attempt to introduce the new tax will be made until, at the earliest, after the general election for the national assembly early next year.

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at about 2 per cent of a healthy GNP, which the government officially placed at about \$273,000 million for 1991. And last week, in mapping out Korea's seventh five-year economic plan, for 1992-1996, a committee chaired by Prime Minister Chung Won-shik estimated that science and technology investment will rise to 3.2 per cent of GNP, or 11.5 million million won (\$15,300 million) by 1996.

These figures should be treated with some caution because much of the increase is due to a surge in capital spending rather than to increased operating expenses for research. Private conglomerates such as Hyundai and Samsung have been funding the construction of research institutes, and this construction boom is expected to continue into the 1990s. Also, the government consistently tends to underestimate GNP in order to maintain favourable lending rates with the World Bank.

Nevertheless, South Korea does now have a substantial infrastructure of new and well-equipped research institutes in both the government and private sector, and the population of doctoral- and masters-level engineers and scientists is growing rapidly. At present, the country has about 50,000 researchers (one-tenth that of Japan), and the government's plans call for this number to be tripled by early next century. This would bring the percentage of researchers in the total population (currently 42 million) up to a level comparable with that of advanced nations, such as the United States and Japan.

The G-7 project forms a key part of the government plans for expansion. With a proposed budget of about \$7,000 million over nine years (1992-2000), the project will support the development of seven advanced technologies — semiconductor memory chips, Integrated Services and Data Networks (ISDN) for telecommunications, high-definition television (HDTV), electrical vehicles, intelligent computers, new antibiotics and chemicals for agriculture, and advanced, fully auto-

mated manufacturing systems.

A second part of the project will concentrate on the development of basic technology that is further from the market. Again seven areas are targeted: new materials, next-generation transportation systems, biotechnology, 'environment friendly' technology, new clean energy sources, advanced atomic reactors and human interface technology based on 'user friendly' electronics and robotics.

If all goes according to plan, Korea will have developed 256-megabit dynamic random access memory (DRAM) chips by 1996 and 1-gigabit chips by 2000. (Korea already has its own domestically developed 16-megabit chips.) HDTV monitors compatible with Japanese and European systems are scheduled to become available in 1993, and HDTV flatscreen displays by 1997. Electrical vehicles would be commercialized by 1996, a neuro-computer by 1997, and ISDN by 2000.

Much (50 to 70 per cent) of the research will be carried out by institutes affiliated with the Ministry of Science and Technology, particularly the Korean Institute of Science and Technology (KIST) in Seoul and affiliated KIST institutes and the Korean Advanced Institute of Science and Technology in Daeduck science town. But private industry will also make a substantial contribution, and so will the new Korean Academy of Industrial Technology, an organization that coordinates and funds near-market joint research between government, industry and academia.

Whether the project will achieve the full level of funding proposed remains open to question. One Western science officer in Seoul says he always divides figures quoted by Korean government officials by three to arrive at a more realistic estimate of what is actually going on. It is clear, however, that the G-7 project will go ahead and Korea is determined to go on the fast track to try to catch up with the most advanced nations of the world.

David Swinbanks

## UK primate research under scrutiny

### London

A NUMBER of published British research studies involving primates should not have been licensed under existing animal welfare legislation, according to the Scottish pressure group Advocates for Animals. The group, which last year exposed serious breaches of animal welfare legislation at the National Institute for Medical Research of the Medical Research Council (MRC) (see *Nature* 345; 190; 1990), this week released a report detailing 13 research papers published since 1987 derived from work that Advocates for Animals believe should not have received Home Office approval.

Les Ward, director of Advocates for Animals, said the aim of the report is to ensure that British primate researchers adhere to UK animal experimentation legislation, as overhauled in 1986. The 1986 Act requires that the Home Secretary not grant a project licence for work involving primates unless no other species are suitable for the research, or if it is impractical to obtain animals from other species.

Ward questions whether this requirement was met for several of the research projects examined in the report. Advocates for Animals also charge that some of the research was repetitive of previous experiments, and that in some cases the Home Office failed adequately to balance the likely suffering of the animals concerned against the expected benefits of the research. The group wants the Home Secretary to investigate why the named research projects were approved, and for the Animal Procedures Committee (a panel of independent experts which advises the Home Office) to review all current British primate research. On Monday, the Home Office said it would look into Advocates for Animals' specific allegations before deciding whether to examine British primate research in general.

Unlike its previous report on work at the National Institute for Medical Research, which involved clear breaches of the 1986 Act, Advocates for Animals' latest charges will be difficult to address. The issues in question — whether the use of primates was essential, whether the suffering outweighed the gain in scientific knowledge, and the degree of overlap with previous work — depend on subjective judgements, where the opinions of researchers and of animal welfare groups will diverge. "You can't give somebody a cost-benefit equation in which to plug in the parameters," says MRC secretary Dai Rees, whose organization provided funding for more than half of the projects named by Advocates for Animals. Nevertheless, he says the MRC intends to investigate the charges fully. Peter Aldhous