Shakeup Under Way for Australian Science

A complete overhaul of the nation's research system has been made central to the government's plans for turning a mining and agricultural economy into one based on high technology

Canberra

AUSTRALIA is a country with a long and respected tradition in basic science. Yet its level of industrial support for research and development is no higher than that of Iceland.

Until recently, this discrepancy has not mattered much. A prosperous economy based primarily on agriculture and mining had ensured that what is often referred to as "the lucky country" could generate sufficient foreign earnings to buy from abroad whatever technology it needed. But with the price of raw materials dropping and a trade gap growing rapidly, the country is being forced to change direction.

Over the past year, the Labour government headed by Prime Minister Bob Hawke has been taking a series of dramatic steps designed to restructure the nation's scientific activities in a way that enhances their contribution to economic growth and, in particular, high-technology exports. "The government has decided that we must concentrate our research resources and plan for strategic directions in the future with defined objectives in mind," said John Dawkins, the minister in charge of the newly-created "superministry" of Employment, Education and Training, in announcing the changes during a budget speech in mid-October.

These steps have included a new "applications-oriented" structure for the nation's main research agency, the Commonwealth Scientific and Industrial Research Organisation (CSIRO); the creation of a new Australian Research Council (ARC) to take over responsibilities for supporting university-based research; and new policies that remove the automatic right of all university academics to claim research support.

The government's strategy, which has been contentious in many parts of the research community, has two major thrusts. The first is to increase its direct involvement in selecting the goals of publicly funded research. A substantial proportion of ARC's funding will in fact be devoted to specified areas of strategic research.

The second is to increase the involvement of the private sector, both directly and indirectly, in supporting and directing the nation's research efforts. Thus, ARC has been given explicit responsibility for increasing links between industrial companies and university researchers.

In many ways, the new directions in Australian science policy, with its emphasis on the contribution of science to the nation's international competitiveness, are little different from those being introduced in other industrialized nations. Several factors, however, distinguish the problems faced by Australia as it tries to modernize its research base. For example, the relative prosperity generated by exports of primary products in the recent past has sheltered Australian research institutions from the type of pressure for structural change that those in other industrialized nations—in particular Britain, which provided the original models for much of Australia's research system—have experienced.

A relatively weak tradition of centralized government direction over all areas of social activity also sets Australia apart from many other countries. This results partly from the fact that Australia has a federal system in which individual states tend to play a more important role in setting policy than they do in, for example, the United States, and the power of central policy-makers is correspondingly less.

Finally, much of the technology transferred into Australia—and thus the R&D on which the country's technology is based—remains under the control of foreign (primarily U.S.-based) transnational corporations. This is one of the main reasons for the low expenditure on industrial R&D in Australia itself, over half of which is carried out by foreign corporations.

These three barriers have become the principal targets of the government's efforts to achieve a major break with past traditions. So far, the most heavily affected organization has been CSIRO, still the most broadly based government research institution in any industrialized country, with a research staff of 7500 and responsibilities for basic and applied research in fields ranging from agriculture to electronics.

John Dawkins. *Minister of Employment, Education and Training, and an architect of the new research strategy.*

CSIRO has now seen its $315 million annual budget cut by 3% and has been given instructions to reorganize its research along eight preselected lines of strategic research. The council's new chairman, Sir Neville Wran, a lawyer who until recently was the Premier of New South Wales, has promised that "there will be a tighter monitoring of research to maximize its economic or social value to the Australian community."

For the first time in the 61-year history of CSIRO, priority areas are being identified and some fields of research are being explicitly dropped. "A small nation like Australia must be selective in R&D areas," says CSIRO chief executive Keith Boardman. "We need to focus more sharply on certain programs and devote sufficient resources to make them worthwhile; in other words, we should be attempting to pick winners."

Similar changes in the funding of university research will, the government hopes, result from the creation of ARC. Research awards were made by ARC's predecessor, the Australian Research Grants Scheme, solely on the basis of academic merit; the new ARC will be expected to allocate its research money with a view to the potential contribution of the research to the nation's economic base, and some of its funding will be explicitly earmarked for this purpose.

Greater direction of university research is also expected to result from a new system for funding universities, part of what one vice-chancellor describes as an "agonizing reappraisal" of the whole higher education system. Until now, universities have received their government support (including an al-

growers are spending on insecticides, and then they'll come in just below that figure."

The reason that the cost of pheromone for grape berry moth is still an academic question is because the Cornell group has had difficulty obtaining an "Experimental Use Permit" from the government, the first and largest hurdle on the road to getting full registration for a pheromone product from EPA. Particularly galling to individual investigators and the small companies they often collaborate with is the fact that it is almost as cumbersome to obtain an experimental use permit as it is to register the pheromone with EPA as a pesticide. And chasing a permit can be a lengthy and expensive process. "Mind-boggling bureaucratic mumbo jumbo," according to one entomologist. Unless a researcher can justify waiving much of the data, the EPA requires detailed information on the pheromone's toxicology, residue chemistry, possible exposure to humans and the environment, and ecological effects.

If the pheromone is going to be used on food crops, the researcher must prove that the pheromone has a limited toxicity and no adverse effects on humans. Without such a "temporary tolerance" permit, the crops must be destroyed. In Geneva, Roelofs and his colleagues have been destroying grapes for years. "At $1000 per acre for grapes, you can very clearly see why we haven't done tests on 80 acres," says Dennehy. "It's crazy," adds Roelofs. "We're destroying grapes that were protected by a completely natural nontoxic substance made by moths."

Charles O'Connor, a Washington D.C. attorney who consults for the pheromone industry, estimates that obtaining an experimental use permit can take as long as a year and as much as $300,000. "The upfront costs of data generation are prohibitive," says O'Connor. And the time factor is crucial. Some moths, for example, are on the wing for only a few nights a year. If researchers miss the reproductive window, they must wait another year to run the experiment.

In its defense, the EPA says that it waives much of the information. "The data requirements are really quite minimal," says Herbert Harrison, chief of insecticides and rodenticides for EPA. Unfortunately, though, it is difficult for researchers to know what will or will not be waived until they actually submit their applications for permits. "It's a crap shoot," says one entomologist currently in the regulatory loop. Researchers like Roelofs would like to see EPA grant "class action" registration for all related pheromones. He would also like to see data requirements slimmed down, especially for experimental use permits for researchers. Harrison says that "at some point we may give pheromones broad exemption. But it's dangerous to do that. We may eventually find one that's toxic. If we don't get any scientific information, we might never know."

Even without government regulations, pheromones may prove to be almost too benign for heavy-handed agriculture. Growers, for instance, like to see dead bugs. "It's tough to get farmers off the pesticide treadmill," says Jack Jenkins of Scentry Incorporated of Buckeye, Arizona. The big chemical companies like to sell pesticides that have broad applications. "We all know how to replace an old chemical with a new chemical, but not how to replace an old chemical with a pheromone," says Kurt Nabholz of Sandoz in Basel, Switzerland.

Yet in a world where insects are becoming increasingly resistant to traditional pesticides, the environment increasingly burdened by the toxic load, and the public more concerned about such things as contaminated ground water, pheromones, however imperfect, appear to have a role to play. Says Ridgway: "It finally looks like pheromones are here to stay." ■ WILLIAM BOOTH

Details of 1957 British Nuclear Accident Withheld to Avoid Endangering U.S. Ties

British Prime Minister Harold Macmillan withheld publication of details of the world's first major nuclear accident, a fire in 1957 at a plutonium separation facility, in order to encourage the United States to continue to share its nuclear secrets with Britain, according to Cabinet papers released in London last week.

The fire took place at a plant at Windscale, on Britain's northwest coast, in a gas-cooled reactor used to produce the fuel for nuclear weapons. Over 20,000 curies of iodine were released into the atmosphere. In comparison, only 30 curies escaped during the nuclear accident at Three Mile Island.

A detailed inquiry into the accident revealed that the fire, which burned for a considerable period of time before it was detected, was the result both of major design faults and lack of experience among technical staff.

However, when the report was presented to Macmillan, the Conservative Prime Minister, he instructed that key passages be deleted prior to its publication—even though it was generally accepted that there were no military secrets involved. The report has now been published under the ruling that government documents in Britain can be made available after an interval of 30 years, unless defense secrets are involved.

"When the report was done, we in the authority—with the agreement of the Ministry of Defense—agreed that there would not be any real security objections to publishing it, and we recommended to the PM [Prime Minister] that it should be published," Lord Plowden, then the chairman of the Atomic Energy Authority, said in an interview last week with the British Broadcasting Corporation. "I went to see the Prime Minister, who said he felt that to publish the report in full would strengthen the hands of those opposed to a liberalization of the Macmahon Act in the U.S., who would claim that the British did not hold on to information but publish it so that people can calculate things from it," said Plowden. "This was an entirely political judgment; Macmillan felt we should modify the publication, and this was done."

Plowden said that the accident had "all the hallmarks of an industry in a hurry" but added that one should not judge what happened 30 years ago in the light of what we know now.

"Atomic energy was a completely new industry. We were under pressure, firstly to get weapons made as quickly as possible because of the fear that there might be an invasion from Russia. Also we wanted to be on equality with the U.S. as one of the countries that did have atomic weapons. And there was also great pressure put on the atomic energy authority to develop a nuclear power program. With hindsight one would probably have gone more slowly."

John Cunningham, a member of Parliament whose constituency includes the Windscale plant (recently redeveloped under the name of the Sellafield reprocessing plant), said it remained important to ensure that no information had been withheld about the accident. "One of the most important lessons of the publication of this information is that it will give a major and much-needed boost to the campaign for a Freedom of Information Act in Britain," he said.

Ironically, some British scientists argue that the Windscale fire could have been prevented if the United States had earlier been prepared to share more of its information with Britain about the behavior of nuclear fuels, and not held back from sharing this information for reasons of national security. ■ DAVID DICKSON