

grammes per gallon. The losers will be the "blenders", companies that jumped into the business in the past few years to take advantage of the small-refiner loophole. They buy cheap gasoline, add lead to boost the octane, then resell it. That practice should be largely halted by the new rules.

Environmental groups are generally pleased with the new rules. The lead industry, predictably, is not. In a letter to the *New York Times* last week, Dr Jerome Cole, vice-president of the International Lead Zinc Research Organization argued that the new regulations will cost the public "millions of barrels of crude oil that lead in gasoline saves while adding billions of dollars to the US balance of payments deficit." **Stephen Budiansky**

Affirmative action employer

The launch of the Soyuz-T, with a three person crew including female cosmonaut Svetlana Savitskaya, coincided neatly with the closing of Unispace-82 in Vienna and upstaged the US contribution to equal opportunities in space, the visit to the conference of Dr Anna Fisher, astronaut in training. Miss Savitskaya's visit to Salyut-7, however, should not be viewed simply as a publicity gimmick, nor an attempt to scoop the launch of Dr Sally Ride aboard the Shuttle next spring. The fact that there were female candidates training at the Gagarin space centre was announced some weeks ago. It would seem that, as far as the space planners were concerned, the launching of a woman was the next routine step.

Soviet space policy is strongly committed to the construction of large space stations,



Savitskaya and crew-mates

aboard which women would serve as scientists. ("And, of course, stewardesses", Andrian Nikolaev, the husband of the first Soviet woman cosmonaut Valentina Tereshkova, once added.) Studies of the effect of spaceflight on the female organism are an obvious prerequisite of such a programme. Yet, since Tereshkova's solo flight in 1963, no woman has been placed in orbit. The reason appears to be partly one of what a Soviet space official delicately called "the amenities". Moreover, the 1961 Soyuz-11 disaster, in which three cosmonauts died due to loss of cabin pressure during re-entry, led to a change in procedure; cosmonauts were to wear spacesuits during the re-entry, which meant that crew size had to be reduced from three to two. It was the introduction of the roomier Soyuz-T transport craft and Salyut-7, that made it possible for the multi-crew spacecraft to have a female visitor.

Israeli science politics

Physicist made Science Minister

Rehovot

Professor Yuval Ne'eman, a well known theoretical physicist and former president of Tel Aviv University has become Israel's first Minister of Science, just five years after turning down the post because he preferred to stay out of politics. Since then, though, Ne'eman has become a fully-fledged politician and now represents the nationalist Tehiya Party in the Knesset. When Tehiya joined the Begin-led coalition government, Ne'eman accepted the position of Minister of Science and Development.

Not all of Ne'eman's academic colleagues are enthusiastic about the notion of a ministry with overall responsibility for science. For one thing, they fear that it might mean an undesirable degree of government control. Ne'eman discounts such fears and claims that there are overwhelming benefits in having science represented at cabinet level. Other ministries already have their own chief scientists and research budgets and Ne'eman sees one of his chief tasks as introducing strong central coordination over these separate activities.

Professor Ne'eman is pleased with what has been achieved by Israeli scientists and technologists, but looks forward to a "quantum leap" in these achievements, in particular supporting the idea of creating "science cities". And he has set a target of \$5,000 million dollars a year for the annual income from exports based on local research — the current level being only \$1,000 million.

Although Ne'eman is clearly putting the emphasis on applied research, he says he will also be fighting to see that pure research gets the funds it deserves. He is particularly interested in creating more national experimental facilities like the Weizmann Institute's nuclear accelerator and the 40-inch telescope at Tel Aviv University. He also hopes to explore the possibility of Israel's becoming involved in further multi-national research bodies. Already Israel is a member of the European Molecular Biology Organization, and other candidates are the European Southern Observatory and the European Space Agency.

Only in the past 15 years, says Ne'eman, has advanced science and technology begun to have a serious impact on Israeli industry. Ne'eman himself can claim much of the credit — during the sixties he was amongst those who persuaded the government to back skill-intensive science-based industry at the expense of the labour-intensive textile industry and in the mid-seventies, as Chief Scientist in the Ministry of Defence, he had a significant impact on the country's military science.

Some Israeli scientists are sceptical about one of Ne'eman's pet projects, how-

ever. He is committed to the plan to build a canal from the Mediterranean to the Dead Sea, which among other things will provide hydroelectric power by utilizing water from the hills around the Dead Sea. Some question the value of spending an estimated \$1,000 million on a project that would only provide a few per cent of Israel's energy requirements. Ne'eman, for long a moving spirit behind the plan, maintains that the energy would be available at crucial times and that the canal



Ne'eman takes science to the cabinet

would provide much-needed cooling water for additional thermal power stations along the route.

Looking forward to his new task, the new minister says he will do his best "not to disconnect" from "real science". "I was serving as a military attaché with the Israeli Embassy in London," he recalls, "when I worked with Murray Gell-Mann on 'The Eightfold Way', the theory that led to the prediction of quarks. And if I was able to combine the purchasing of submarines with the charting of elementary particles then, I don't see why I can't maintain the same duality now." **Nechemia Meyers**

US degrees

Doctoral decline

Washington

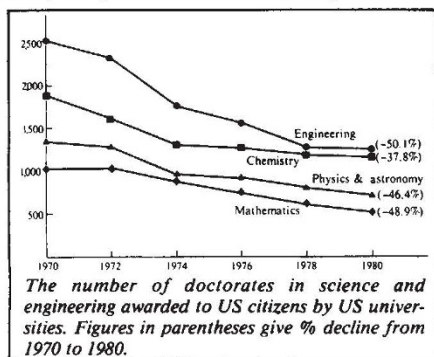
The number of US citizens who received doctorates in the "hard" science fields in the United States declined steadily during the 1970s (see chart). Some see in this trend a dangerous drift away from basic research as a career priority for young US scientists. David A. Shirley, director of the Lawrence Berkeley Laboratory, considers the figures "poignant" evidence of that US society is steering its young people away from basic science.

Another explanation is the changing environment in US university science departments, and the steady upward trend in salaries offered by industry to graduates who have made the initial four-year invest-

ment in a bachelor's degree in the hard sciences or engineering.

When US university science departments were expanding and funding was ample, a career in science was seen as the direct pursuit of a PhD and a research career on a university faculty. Young people were encouraged to consider this the most promising route — it being also the one their faculty advisers had usually followed.

But now there are few positions available to a young PhD in university departments



and laboratories, and still fewer with prospects of a permanent university job with tenure. Furthermore, industry pay is better. One recent survey found that industry offers geologists with a master's degree much the same salary (up to \$24,000) as they would command with a PhD as an assistant professor. So increasingly, young US researchers may not see academia as a promising or even stable place to be.

So, should they bother to get a PhD before entering industry? In June 1982, new PhDs in mathematics were offered an average of \$30,000 a year by industry, whereas new bachelors' degree holders in the field were offered, on average, \$9,000 less. Chemical engineers with a PhD were offered on average \$36,000 and again those with bachelors' degrees were offered

\$9,000 less. Since a doctorate takes seven years to earn, and the candidate earns little or no money during that time and must pay for tuition, the \$1,300 reward per year of study for the degree might seem insufficient.

So economics may be reshaping student attitudes away from the traditional career of a PhD and a university post. Of the situation, they may even be thinking, as one manpower specialist said, "why can't I do good work in industry, too?"

Deborah Shapley

Artificial intelligence

Industry beckons students

Pittsburgh

When 1,500 of the hard core among computer adepts converged upon the University of Pittsburgh campus for the National Conference on Artificial Intelligence (AI) recently, the usual talk of knowledge representation, the meaning of contradiction and many dozen other steps on the long road to a computer with human-like reasoning and perception, was supplemented by talk of entrepreneurship and commercialization. This is something new for the infant field of AI, and it has the field's old guard worried.

The change was apparent in both the exhibitors at the meeting and the audience; Dr Roger Schank of Yale University, who is also the founder of Cognitive Systems Inc, a prototype of small entrepreneurial ventures in AI, noted that ten years ago not a single venture capitalist was to be seen at AI meetings. This year, Cognitive Systems was one of several firms showing off specialized information systems for applications such as petroleum exploration, molecular genetics research and financial analysis.

Leading the charge against the new commercialism was Professor Marvin Minsky of the Massachusetts Institute of Technology, the "dean" of AI. "What I don't like about the problems most people work on is that there's too much 'do-goodism' in them," he said. Applications, such as information systems to aid in medical diagnosis or petroleum exploration draw talented people away from work that will do greater good in the long run. Minsky warned that most of the basic research in AI is done by doctoral students who then

go to work for a company, applying the AI expertise of several years ago on some very specific problem, such as signal processing (or, as Schank put it, "expert systems on paint thinners"). In so doing, Minsky said, "they rob the world of their intelligence".

The lure of industry is also attracting established university researchers in AI, just as it has in other engineering fields. A substantial number of people moving into industry are at the middle level, according to Professor Allen Newell of Carnegie-Mellon University. Newell said these are the researchers who would otherwise just be taking over their own research programmes at universities, and "we're really going to feel that loss".

According to Newell, universities should be made more competitive, both in salaries and research facilities. The average university researcher, he said, receives only one-half to two-thirds of the research support that an industry researcher receives.

To be sure, what is now happening to AI is no different from what has happened for years to computer science and engineering in general. AI, however, may be much more vulnerable. It is still a very young and speculative field, and thus pressures from industry for quick pay-backs are at once stronger and more acutely felt. The result, said Minsky, is that in the entire field there are less than 100 people who have a "license to kill" in having the freedom to spend five or ten years on a single project.

And Minsky offered a history lesson to those who expect quicker results. "It was 300 years from Galileo to Einstein," he said. "What could those fellows have been doing?"

Stephen Budiansky

University woos Oak Ridge laboratory

Last May, when the Union Carbide Corporation announced it would not renew the contract it has long held with the government to manage the Oak Ridge National Laboratory (ORNL) and three related atomic facilities, most observers expected some other corporation to take over (*Nature* 27 May, p.255).

The bidding has barely begun; indeed the US Department of Energy is only just asking all who are interested to make themselves known. Surprisingly, the local University of Tennessee at Knoxville, looks the most serious contender.

L. Evans Roth, the university's Vice Chancellor for Graduate Education, argues that the ORNL and the university are already intertwined, with ORNL scientists teaching at the university and the university programmes under way at the lab. "We already have a marriage without the contract", Roth says.

There is little doubt that acquiring the highly prestigious multi-disciplinary lab-

oratory would be a feather in the university's cap, and to that end it has a task force studying the shape of a management contract, with separate committees on administration, scientific-technical matters, and faculty liaison. Roth and other officials have toured the other national laboratories to look at other university/laboratory relationships, and Glenn Seaborg, the Nobel Prize winner and former atomic energy chief, has visited Knoxville to proffer advice.

Oak Ridge, on the other hand, may have mixed feelings about a union with the University of Tennessee — a state institution with 45,000 students and little experience in managing a giant research enterprise. Now under fire from many in Washington who are questioning the value of places like ORNL, the laboratory might be better served by a more experienced partner. The final decision may depend on what other suitors emerge in the months ahead.

Deborah Shapley

