

## Science Appeal

Many key scientific figures and organizations claim that European science and technology is in a state of crisis. The lackadaisical attitude toward science is most obvious at the high school level, where some countries have seen startling falls in the numbers of children choosing to study science. For example, according to the UK's Institute of Physics, the total number of exams taken for entry into undergraduate studies in the UK rose 7.4% between 1991 and 2003, but the entries in chemistry and physics dropped by 18.7% and 29.6%, respectively. This precipitated a 'domino effect', with secondary schools suffering shortages of science teachers and certain university departments struggling to fill undergraduate and graduate positions. This has forced physical sciences departments, such as the Chemistry Department at King's College, to close. Industry is predicting a shortfall in the recruitment of a qualified workforce in the future. Although these broad trends vary widely between countries within Europe, the consensus is that the crisis is real and is affecting mainly the 'harder' physical sciences across Europe.

Although the available statistics suggest physical science is in decline, the life sciences may not be immune to this epidemic. The numbers of French undergraduates enrolling in the life sciences dropped 27% between 1995 and 2000. In the UK, Sir Alistair McFarlane, chair of the Royal Society Education Committee, recently warned that the introduction of new tuition fees to be paid by undergraduates might act as a disincentive for studying science if the higher costs of science programs are reflected in the fee charged. Even if the recent downturn in life science enrollment in France is transient and degree fees do not affect UK entrants into science programs, the European Union (EU) will still need to increase the pool of qualified research and development employees, as illustrated in the April 2004 report by the EU's High Level Group (HLG) on Human Resources for Science and Technology. The number of science and technology researchers (which includes all areas of science, engineering and technology) must increase from 5.7 to a minimum of 8 per 1,000 of the European workforce to meet the EU objective of increasing the proportion of European GDP invested in research from 1.9% to 3% by 2010. The HLG predicts that unless serious steps are taken to increase the potential pool, this target will not be met.

Demographic changes also affect the number of available scientists. Eurostat predicts that the population in the 15 EU member states will begin to decrease in 2020. The 25–64 age group presently engaged in science and technology is predicted to increase 1.5% by 2010, and the 25–34 age group that will replace the positions opened by retirees will fall by 16% overall. The so-called 'brain drain' or migration of qualified researchers to the US has been a longstanding

issue for all the sciences. At present, 400,000 European science graduates reside in the US, but a survey by the European Commission revealed that only 13% of European scientists working abroad plan to return home. The recent visa restrictions may help to stem the loss of researchers to the US, but unless opportunities for young scientists improve within the EU, this trend will probably persist. Although attracting scientists from outside the EU could help counteract these trends, the long-term solution must be to provide young Europeans more compelling reasons to choose a career in the science and technology sector.

A 2003 report from the UK Department for Education and Skills suggests that the shortage of science teachers and the failure of subject courses to interest pupils have been the main contributors to the decline of science at the classroom level. Rather than concentrating on key principles, relating scientific discoveries to everyday life and emphasizing science as a way of thinking, the curricula of many science subjects are 'top-heavy' with rapidly outdated facts, alienating pupils instead of inspiring them. The UK Department for Education and Skills recommends that teachers receive better training in all areas of science, particularly those related to contemporary issues. Closer relationships should be forged between schools and real-life professionals from academia and industry. Programs such as lecture tours in UK schools that link the success of sporting heroes to science and technology are alternative methods for sparking children's interest in science.

Today's employment situation does not reflect tomorrow's job market. The current disincentives are clear. Graduate students, post-doctorates and junior academic staff are poorly paid and often accumulate personal debt. Even permanent scientists are underpaid compared to professionals with similar standing in other fields, according to the HGL. The stability of employment in research is also an issue. Many industrial companies are now using short-term contracts with smaller firms or universities for much of their research. The recent wave of protests by European scientists against low pay and poor career opportunities, particularly in Italy and France (in which the INSERM will hire only 30 scientists under the age of 35 this year, compared to 69 last year and 95 in 2002), reinforces this negative message. Thus, it is all the more urgent for pupils to be made better aware of career opportunities and incentives available for pursuing a career in science and technology. As Edward Teller once said, "The science of today is the technology of tomorrow". Europe can ill-afford to ignore these warning signs. National governments and industry must work in tandem to better market careers in science to prevent stagnation. Only by acknowledging and addressing these issues will the future of science and education be brighter for Europe.