

US universities

New crisis looms for graduate education

Washington

GRADUATE departments in US universities face severe shortages of talented doctoral candidates in areas such as engineering and computer science, while good staff are frequently lured away by the better pay and newer laboratories available in industry. These are the principal findings of the report last week of a commission appointed jointly by Congress and President Reagan.

The commission found what it describes as "startling inadequacies" in the number of doctoral students entering important fields. In 1979, for example, only 309 doctorates in chemical engineering were awarded in the United States, and nearly half of those went to foreign students. The dwindling number of new doctorates is making it impossible for some universities to replenish depleted faculties in fashionable fields such as computer engineering, solid-state electronics and digital systems.

In other fields, however, the problem is reversed. Shrinking employment opportunities in the humanities and social sciences have reduced staff turnover and blocked the careers of younger academics. Many young humanists and social scientists, the commission says, now lead lives of "quiet desperation", making up a class of itinerant scholars wandering from campus to campus in the often vain hope of securing a tenured post.

The collapse of the academic job market has discouraged many graduates from pursuing academic studies. A telling statistic reported by the commission is that only a third of those who graduated with a good degree in 1980 planned traditional graduate studies compared with more than three-quarters in the 1960s. Many of the best graduates were more inclined to switch to professional studies in law or medicine.

Science graduates who do choose to pursue a career in research do not always find that a university offers the best research environment. Surveys have shown that university equipment is usually twice as old as that in leading commercial laboratories, prompting a university respondent to a survey by the Association of American Universities to complain that the ivory towers are now in industry.

Thomas Kailaph, associate chairman of electrical engineering at Stanford University, told the commission that a \$13 million engineering equipment fund set up by the Department of Defense had been swamped by requests totalling more than \$1,000 million. The University of California estimates that since 1975, when 25 per cent of its research equipment was

obsolete, obsolescence has claimed an additional 5 per cent each year, while state appropriations for equipment replacement have averaged less than 2 per cent of replacement costs.

Something is being done, however. The commission applauds the National Science Foundation's plan to increase its support for equipment and instrumentation from an estimated \$90 million in 1982 to \$180 million by 1984. The Pentagon is also increasing its spending on university research facilities. But the commission calls for an even greater effort and wants

Congress to approve new methods, such as larger tax incentives and federal matching grants, to persuade industry to donate equipment to universities.

The commission also recommends a substantial increase in federal support for research fellowships and assistantships. Graduate students, it says, should remain eligible for the government's Guaranteed Student Loan scheme, which enables students to borrow up to \$5,000 a year on a fixed interest rate of 8 per cent, with repayments postponed until graduation. Nearly half a million graduate and professional students used the loan scheme in 1982, and although the Reagan Administration, concerned about the mounting cost, proposed restricting the scheme to undergraduates, it later dropped the proposal when faced with strong congressional opposition.

Peter David

UK nuclear power

Possible prosecution for Sellafield

THE Director of Public Prosecutions is this week considering whether there is a case for criminal proceedings against British Nuclear Fuels Limited (BNFL) over last month's accidental radioactive discharge into the sea from its fuel reprocessing plant at Sellafield (formerly Windscale) in Cumbria. A preliminary report into the incident by the Nuclear Installations Inspectorate is being studied, and could lead to prosecution under the Health and Safety at Work Act, while a separate report by the Department of the Environment, now being considered by ministers, could form the basis of a prosecution under the Radioactive Substances Act.

It is clear that the discharge was larger than BNFL at first admitted. In addition to come 600 curies of beta radioactivity in aqueous solution, an unknown quantity of particulate matter and chemical solvent was released. BNFL says the total amount of radioactivity released was substantially less than 4,500 curies and so within authorized limits.

The accident occurred because of a "misunderstanding" between plant managers. On 11 November automatic alarms were triggered when water, solvent and "crud" were drained into a sea discharge tank before the highly radioactive solvent and "crud" had first been separated off. The flow was stopped, but not before 4,500 curies had found its way into the sea discharge tank, intended only for dilute aqueous waste. The contents of the tank were eventually discharged into the sea through a single 2-inch diameter pipe. Mr Con Allday, BNFL's chairman, said last week that the sea tank was not meant to be a last barrier before the sea and that management decisions after the original error had been correct. Staff had acted at all times in good faith; nobody had been sacked or suspended from duty.

The discharge was first brought to public attention by Greenpeace, the "direct action" conservation group, after radioactive contamination of their divers on 15 and 16 November and BNFL's first public statement on the matter was made on 19 November. The statement referred only to 500 curies of beta radioactivity in aqueous solution, and made no mention of the particulate matter, which, sticking to seaweed and marine debris, led to a public warning by the Department of the Environment against use of beaches near Sellafield.

Last week Mr Allday accepted that the nuclear industry had to be, like Caesar's wife, above suspicion, and that BNFL had fallen from the high standards rightly expected of it. But he stressed that there was no evidence that the public had been put at hazard as a result of the accident. He also complained that BNFL had not received due credit for the action it had taken to reduce sea discharges from the high levels of the early 1970s. Needless to say, operating procedures have been revised to prevent a repetition of last month's accident, even though it was probably not an important health hazard.

Perhaps of more concern are the alpha-emitting actinides (especially plutonium), which are discharged routinely and bind to sediments on the sea bed. Safety limits for plutonium were effectively lowered by a factor of fifteen recently (see *Nature* 15 December, p.634). The National Radiological Protection Board announced this week that it is to set up a controlled investigation into household dust as a possible exposure route for actinides, which are resuspended and concentrated from sediments and then blown ashore in sea spray. But, says the board, exposure through this route does not at present appear to be a significant hazard.

Tim Beardsley