

# Keeping UK Science world class

*Lord Rees of Ludlow PRS*

Science, engineering and technology make ever more pervasive contributions to our lives. Science and its applications can improve the quality of life and the prosperity in this and every nation; they also confront us with a range of new risks, and difficult policy issues. The UK is an international leader in science, as the annual statistics published by the Office of Science and Technology illustrate. On most measures of productivity and impact, this country is second to the world leader, the United States. But two worrying trends threaten to undermine our position in the world league of science: declining popularity of chemistry, maths and physics among A-level students, and relatively low levels of public and private investment in research and development.

Recent surveys show that the United Kingdom compares well with other countries in terms of participation and performance in science education at school level up to the age of 16. But after the age of 16, our record appears to deteriorate. We have one of the lowest participation rates in education for 16 and 17 year-olds (ahead only of Italy among the G7 nations). And entries in chemistry, physics, biology and mathematics accounted for only 22.9% of A-level entries in all subjects by students in England, Wales and Northern Ireland in 2005.

What is more, participation rates in the sciences and mathematics have been deteriorating: they accounted for 30.0% of all A-level entries in 1991. Between 1991 and 2005, the total number of A-level entries in all subjects increased by 12.1%. But over that period, the number of entries in physics, chemistry and mathematics declined by 35.2%,

12.6% and 21.5% respectively. Not all of the sciences have shown a downwards trend, with entries in biology rising by 15.8%, and increases in other newer subjects such as computing. It is not clear how the performance of UK students currently compares with those in other countries, but hopefully the Government will be successful in persuading enough English schools to be included in an international comparison exercise this year to provide representative figures.

Clearly if our universities and businesses are to be internationally competitive in the physical sciences, we will need to ensure sufficient numbers of talented young people emerge from our schools with career ambitions and qualifications in those disciplines. I hope that the new GCSE curriculum for science, which will be introduced next September, will encourage more pupils to study the sciences and mathematics at A-level. But further measures will be needed, such as tackling the shortages of suitably qualified teachers in those subjects. The scientific community, the Government and our schools will need to work together if the downward trends are to be reversed.

Ensuring the flow of well-qualified scientists and engineers into the workforce is also a key part of tackling the other weakness in the UK's performance in science, engineering and technology: the amount invested in research and development. UK gross expenditure on research and development in 2003 was equivalent to 1.89% of gross domestic product. This figure was lower than in the early 1990s and puts the UK in 14th place in the international league table of OECD members.



Much public money has been invested in science in recent years, but the government-financed proportion of gross expenditure on research and development in the UK, as a proportion of GDP, in 2003 was 0.59%. This was well below the OECD and EU-25 averages, and placed us 16th in the OECD league table. Industry-financed gross expenditure on research and development, as a proportion of GDP, in 2003 was 0.83%, also below the OECD and EU-25 averages and producing a ranking of 17th in the OECD.

Recognising our poor performance, the Government's 10-year framework for science and innovation has set an ambitious target of raising UK gross expenditure on research and development to 2.5% of GDP by 2014. This target can only be achieved if there is sustained investment by both the public and private sector.

Science, engineering and technology provide the base for the economic performance of the UK and its competitors in the international community. The UK has an outstanding track record in world science. We must maintain our momentum: success should breed further success; we need to become still more successful in attracting and nurturing mobile talent. But there are now some fundamental weaknesses which could undermine our position. It is up to policy-makers and the science community to see that these problems are tackled so that the UK in the future can continue to reap the benefits of being a world leader in science, in an era when we find growing competition from the Far East, as well as from across the Atlantic.

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