

offered suits their needs in the modern world, or is one that suits a faculty's traditional view of what physics should be about.

Declining interest

A similar story of declining interest in physics among university applicants is to be heard in the United Kingdom. The number graduating with a bachelors degree is holding steady at about 2,300 per year (an apparent dramatic dip in physics graduates in 1996 was an artefact resulting from the introduction three years earlier of four-year courses), but the percentage of applicants for physics degrees is down by 10 per cent compared with 1998. This compares with an average 2 per cent decline nationally in all subjects. The decline in the numbers taking up post-graduate positions has different reasons. The minimum stipend for a PhD is £6,500 (\$10,000) per year, not enough to live on (*Nature* 397, 640; 1999).

In an effort to reverse the decline in physics at school level, the UK Institute of Physics has devised a curriculum to make the subject more attractive to 16–18-year-olds. This programme goes beyond classical physics and introduces students to cosmology and particle physics. A few schools will take part in a pilot study starting this September to test the course. If successful, the course will be widely available in September 2000.

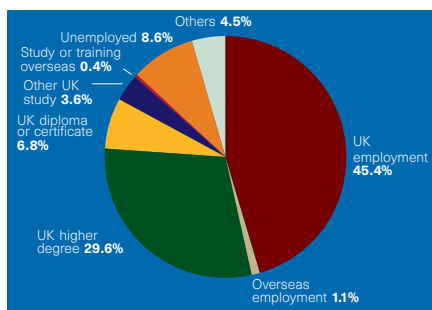
Cold wind blows

Although there are few hard numbers to back up the perception, it seems that the coolness towards physics seen in the United States and the United Kingdom is also being felt across northern Europe. "It's largely hearsay, but throughout northern Europe there are anecdotal stories of declining numbers enrolling to study physics," says John Lewis, treasurer of the European Physical Society. So concerned is the society that in September it is bringing together 50 influential physicists from across Europe, including presidents of 16 national societies, to thrash out a strategy for discovering how much of a problem there is and how it can be dealt with.

Germany is likely to feel the pinch soon. In 1998 for the first time more physics PhDs were awarded than physics diplomas (a degree that is more than a masters but less than a doctorate), says Krauth. In Germany a diploma is a highly regarded qualification awarded after five years of higher education and essential for anyone wishing to earn a doctorate. The decline in diplomas, which has taken everyone by surprise, will mean that Germany's production of PhD physicists will fall in a few years, says Alex Bradshaw, head of the German Physical Society.

Social conscience

The factors causing the declining interest in school or undergraduate physics are complex. In the United States and the United



First destinations: work or further study chosen by recent UK physics graduates surveyed in 1996.

Kingdom, one reason is the unimaginative quality of curricula and teaching methods in first-year university courses or at 16-plus. But there are bigger issues at stake. Krauth says: "In Germany, young people are questioning whether physics and technology have served humanity well."

In the United States, the physics and astronomy board of the National Research Council (the research arm of the National Academy of Sciences) began a decade-long series of studies in 1991 to confront head on the issue of the relevance to society of all branches of physics. Central questions being addressed include: "How can the intellectual vitality of physics be continued into the next millennium?" and "What contribution does physics make to the national need?"

In these post-Cold War days the answer to the second question is less obvious to the public, and hence to prospective students, than it used to be. One problem is that there is no physics industry, says Czujko. Chemistry has the chemical industry, biology has biotechnology and pharmaceuticals, geology has mining and oil exploration, but the path from basic physics to industrial usefulness and jobs is not obvious.

Conscious of this low visibility of physics, the physics and astronomy board's first study of a branch of physics, published in 1994,

pointed out that atomic, molecular and optical physics is the underpinning science for 9 per cent of US gross domestic product. During 1999, the board will publish studies of elementary particle physics, condensed matter and materials physics, nuclear physics and gravitational physics. Then will come the third and most difficult stage, an overview of physics, to be published in 2000 and making recommendations about education and attempting to define the place of physics in today's society.

The low profile of physics leaves students with the false impression that job options are limited. Yet, providing that they do not aspire to a full-time, permanent academic research post, this is a false perception. In 1997, only two per cent of US PhD physicists were unemployed after six months. But of the 48 per cent in permanent positions, only 43 per cent were employed in physics. The rest had jobs in engineering, computing, other sciences, business and finance. At Vacuum Schmelze in Germany, Krauth says that 60 physicists out of a total workforce of 2,000 do a full range of jobs from research and development to sales and marketing.

A UK survey by the Higher Education Statistics Agency shows that people with a bachelors degree in physics found jobs in 1996 in business analysis, as test engineers, in sales, data research, the armed services, as systems engineers, analysts and programmers, as teachers and as production, telecommunications and safety engineers. Just under 30 per cent were studying for PhDs or masters degrees.

Perhaps then, despite the gloom in the academic sphere, there is some justification for Czujko's assertion: "I don't think physics is dead. I'm bullish on physics." □

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Job search starts here

The American Institute of Physics website is the most relevant site for US physicists, containing forums, links and a wealth of statistics, survey data and job advertisements, as well as a section in which to post your resumé. Other useful URLs are those of the American Physical Society and the American Association for the Advancement of Science.

In Europe, start with the European Physical Society site. This connects you with the physics societies in

Europe and gives access to sites like that of the non-profit group Association Barnard Gregory in France, a resource for job-hunting scientists. The UK Institute of Physics is the best funded European organization, and offers the most extensive resources and information about education and careers of the European sites.

For electronic searches, remember the bulletin boards and USENET. If you send unsolicited CVs, remember that they may be

scanned into a database. Make sure the layout is clean and unfussy with no fancy typefaces. Make sure the CV contains the crucial search words that you would want to be identified to pull your CV to the fore. Good luck!

- <http://www.aip.org>
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- <http://www.aas.org>
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