clear, although the decline has been greatest in the "traditional" fields such as civil engineering, while the most modern departments such as computer sciences are full to overflowing. This suggests that the universities are failing to adapt to modern trends — an ironic conclusion when they themselves have founded such institutions as the Institute of Forward Planning at Tel Aviv or the Neimann Institute at the Technion to act as potential policy advisers.

Employment problems are exacerbated by the relatively small payrolls of the new science-based industries. Would-be students therefore think twice before investing some five or seven years — delayed by a further three years military service — in an exact science when the job prospects are so uncertain.

The Jerusalem College of Technology, which was specifically founded to train the expert workforce the country needs, may be an exception. It is a relatively small and religious foundation where the all-male students study Judaism in the mornings and technical subjects to first degree level in the afternoons and evenings. The "new pioneering spirit" described by the founder and rector, Professor William Low, has presumably helped to take the edge off job uncertainty.

Perhaps inevitably, the symposium produced a gloomy forecast for the next couple of decades. According to Professor Joshua Yavner of Tel Aviv University, unless the government stops the cuts in higher education, Israel will suffer the loss of its main "natural resource" — educated manpower. Hitherto, the University Grants Committee, which administers the government's block funding of higher education, has tried to restrict the cuts to ancillary and non-academic fields (although library budgets have been considerably curtailed), but a point will soon be reached where no more such economies are possible. Then, inevitably, the output of science graduates and PhDs will begin to decline, and the new science-based industries, founded on the expertise of those who graduated in the 1960s and early 1970s, will fail to achieve their early promise.

Vera Rich

US research patents

Conflicts arise

Washington

United States universities are lobbying hard in defence of their newly-won right to an automatic patent on all inventions arising from federally supported research. They are alarmed that their rights may be circumscribed in what may be the most profitable field — genetic engineering.

Two weeks ago, the House of Representatives Science and Technology Committee approved an amendment to a draft bill on patent rights, already approved by the Senate, to exempt the results of research using recombinant DNA techniques from the broad provisions of patent legislation passed by Congress last December.

The amendment was offered by Representative Albert Gore of Tennessee, chairman of the committee's investigations and oversight subcommittee, and follows his criticism of an an agreement between Massachusetts General Hospital (MGH) and the German chemical company Hoechst that would, he claims, allow the company to benefit unfairly from research paid for by the US taxpayer (*Nature* 18 June, p.525).

Several Washington-based groups representing research universities have protested, saying that this amendment undermines the whole purpose of the new legislation, which is to speed the transfer of research results to private companies. They point out that three years ago, after consulting universities and industry, Dr Donald Fredrickson, then director of the National Institutes of Health (NIH), concluded that no special arrangements need be made for the application of patent laws to genetic engineering research.

An aide to Mr Gore said last week that the congressman might agree to withdraw the amendment before the draft bill reaches the floor of the House for discussion. The Senate has already passed such a bill which even expands the scope of last year's legislation to include not only universities and small businesses but all companies receiving federal research funds, and Senate aides said last week that they were totally opposed to the House commitee's amendments.

However, Mr Gore still seems keen that the bill should make a sharp distinction between the control of research results funded from public and private funds. This could complicate efforts by NIH to interpret the new law's provisions on jointly funded projects.

Under the terms of the MGH/Hoechst agreement, the company will provide the hospital with up to $50 million over a ten-year period to support basic research carried out in a new Department of Molecular Biology. All the research would be under the control of MGH and all research results could be freely published after a 30-day preview by the company, but Hoechst would have first refusal to license patentable results.

Both MGH and Hoechst insist that this arrangement is compatible with existing academic practice, that they have gone to great lengths to avoid any possible conflicts of interest or undue secrecy, and indeed that the terms of the agreement might act as a model for other universities seeking research support from the private sector.

Mr Gore, however, says that his concerns are endorsed by a report he commissioned from the General Accounting Office, the investigative arm of Congress, which pointed out ways in which the agreement might conflict with the patent legislation passed last year. Under the current legislation, any patents arising from jointly funded research would remain the property of the research institution, but the federal government would be permitted free use of the patent, and would also be able to reclaim control of the patent rights. However, MGH acting director general Dr Joseph Martin insisted that a clear distinction would be made between research supported by the federal government and that financed by Hoechst.

Mr Gore remains unconvinced. He argues that maintaining a clear separation between separately-funded research projects is "simply a fiction" and promises that, even if his amendment to the patent legislation is dropped, he will be keeping a close eye on the MGH/Hoechst and other similar agreements, to protect what he describes as a massive public investment in recombinant DNA research. An official in the legislative office of NIH said last Friday that he felt the concern raised by the General Accounting Office; about jointly funded research "is certainly a problem that is not non-existent, although it does not currently appear very prevalent". A delegation from NIH will be visiting MGH next week to discuss the impact of the new patent legislation on future arrangements for federally funded research at the hospital.

David Dickson

Science in France

Democratic union

Grenoble

How far can democracy go? This question is emerging as one of those central to the new politics of science in France, and it was put to a remarkable test last week.

Professor Robert Tournier, the 47-year-old director of the renowned laboratory for very low temperatures at Grenoble, in the Rhônes-Alpes, announced some time ago to his colleagues that he wanted to resign the directorship to have more time for research in his own laboratory. Normally, the CNRS would take advice on a new director from the laboratory steering committee, and from the CNRS "parliament", the Comité National, and then would merely announce an appointment. This time it has another factor to take into account. Internal advisory committees in the laboratory could not agree on their recommendation for a successor, and Fournier, as a good democrat and socialist, asked the whole laboratory, including technicians, to give their advice on two candidates.

The resulting "election" took place last week. It has no official significance, and was nearly a draw. But the trades unions (their favoured candidate having won) are treating the event as a clear selection of director, and have written to the Paris headquarters of the Centre National de la Recherche Scientifique, to which the laboratory belongs, to say so.

As it happens, the narrowly-elected

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candidate — a personable 39-year-old physicist called Daniel Thoulouze — is also likely to be the recommendation of the relevant section of the Comité National, so there may be no conflict. But the CNRS directorate is put in an awkward position whatever the result. If it selects Thoulouze, it will appear to approve of the grass-roots election of laboratory directors — which it wants to avoid. Yet if it selects another, it will appear to confirm the fears of the more radical scientists and the strong trades union movement in French science that, despite a socialist government, the selection of laboratory directors — who have great power over their laboratories — will remain closed and centralized.

In the event, the CNRS may be forced to ask Tournier to continue. The new CNRS director-general, Jean-Jacques Payan, is not against elections in principle; but he says they should be undertaken only "in a very precise framework", meaning that the electorate should be appropriate to the category of post. But Payan is under great pressure from the grass roots, the technicians and the younger researchers, for a more democratic way of appointing directors, and he will certainly have to give in to some extent. As Tournier himself said this week, the question is whether the CNRS is forced into a system where directors must conform to majority opinion in a laboratory, or a system where the directors can be independent, but must subsequently seek to bring the whole laboratory behind them.

Meanwhile the unions of Grenoble, which have enjoyed a large degree of democracy (or at least, consultation), since 1968, are determined to be "serious" about the election. The candidates were grilled in debates, and their scientific and general laboratory policy examined, they said. The unions' objective is that the laboratory should continue to do good science, and they insist that that requires the director to have good relations with his staff, down to the lowest technician.

And to some extent, this policy is reflected at the Ministry of Research and Technology in Paris, which gave Payan his job at the CNRS. The strong feeling there is that science is more and more a collective exercise — and that democracy and efficiency go together. But on the other hand, they also feel at the ministry that too much democracy leads to "turbulence", a position which would seem to be close to Payan's own (which is perhaps not surprising, for the minister for science, Jean-Pierre Chevènement, and Payan have been close colleagues for a decade.)

In the end, the issue is going to be how far Chevènement is prepared to travel with the unions — and particularly the communist-affiliate CGT, which is strong at Grenoble. The CGT secretary here said last week that he and his union were watching and waiting. And if Chevènement does not come up to their expectations, he promises a struggle.

Robert Walgate

What price IIASA?

Washington

The Vienna-based International Institute for Applied Systems Analysis (IIASA) has now been informed officially that the United States will be withdrawing its support for the institute from the beginning of 1983 (see *Nature* 3 December, p.390). This gives IIASA some breathing space in which to seek ways of keeping the United States involved — even if its contribution is severely reduced.

At present the United States and the Soviet Union together provide about half of IIASA's $10 million annual budget, and the IIASA council is now looking at ways to reassess the dues from each of the member nations. At present the United States's $2.5 million contribution comes from the National Science Foundation and is channelled through the National Academy of Sciences, and one possibility is that the money might be raised from other federal agencies. Private foundations are also being approached but so far all offers for support have been well below current levels.

Whether the United States will come back remains an open question. Founded in the early 1970s as a symbol of detente, IIASA has provided a useful window for both East and West on economic and social conditions on the other side — for example information about energy resources. But the institute has failed to stem doubts about the true academic value of its work.

David Dickson

Pakistan's space ambitions

A military option?

Bangalore

Pakistan looks set to embark upon an ambitious programme of space research — with clear hints that the spur is the prospect of military applications in the long term. Dr Salim Mahamood, chairman of Pakistan's Space and Upper Atmospheric Research Commission (SUPARCO), while unveiling the details of a 10-year national space programme in Islamabad recently, said that Pakistan did not want to be left behind in the space race, and that his country is studying in detail the configuration of a satellite which "can serve strategic purposes by taking pictures of military installations, army movements and acting as control, command and communication bases".

The setting up of SUPARCO earlier this year, with President Zia at its head, is said to have given fresh impetus to the hitherto slow-moving Pakistani space programme which is currently concerned mainly with launching sounding rockets from a base on the outskirts of Karachi. Dr Mahamood claims that Pakistan is on the way to developing a communications satellite that "would be launched with the aid of either a European or an American rocket".

Since the successful flight test of India's SLV-3 rocket in July 1980, there have been fears in Pakistan that India might use experience gained with SLV-3 to build a strategic missile. Indeed, in November 1979 an Indian parliamentary committee was told that within six months of a political decision, SLV-3 could be modified into a medium-range ballistic missile. But the Indian Space Department stresses that military objectives are beyond the purview of the Indian space programme which is directed at "harnessing space for socio-economic development".

There is concern too that with the launch of the Bhaskara II satellite, India is developing the ability not only to survey the land for natural resources but also to carry out military surveillance over Pakistan.

Dr Mahamood claims that over the next five years, Pakistan will attempt to test a space launch vehicle of its own. The controversial deal between Pakistan and the West German private enterprise space agency OTRAG seems to be in obeyance. It is claimed that Colonel Gadaffi, OTRAG's host in Libya, had contacted Pakistan with an offer of OTRAG's technology.

How true is the rumour of a link between OTRAG and Pakistan is not known but some strategic analysts say that OTRAG could provide about 2,000 qualified space technologists badly needed to bolster Pakistan's space research efforts.

Meanwhile, Pakistan is negotiating with the US National Aeronautics and Space Administration for the setting up of a $10 million ground station near Islamabad to receive earth resources data from the Landsat remote sensing satellite.

B. Radhakrishna Rao

India's space programme

Now for real

New Delhi

India entered a new phase in its development of a series of satellites for remote-sensing applications with the successful launching of its experimental satellite Bhaskara II, into a circular Earth orbit from the Soviet Union on 20 November. India's space programme for the 1980s includes as one of its two chief goals a major survey of natural resources. The other task is the development of space-based communications system. The first operational satellite, the National Satellite 1A will be launched in April 1982.

The 440-kilogramme Bhaskara II is an improved version of Bhaskara I, which went out of action, after 26 months, in August. Modifications to the camera system should eliminate the "corona discharge" which caused the breakdown of one of the two television cameras aboard Bhaskar I for a few months. And an extra

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