

## FEATURES

# Low expectations for Swedish PhDs

In Sweden, as in most European countries, young scientists are facing problems finding work. **Wendy Barnaby** reports on the falling market in research positions for newly-qualified PhDs

THE expansion in university teaching in the 1960s has not been followed by the creation of research posts for today's post-graduates, and many young PhDs in the natural sciences are finding it very hard to do research.

The expectations of young Swedish scientists have certainly fallen, yet they are hardly ever — strictly speaking — unemployed. According to Dr Bengterik Ronne, at the central administration of universities and tertiary education institutions (UHÄ), PhDs can still get jobs but they have to start at a lower level than they would have done a few years ago. This is borne out by figures published by the National Central Bureau of Statistics, showing unemployment amongst all licentiates (a qualification, now abolished, a little lower than a PhD) and PhDs, three years after graduation.

The latest available statistics cover the period 1976–1978, and continue a reasonably unchanging pattern in which most PhDs (as high as 90% to 98%, for this period) say they are employed wholly or partly within the field for which they were educated, with relatively qualified tasks. Only eight people over the whole period, out of a total of 1,008, said they were unemployed, and there is no way of knowing from the statistics whether they were licentiates or PhDs, or whether they had read social or natural sciences. But the statistics hide a lot of discontent.

Not many PhDs go into industry. "In the 1960s, Swedish industries were very optimistic about the numbers of PhDs they would need", says Professor Ingvar Lindqvist, Secretary of the Natural Sciences Research Council (NFR); "but when economic conditions changed for the worse, they realised they had overestimated their needs, and both industry and government lost interest in PhDs." According to Bengt Gustafsson at the central organisation of the academics' trade union (SACO/SR), there are only 700 PhDs working in Swedish industry, and most of them are chemists doing research in pharmaceutical companies.

Most natural sciences PhDs, then, end up in universities. But conditions there for them are far from good. The 185 who received their doctorates in 1976/77 had less than a one in ten chance of getting a research position (*forskarassistent*), which can be held for two three-year periods. A

small number of PhDs are given grants by the NFR and hope to be supported by NFR funds for their entire careers.

Other options are to apply for grants from other foundations or become attached to research projects that are already funded. But all grants are very insecure, as Professor Lindqvist complains. "There is a general political philosophy in this country of security in jobs", he points out, "but it hasn't worked well at the universities. People get grants for one year at a time."

Under the security of employment laws in Sweden, a university is obliged to offer a research scientist another job at the same salary — either in his own department or in another one — if his grant dries up. But trying to find niches for displaced people can be a difficult problem, as one of the SACO/SR representatives at the Royal Institute of Technology (KTH), Dr Bertil Wilner, has found. "It's easier to find alternative positions for technicians and administrative staff", he says, "but for specialised research scientists it's a very hard problem to solve." He estimates that about 5% of KTH's research scientists find themselves in this situation every year. The security of employment laws provide legal assurance of an uninterrupted income but not of uninterrupted research in the same field: there is simply not enough research money to assure that.

Money is a problem at all levels of research. At the end of 1978, the NFR asked an international group of physicists to evaluate Swedish experimental nuclear and particle physics. "The first and overwhelming impression", reported the group, "was one of underfunding . . . More precisely, the present materials budgets for research per physicist are too low to guarantee efficient work. They are much lower than current standards internationally, most likely by a factor of two or three."

The group also commented on what it considered the "old fashioned organisation of research at the universities. Younger researchers with international reputations seemed unable to command permanent research positions. The near absence of intermediate tenure positions is disruptive and unhealthy for all long and medium term programmes. The present situation leads to an obsession with the necessity for personal research

programmes with too many subcritical groups."

All this insecurity is having a distinct effect on PhD students, many of whom are increasingly reluctant to finish their doctorates. The PhD student is marginally more secure than the PhD graduate, even if, as UHÄ maintains, some students are forced to earn a living by taking on research not particularly suitable for their doctorates — another contributing factor to the decline in PhD examinations.

Since 1971, the numbers of natural sciences students passing their PhDs has dropped every year; and in 1976/77 it was less than in the mid-1960s even though recruitment to research education has remained fairly constant.

So far, the effects of these problems on research as a whole are not easy to point to. The international evaluation of physics made by the NFR, for example, did not mention any area in which Swedish research in physics is falling behind that in other countries, even though the evaluators often expressed their surprise about personnel and organisational set-ups; and Professor Lindqvist cannot point to any areas in which Swedish scientists are lagging.

But there are problems in sectoral research — research supported by organisations within their own fields of responsibility. According to Professor Erik Arrhenius at the Department of Cellular Toxicology, University of Stockholm, it is very difficult to get PhD students involved in research on the environment. The projects supported by the National Environment Protection Board (NEPB) run for one year at a time, and good scientists want more security than a one-year project can give.

The National Board for Technical Development (STU) has had similar problems with one-year projects. According to Dr Lennart Lindeborg, these problems have triggered the setting up of a new arrangement under which STU will guarantee the researchers' involvement in future projects for five years. The new projects will be in electronics, informatics, speech communication, food production processes, gene technology, the chemistry of wood, enzyme technology, the physics and chemistry of surfaces, fibrous materials and future industrial production systems.

Apart from the plight of present researchers, many are worried about the future. There is a fear that recruitment of graduates for PhD studies will decline. SACO/SR points to the slide in students

completing three years of natural science subjects at universities from 1,390 in 1970/71 to 564 in 1976/77. Bengt Gustafsson maintains that this drop has resulted from the decline in university intake in 1972/73. As the numbers of new students fell off, so did the money for teaching staff; so the universities tried to make themselves more interesting by setting up short courses such as popular astronomy and amateur geology.

These courses have proved almost too successful: students now take them in preference to long courses that can lead to research. Professor Lindqvist thinks there will be a shortfall of PhD recruits in 15 to 20 years. He points to the increasing unpopularity of the natural sciences in secondary schools, saying that it is much easier to earn maximum marks (and it is marks which count for university entrance) in non-science subjects.

There have been piles of papers written about the reorganisation of the universities. Two more commissions will be reporting soon — one on the reorganisation of teaching structures and the other on the education of research students. The first commission is expected to recommend widespread changes to create more tenured research positions and spread the teaching burden more evenly amongst university jobs.

But the crux of the matter is money. Last year, Parliament allocated the UHÄ Sk205 million (about \$46 million) to provide five universities with basic facilities with which to conduct natural sciences research: research education, fundamental research, professorships and appointments for those who had passed their PhDs, secretaries, libraries, instruments and buildings. Engineering research received Sk222 million (about \$50 million), to be spread over six technical universities, for the same sorts of things.

As salaries, equipment and research funds all come out of the same budget, research gets less money as the universities have to go on paying the salaries of scientists whose projects have ended. According to Professor Lindqvist, the University of Lund has to pay more than SK2 million (about \$450,000) a year supporting former docents.

All the relevant authorities are demanding more money, and all the political parties said before last September's election that more money should be given. The Swedish Parliament has in fact agreed that about 1,000 jobs in the public sector — in archives, museums, libraries, positions in planning, commissions of enquiry and some teaching posts at secondary schools — should be given in the first instance to PhDs.

The union also wants the state to give increased support to the development of technology-intensive industries such as telecommunications, energy and defence, to provide secure working places for scientists as well as competitive exports. □

# How the popularisation of science narrows the polarisation of the people

In the last of three articles on science and technology in China, **Tong B Tang**, research fellow at Darwin College, Cambridge, UK, reports on scientific education and popularisation

*Workers from three provinces of North East China watching a lathe demonstration at a gathering in Shenyang*



EDUCATION has always been a central issue in Red China. By comparison, Marxist socialism in the West was also initially strongly associated with an educational movement; it stimulated developments in the philosophy of education, and was instrumental in spreading the concept of education for the working classes. This last influence was never necessary in China: in the past, non-hereditary mandarins were selected by imperial examinations which theoretically anyone could take. Traditionally the populace has been conditioned to appreciate the advantages of education. This deep-rooted exaltation of learning however, makes it all the more important to watch out for intellectual (as well as bureaucratic) elitism.

Two years ago China introduced a nation-wide examination for university entrance to replace nomination at one's place of work. Had everyone equal access to primary education, there would be equal opportunities for all. In practice however, students who can or want to take advantage of further education still tend to come from professional families. Another uneven situation is the formal existence of "key schools", (and universities) which admit "bright" pupils (from the age of five or six onwards) and whose facilities are given priority.

Going straight from high school to university is no longer rare but the long-standing policy of mobilising school leavers to work or settle in the countryside still persists, as affirmed by Chairman Hua in August last year. There are still many technical problems but this policy, besides playing other roles, spreads learning to the rural masses.

Another effective way in which the Chinese try to redress any imbalances in educational equality is their system of marking the university entrance exam. The pass mark is regionally adjusted, and lowered for candidates who have left school and are working in the countryside; ethnic minorities are also given 10 additional marks and educational work in secluded and border areas is paid special attention. Depending on the university (higher for a "key" one), the students need 300-400 out of a possible total of 500 marks to get in. Once there, freshers who come from poorer backgrounds are given extra