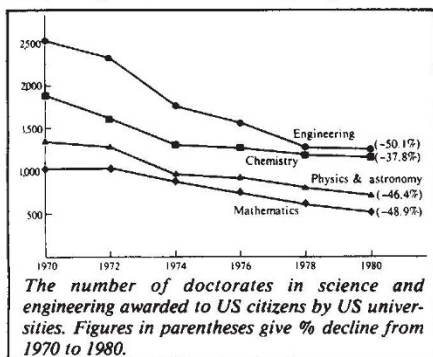


ment in a bachelor's degree in the hard sciences or engineering.

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

