

operation.

Although it is too soon to know whether GMAG will or should go out of business, the recruitment of specialists in genetic manipulation to the committee may now become increasingly difficult. The group, in any case, will have its hands full with the scrutiny of proposals for work in categories II-IV of the guidelines procedures, and with the principles for regulating large-scale manufacture. The reconstitution of the Dangerous Pathogens Advisory Group, expected soon, should, however, help to clarify GMAG's long-term future.

Engineering research

Planning for more

Washington

Federal policy-makers are now in the process of deciding whether the National Science Foundation (NSF) can provide an adequate framework for regenerating the health of the nation's engineering efforts. NSF officials are confident that it can. A prominent component of plans for reorganizing the foundation, formally presented last Thursday to the National Science Board responsible for foundation policy, is the creation of a new engineering directorate (see *Nature* 11 September). Applied science, which shares a directorate with engineering, would be distributed among the other research directorates.

Concern for the health of US engineering research has arisen as part of the wider debate about declining productivity and stagnating innovation. Equally important, however, has been what NSF acting director Dr Donald Langenberg describes as an "upsurge of interest" from engineering societies over the state of their profession and the role of federal support.

Both NSF and its critics agree that US engineering is in poor health. A rapidly escalating demand for engineers for large-scale construction projects in the oil and chemical industries has created a national shortage of engineers. This situation will be exacerbated by the demands of new plants to be financed out of the government's \$20,000 synthetic fuels programme.

The shortage is reflected in the high salaries paid to engineering graduates, while another result is that few graduates are tempted to stay on at university to do research once they have completed their first degree. Many postgraduate courses are now largely filled with foreign students and NSF estimates that, overall, there are 2,000 empty positions in university engineering faculties.

Some universities are designing schemes to compensate. Carnegie-Mellon University in Pittsburgh, for example, plans to offer loans of \$1,000 a month to PhD candidates, which need not be paid back if the candidate stays on and teaches.

However, there is general agreement that more than a piecemeal approach is needed;

the question is the form it should take. Dr Leo Young, president of the Institute of Electrical and Electronic Engineers (IEEE), has proposed a "blue-ribbon commission" — somewhat similar to Britain's Finiston Committee — to look at the problems facing the profession.

In Congress, discussion has focused on a bill introduced by Mr George Brown, chairman of the House science and technology subcommittee, which proposes setting up a National Technology Foundation. Mr Brown admits that his proposal has been put forward chiefly as a vehicle for discussing a range of proposals and that a revised bill is likely to be presented to the next session of Congress.

However, many engineers have not lost the opportunity to vent their frustrations at what they consider to be a lack of support from the federal government in general — and the NSF in particular — especially in fields outside space and defence research.

"Those university departments supported by the Department of Defense and the National Aeronautics and Space Administration have fared well, while civilian engineering, such as building technology and machinery design, have been neglected" complained Dr Bruno O. Weinschel, head of a private engineering company and secretary of IEEE.

National Science Board chairman Dr Lewis Branscomb of IBM admitted at congressional hearings on the bill that NSF support for engineering may have been weak in the past, but he insisted that this was now being remedied. He pointed out that for the past two years the board has proposed greater increases in the foundation's support for engineering research than for any other area of science.

NSF is hoping that its planned reorganization will go some way towards meeting its critics and will in particular head off any attempt to set up a new, separate institution (which might, in addition to the organization split, also be in a position to compete for funds). At a public meeting two weeks ago, held to discuss the reorganization proposals, Dr Langenberg said that engineering research could benefit financially from having its own directorate. He also hinted that reorganization plans were likely to be accompanied by a request for a significant increase in funds for engineering research when the foundation's budget request for 1982 goes to Congress in January.

Further financial commitments are likely to result from President Carter's decision about how to embrace science and engineering education in US schools and colleges, a report on which was sent to the White House by NSF and the Department of Education last month, and is expected to be made public shortly. But even if the Administration agrees that there is room for a larger role for engineering in the foundation, Congress may take some convincing. In debating the NSF appropriations in July, the House of Repre-

sentatives rejected a proposal for a 10 per cent increase in funds for the engineering directorate.

The White House report is likely to have a good deal to say about engineering research in American universities and colleges. Although, elsewhere, engineering graduates tend to stay away from doctoral courses, in its United States the demand is still quite high. There is, however, increasing concern about the willingness of potential faculty members to teach.

Perhaps more significantly, the powerful House Appropriations Committee claimed that its restriction of the use of NSF funds planned for various innovation projects was imposed "to ensure that an unacceptable level of un-budgeted items does not erode funding for basic research programmes which is — and continues to be — the *raison d'être* of the foundation".

These sentiments find an echo, though somewhat muted, within the scientific community. At the public meeting on 13 September, representatives of several of the NSF's advisory committees expressed concern that too great an emphasis on engineering and applied science could put a further squeeze on basic research. Dr Langenberg replied that he felt basic science was sufficiently robust not to be significantly threatened, but not everyone present was convinced. **David Dickson**

Electronic publishing

Keyboard papers

Those who wish to publish a research article in a journal, who are asked to referee a paper or who simply want to read what their colleagues have been publishing may in future have to turn to a computer terminal. The fully electronic scientific journal is still a few years off, however. But a group of British researchers is already beginning to consider its possibilities, in a project supported to the tune of £256,000 by the British Library.

The aim of the project, which begins in earnest in November, is to investigate whether electronic journals might ever be feasible, how much they would cost the user and the type of problems they would pose to users. The leg work is being done by groups at the University of Birmingham Loughborough University. The Birmingham group, under Professor P. Jarratt, will be providing the central computer facility and hardware and software to other participants in the project at a cost of £122,000. The Loughborough group, under Professor B. Shackel, will coordinate the setting up of an experimental electronic journal using the rest of the funds.

About 35-40 people dotted throughout universities in Britain will be collaborating. Each centre will provide its own terminal linked in to the Birmingham computer. The British Library funds will go towards

paying for time spent on the computer and telephone connection costs. Appropriately, the collaborators in the experiment have been drawn from the British community of researchers into computer human factors, which will form the subject of the journal.

The project is expected to last two years during which time each collaborator will be required to submit two papers to the journal for publication. Papers can be submitted directly via the computer system, can be sent to the editor, Professor Shackel, in a reasonably neat form for input into the system via a word processor or can be sent in perfect form to Birmingham for input through optical character recognition. Referees, who will be drawn from the same group of collaborators, will be informed that a paper is waiting to be read by messages which will appear on their Visual Display Units (VDUs) the next time they access the system. The submission and refereeing of a manuscript will be confidential to the editor and author or referee. Only when the manuscript has been accepted for publication will it be available to all collaborators in the system.

The British experiment is not the first of its kind. An earlier, similar exercise supported by the National Science Foundation in the United States ended in failure. The main problem was that people found the computer system difficult and time-consuming to deal with. At the end of that project, no paper had been submitted to the experimental journal, let alone published.

Professor Shackel is confident that the British experiment will not fall into the traps of the American one. His project, he says, has been designed to allow users a fair degree of flexibility, something which the Americans omitted. Although the ideal operating mode would be for everything to be done directly onto the computer, including the original writing of manuscripts, refereeing and editing, Professor Shackel acknowledges that this would be impractical for most people. His system allows authors to submit papers in several different ways, including the conventional way of sending a typed manuscript to him. Referees will also have the option of reading manuscripts directly on their VDUs or requesting that they be printed out.

Another aspect of the project's flexibility, says Professor Shackel, is that it will also investigate the possibilities of publishing scientific newsletters, annotated abstracts and reports of workshop conferences electronically, not just research papers. He also hopes to study the potential for greater cooperation between authors, referees and editors by using computer communications, and for increasing informal communication between scientists working on similar problems in different places.

Judy Redfearn

Soviet swindles

Degrees by stealth

Soviet ministries are killing the goose that lays the golden egg, as far as applied science is concerned. So says the prestigious weekly *Literaturnaya Gazeta* in the latest round of its press debate on the relative merits of pure and applied research.

Such debates are a common Soviet method of airing and channelling public opinion on problems of general concern ahead of decisions by the Party. The present debate was launched by *Literaturnaya Gazeta* in January of this year, as a Soviet version of C.P. Snow's "two cultures". In particular, it aims to investigate why public opinion considers applied research so much less prestigious than pure research. This is more than an academic question because, according to Party directives, all Soviet research should be aimed towards benefiting the national economy. However, at the Twenty-Fifth Party Congress (1976), Mr Brezhnev said that in the long run "there is nothing more practical than a good theory". And although the Soviet higher education system stipulates that new graduates must work three years in whatever job they are assigned, it is the most brilliant graduates (and those with special Party backing), who end up in the academic research posts.

To a certain extent, the division between pure research (carried out in the Institutes of the Academy of Sciences) and applied research (carried out in the "Branch Institutes" belonging to the various ministries) is a formal one. As I. Novikov, a Corresponding-Member of the Soviet Academy of Sciences, pointed out in the latest round of the debate, leading establishments such as the Kurchatov Atomic Energy Institute or the Central Institute of Aero-Hydrodynamics (the "cradle of Soviet aeronautics") fall outside the Academy structure. For the most part, however, conditions in the branch institutes bear no comparison with those of the Academy.

The working environment of the branch institutes was criticized by S. Kara-Murza, apparently representing the younger generation of scientists. He complained that it was difficult to maintain pride in one's work, and that team spirit was hampered by the custom of hanging up on the notice board graded assessments of researchers' creative potential. The ministries running the branch institutes seem to be trying to extend the principles learned in maximizing productivity in factories to the field of scientific research. The branch institutes also tend to be inward-looking, concentrating on intra-departmental communication and missing outside developments. One example of this is the institute that was supposed to be playing a leading role in stock-breeding and was found to be using methods of

biochemical analysis which dated from the 1920s and 1930s. The institutes run by the All-Union Academy of Sciences and the academies of the Union republics are less insular and benefit from communication with the world scientific community.

Meanwhile, it seems that some employees of the non-Academy institutes have found unauthorized outlets for their frustrated talents. These range from a racket in fake degrees and diplomas uncovered last year in Georgia and Azerbaijan to last month's revelation that the rector of a technological institute of fishery in Astrakhan had been diverting student housing funds to build luxury flats. Perhaps the most ingenious example of corruption so far comes from the Novgorod Polytechnic Institute and involved senior staff and some two hundred students. The staff applied for funds for research for which they had no facilities — the students were entered as "researchers", and received a sizeable share of the profits.

Vera Rich

Space shuttle

Delay costs money

Washington

Officials of the National Aeronautics and Space Administration (NASA) have expressed confidence that despite a tight schedule it should be possible to meet the planned date of next March for the first orbital flight of the re-usable space shuttle.

The delays in the schedule of operational flights have already caused problems for some of the shuttle's early commercial users faced with the alternatives of setting back their launch programmes or opting for more expensive expendable launchers.

Satellite Business Systems, for example, which plans to launch a series of satellites for information relay by private corporations, has recently decided to use a Delta rocket for the launch of its second satellite in 1981, rather than waiting for its first scheduled shuttle launch, originally booked for next March but since pushed back to 1983.

Even greater problems have been caused for Intelsat, the consortium of telecommunications authorities which pay for and use the communications satellites which are the present base of international telecommunications traffic.

Originally it had been intended to launch several of the Intelsat V series of satellites, the first due in December, from the shuttle. Now at least the first five out of eight launches will be from Atlas Centaur rockets.

Intelsat is keeping its options open. In addition to its shuttle bookings, and a recent decision to order the extra Centaur launches, space has been booked on two early Ariane launches (which remain dependent on the success of further tests of the European rocket).