BIOSCIENCES FEDERATION

Science Policy Priorities 2005 – 2009

Contents

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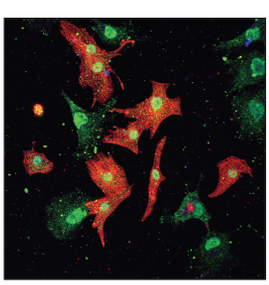
Page 5: (a) Students on a field trip © Dan Jenkins; (b) Student studying, Imperial College © Bill Parry
Page 6: Members of the public at the Science Museum, London © Bill Parry
Page 7 (a) St. Stephen's Tower, Parliament © Bill Parry; (b) Four stages in Zebrafish embryo development from 0–72 hours post fertilisation. © Jennifer McLeish
Page 9 (a) Removing the maternal nucleus during nuclear transfer © Roslin Institute; (b) © Dr Rita Jabr, KCL
Page 10 Imperial College tower reflection © Bill Parry
Page 11 Bruges, Belgium © Bill Parry

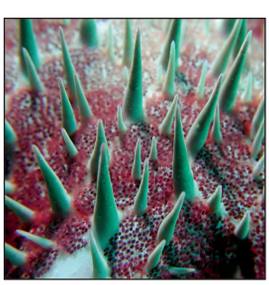
Foreword

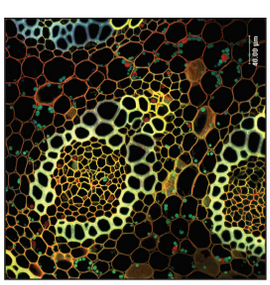
The Government has recognised the contribution that a flourishing science base can make to the health and prosperity of the nation, and has been supportive towards science in successive Comprehensive Spending Reviews. In 2003/4 government-funded expenditure on R&D was restored, in real terms, to its level in the mid-1980s, and we are currently one year into a 10-year plan that aims to make the UK a world leader in science and innovation and attract substantial inward investment.

The Biosciences Federation supports the ambitions of the 10-year programme. It recently invited its 38 member organisations to recommend what should be the science policy priorities for the new Government to enable it to move forward with its plans. I commend to the Government the views presented in this document as representing the top 6 science policy priorities of the Federation.

Professor Sir Tom Blundell
President, Biosciences Federation







Executive Summary

The Biosciences Federation (BSF) welcomes the importance that the government attaches to science and the increased funding that reflects this. It is pleased that the Government has a long-term strategy for science, and is committed to dialogue on how science can help to deliver the Government's aims.

The BSF has identified six policy priorities that need to be addressed by the Government over the next 5 years. These are:

Attracting, training and retaining world class scientists

This is crucial to maintaining the strength of the UK science base. The value of a science degree in all employment sectors must be emphasised, while those who choose to follow a scientific career must be fairly rewarded.

- The school science curriculum needs to be improved to include a greater focus on stimulating experimental work and the application of knowledge and skills, and to emphasise the relevance of basic science to everyday life (Action: DfES)
- Attracting more good graduates into science teaching requires a premium salary for teaching a shortage subject, supported by excellent continuing professional development (Action: DfES)
- Careers advice needs to improve considerably in most schools so that school pupils appreciate that the skills acquired by studying science are valued by a wide range of employers (Action: DfES)
- The remuneration of public-sector scientists must be competitive with other highly-skilled professions. Graduates must see a rewarding career structure in science (Action: OST, DfES, Treasury)

Stimulating public enthusiasm for science and technology

The public perception of science and scientists has an enormous impact on how policies are formulated, the type of research that can be conducted, and on the attractiveness of the UK as a place to do science.

- Ministers need to project science enthusiastically, publicly and often, giving a positive message on how investment in science benefits the individual, the economy, the environment and society (Action: HM Government)
- The Government must ensure the adequacy and quality of science and engineering coverage in public service broadcasting through its review of the BBC charter (Action: Dept of Culture, Media and Sport)
- Scholarship activities of academics, such as book writing and engaging in dialogue with the public and policy-makers, must not be hindered by existing funding mechanisms (Action: OST; DfES)

Ensuring that public policy is underpinned by sound science

Public policy should be based on the best research and an appreciation of the deficiencies in the available information. Good policy making depends on a strong scientific culture within Government departments.

- Departments must ensure that they have the internal scientific expertise needed to incorporate scientific evidence into policy, and that scientific staff maintain and extend their awareness of scientific advances (Action: Government Departments; OST)
- Mechanisms need to be in place to ensure that Government departments follow best practice in seeking, receiving and acting on external scientific advice (Action: OST)

Promoting more effective commercialisation of science

Exploitation of science and engineering by academic institutions requires access to staff who can manage commercial enterprises.

- Universities and Research Councils, working with Industry, need funding to employ and train technology transfer staff who are able to recognise commercially viable ideas and communicate these to stakeholders (Action: OST, Treasury)

Government funded knowledge transfer programmes do not always operate over a timescale sufficient to ensure the sustainability of a project.

- Knowledge transfer schemes that have proven to be successful should be eligible for continued public funding until projects are sustainable in the long term (OST)

Tax incentives for companies investing in research are often complex and bureaucratic.

- These need to be simplified to encourage greater take-up (Action: Treasury)

University scientists are put off whole animal work, and bioscience companies obliged to consider the advisability of being based in the UK, by the climate of apprehension created by animal rights extremists.

- The Government must continue to evolve tough measures against animal extremists in order to create an environment free from harassment for those involved directly or indirectly with animal experimentation (Action: OST, Home Office)

Ensuring strategic science provision in Higher Education

Withdrawal of courses is beginning to impinge severely on the full breadth of biology, particularly in applied areas of biology. The real costs of delivering such courses are often underestimated. As modern science is cross-disciplinary, the closure of physical science courses is also a potential threat to the future of biosciences research.

- Since biology is fundamentally important for the health and wealth of society, the Government must ensure that all branches of biology are strongly supported in the UK (Action: OST, DfES)
- The Government must also ensure that the levels of expertise in the physical, chemical and mathematical sciences are sustained (Action: OST, DfES)

Fostering closer links with the European science base

Science is not a respecter of international boundaries. Strengthening European R&D overall through the Framework programmes will help Britain achieve the challenging targets set out in the 10-year Science and Innovation Framework.

- UK funding policies should aim to ensure that UK institutions continue to be a popular partner in collaborations between European countries (Action: OST; Treasury)
- European funding needs to complement, not substitute, UK research funding (Action: Treasury)
- The Government should press for increased transparency in European funding decisions, more rapid responses and much reduced bureaucracy (Action: OST)
- The Government should press the European Union to overcome the obstacles to introducing a low cost patent system across all European countries (Action: DTI)

Attracting, training and retaining world-class scientists

Maximising the potential of research requires the best people, and the formation of the best teams. However, many UK universities are experiencing difficulties in recruiting and retaining world-class researchers and teachers in science and engineering[1]. The pool of scientific talent from which universities can draw is diminishing due, in part, to young people turning away from science subjects at school and at university, and to the lack of a rewarding academic career structure.

Science education

One of the major problems facing science education is the shortage of well-qualified teachers, with many pupils taught science subjects by people who have not been trained in the relevant discipline. More graduates must be encouraged to enter the teaching profession.

The school science curriculum needs to be improved. In order to enthuse students, basic science material should be presented with reference to real-life applications of science and scientific issues. The 21st Century Science and Salters-Nuffield Advanced Biology courses provide good examples on which to build. Assessment needs to focus on the ability to apply skills and knowledge not just regurgitate facts. The science curriculum must also recognise the gender differences in scientific interest[2], and present topics that are appealing to both girls and boys.

Practical classes form a crucial part of any science education. Both laboratory work and fieldwork are necessary for teaching biology. Unfortunately, a lack of funding has forced many secondary schools to discontinue practical classes. A review of the funding mechanisms and/or the development of equipment sharing schemes, such as specialist science centres, is necessary to provide an adequate standard of science education to all students. There is also evidence that provision of good laboratory equipment has a positive effect on the recruitment and retention of teaching staff[3]. Teachers need better advice on the interpretation of health and safety regulations and on risk assessments in order to ensure that these concerns do not limit students' access to practical work and fieldwork.

Careers advice is another major issue, with many young people reporting that they have little knowledge about the jobs open to them if they study science. The value of scientific skills in a wide range of employment sectors must be emphasised. In a recent report from the Council for Industry and Higher Education, science graduates are described as adaptable, able to present complex material and arguments clearly, and skilled in time management, risk assessment, problem solving and data analysis[4].

The introduction of variable university tuition fees is a potential threat to science courses since these are more expensive to provide than courses in many other subjects, partly because of the need to include a substantial element of practical work. Universities might be tempted to charge a higher fee, thus introducing a disincentive for students to study science, especially those from less wealthy backgrounds. Fees charged to students in the sciences must be at least as low as for other disciplines. Government support is needed to meet the higher costs of science courses.

Career structure and remuneration

There are growing concerns that the remuneration of public-sector researchers is not competitive with other highly-skilled and trained professions. For example, university scientists in the UK are paid 20-50% less than their counterparts working in the pharmaceutical industry[5], while many young scientists are lost to careers such as finance or accountancy. The old adage that the attraction of academic freedom compensates for the lack of financial reward no longer applies in today's pressurised university environment. Expectations to research, teach, communicate through publications and presentations, obtain research funding, and cope with the rising tide of imposed bureaucracy currently make academic science an unattractive career option. A symposium in 2004[6] organised by Save British Science, and attended by representatives of academia, industry and the charity sector,

produced an average salary trajectory with age for scientists and engineers that would be competitive in the market place and affordable to the tax payer. To implement it would require an additional £250 million a year in England, representing less than 6% of the government's current annual expenditure on science, engineering and technology R&D in the science base.

It is not clear that fixed term contracts legislation is leading universities to manage better the careers of young researchers. There is a real risk that when the legislation begins to 'bite' in 2006 there will be a surge of young researchers made redundant rather than offered open-ended contracts.

The UK is losing scientific talent to other countries (particularly the US) because of the poor career structure and remuneration. While there are many benefits for scientists in spending some of their scientific career abroad there must be an incentive to return to the UK and use the experience for international collaboration[7].

The Research Councils have made an effort to make PhD stipends competitive, and the Funding Councils must now be given money and instructed to work with universities to make academic salaries and career structure attractive to the brightest of our young scientists.

Difficulties in recruiting school science teachers are due in part to the lower social esteem in which the teaching profession is now held. To address this, the government must continue to develop schemes to offer premium salaries to teachers of shortage subjects like science, and to ensure that science teachers have assured access to high quality continuing professional development throughout their careers.

Stimulating public enthusiasm for science and technology

The public perception of science and scientists has an enormous impact on how policies are formulated, the type of research that can be conducted, and on the attractiveness of the UK as a place to do science. Considerable emphasis and funding has been given to this issue over the last 5 years, and it is encouraging to note that a recent MORI poll has shown that 70% of the British public trust scientists to tell the truth.

Communicating science through the media

As tax-payers fund public research they should have access to the information generated and an explanation of why and how the money was spent. Universities and Research Councils may need to employ more press officers with an appropriate scientific background to communicate complex issues. Active research scientists who can communicate effectively should be encouraged to do so. Scholarship activities, such as book writing and engaging in dialogue on scientific matters with the public and policy-makers, must not be hindered by existing funding mechanisms. Without recognition there is little incentive, and in some cases active discouragement from participating in such activities.

The Royal Institution and the British Association for the Advancement of Science do an excellent job of communicating science to interested members of the public. However, a typical audience is predominantly white, middle class and over 50, and therefore unrepresentative of society as a whole. The average British citizen receives most scientific information through the standard media. Significant improvements have been made to the quality and quantity of science reporting over the last few years, particularly in television and radio. Natural history programmes prove extremely popular with the public, perhaps due to their accessibility and perceived relevance to everyday life. We would like to see more media coverage of experimental science, including programmes detailing the research that Government departments use to formulate public policy. The Government must ensure the adequacy and quality of science and engineering coverage in public service broadcasting. The BBC charter should contain specific recognition of its role in science communication.

Public trust in science

Scientific advice to the public needs to be timely and targeted. Public concerns about genetic modification were apparent as early as 1979, but these were largely ignored by industry and government. These nascent concerns were fuelled by fears over BSE and other food scares and evolved into opposition as the GM debate became public and political. Ministers need to project science enthusiastically, publicly and often, to give a positive message on how investment in science benefits the individual, the economy and society.

The scientific community itself must be transparent in discussions about scientific evidence and the risks and benefits of new technologies to enable the public to engage in sensible and rational debate, and form a reasoned judgement on scientific issues. Public trust in scientists might be further enhanced if they were seen to subscribe to a code of ethics. The Institute of Biology has an ethical code already in place.

Ensuring that public policy is underpinned by sound science

The UK's system of providing scientific advice to Government is based on a set of guidelines issued by the DTI in 1997[8] and updated by the OST in 2000[9]. These guidelines provide an excellent framework for the use of scientific expertise in formulating public policy. However, the extent to which these guidelines are utilised by each Government department is unclear. OST must continue to work with senior policy makers in each department to ensure that the principles of the guidelines are fully embedded in departmental policy procedures.

Public policy should be based on the best research, and an appreciation of the deficiencies and uncertainties in the available information. Departments must obtain a wide range of advice from the best-informed sources, both within and outside government, particularly when there is uncertainty. The value of networks of organisations, such as learned societies, must not be underestimated and should not be ignored. Many professional bodies have access to a wide range of specialists whose experience could usefully be brought to bear on relevant issues. A perception of bias means that the knowledge lodged in industry is greatly under-utilised. Declarations of interest do not necessarily undermine the credibility or independence of advice providing that they are made available to anyone who might rely on that advice. The evidence and analysis, as well as all relevant papers on which policies are based, must be made publicly available.

Departments should also ensure they have the mechanisms in place for early identification of issues which affect more than one department and adequate procedures for exchange of information.

Good policy making depends on a strong scientific culture within Government departments. Departments must ensure that they have the internal scientific expertise needed to incorporate scientific evidence into policy, and that scientific staff maintain and extend their awareness of scientific advances.

Promoting more effective commercialisation of science

Science and engineering are fundamental to a globally competitive economy. Research across 16 comparable countries has shown that increased levels of research in the public and private sectors increases the productivity of the economy[10]. Ensuring the transfer of knowledge between the science base and the commercial sector is crucial if we are to achieve the maximum benefits that science and engineering can provide.

We must increase the pull from industry for academic expertise and discovery. Large industries often act as 'lightning rods', attracting smaller concerns and generating spin-out companies. Over the last 15 years Government has introduced a variety of schemes designed to encourage the formation of closer links between industry and academia. While we welcome the recent increase in Central Government investment in knowledge transfer programmes (Figure 1), we are concerned that funding of some schemes does not always operate over a timescale sufficient to ensure sustainability of a project. Knowledge transfer schemes that have proven to be successful should be eligible for continued public funding until projects are sustainable in the long term.

We cannot expect good scientists necessarily to be good businessmen. Effective exploitation of science and engineering requires scientists to have access to staff who can understand and manage commercial enterprises. The Biosciences Federation welcomes the accreditation scheme for knowledge transfer staff launched by the Association of University Research and Industry Links and hopes that this will raise the profile of the profession. Universities and Research Councils, working with Industry, need funding to employ and train technology transfer staff who are able to recognise commercially viable ideas and communicate these to stakeholders.

Curiosity-driven basic research has resulted in many breakthroughs of immense economic value. For example DNA fingerprinting, which has revolutionised forensic science, paternity and immigration issues and is used world-wide, was discovered during basic research on gene evolution. The royalties received have been fed back into society through research funding mechanisms. It is essential that funding for applied science does not come at the expense of financing for "blue skies" research.

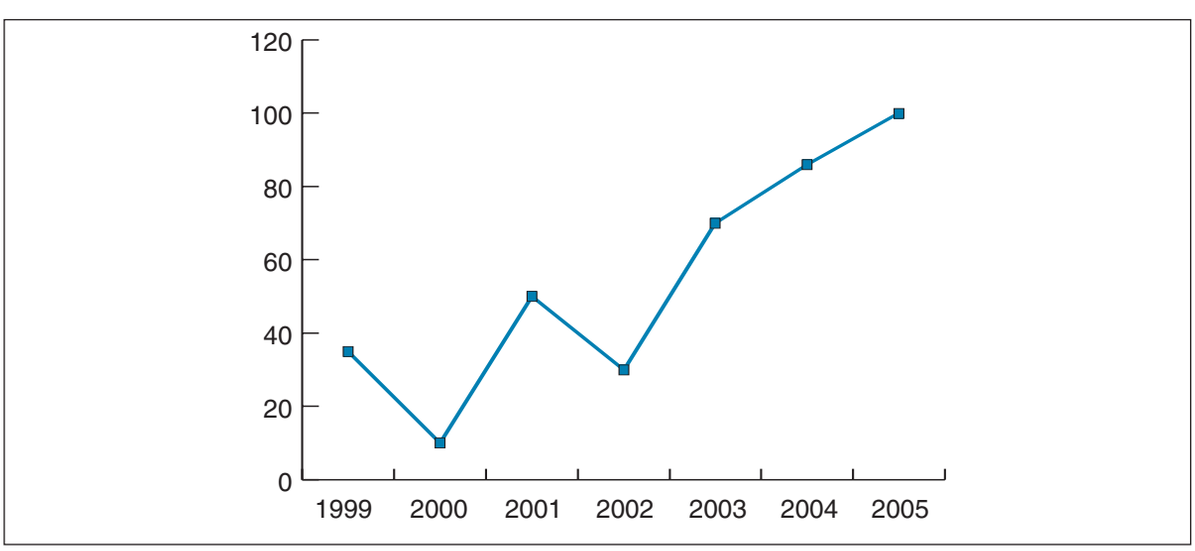
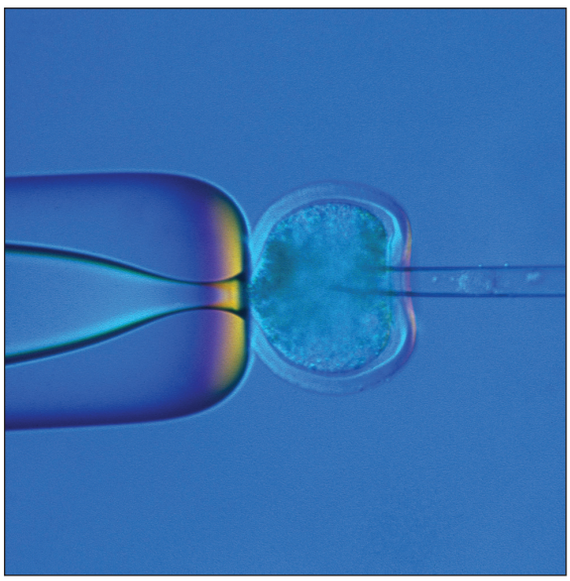


Figure 1. Central Government investment (£m) in knowledge transfer programmes[11].



Many companies in Britain invest less in research and development, as a proportion of their profits, than companies in other parts of the world. A culture of short-termism, particularly by the investment community, may be one reason for this. Government support for industrial research has a strong effect on the economy[10], and this justifies the various funding schemes developed by the Department of Trade and Industry. The Research and Development Tax Relief scheme is a good idea in principle, but claiming the credit is not easy and the scheme's administration has been described as 'a shambles'[12]. The result is that a large proportion of companies have not increased their R&D expenditure as a result of the credit. The scheme needs to be simplified to encourage greater take-up. Perhaps the most successful scheme in recent years has been the Grants for Research and Development initiative, under which the Government was investing £45 million a year to support the research objectives of small businesses. However, despite the obvious success of the scheme, the investment has been reduced to £35 million per year. The Government must maintain adequate funding to support R&D in the private sector, and the funding of the Grants for Research and Development initiative should be restored.

One of the keys to delivering economic benefits from scientific research is effective protection of intellectual property. Current legislation prevents the publication of an invention prior to filing a patent application. This can result in a culture of secrecy which impedes the progress of science in the UK. Patent legislation must not hinder the knowledge transfer process.

Intimidation by animal rights activists discourages academic scientists from working with animals, and is a strong disincentive for bioscience companies continuing to base their activities in the UK. The Government's tougher approach to dealing with extremists appears to be bearing fruit in that the Association of the British Pharmaceutical Industry recorded a smaller number of incidents in the first half of 2005, but we cannot be complacent. The Government must continue to evolve tough measures against animal extremists in order to create an environment free from harassment for those involved directly or indirectly with animal experimentation.

In addition to improving the country's wealth and providing 'value for money' for funding bodies, the commercialisation of UK research will maximise the global impact of, and regard for, British science.

Encouraging strategic science provision in Higher Education

The well-publicised closures of physical sciences departments have been brought about by a decline in undergraduate demand, and the high cost of providing science courses which is exacerbated when a department fails to achieve a 5 ranking in the Research Assessment Exercise. Although the biosciences have been relatively successful in retaining student numbers, strategic closures of departments and courses are beginning to impinge on the full breadth of biology, including some of the more molecular areas and applied areas such as agriculture, horticulture and ecology.

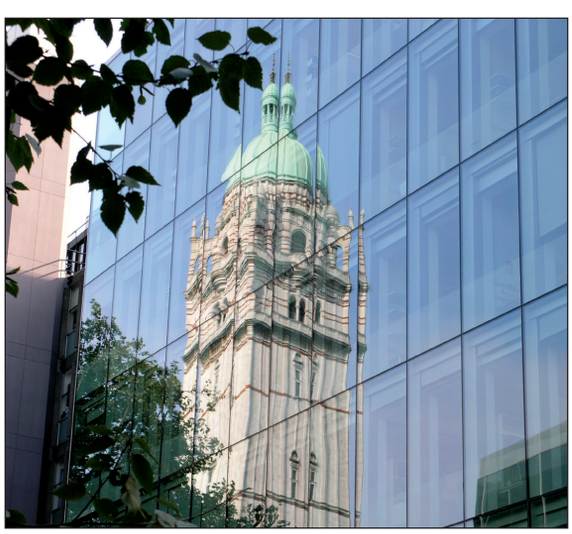
Students interested in biology are increasingly choosing university courses made popular by the media, including sports science and forensic science, rather than traditional core bioscience disciplines. We reject HEFCE's conclusion[13] that because the number of university students overall pursuing biosciences has not declined there is therefore no real problem. The profile of subjects is all important. School pupils need to be better advised that some of the new courses may offer less breadth and depth of learning, and may lead to poorer employment prospects than traditional bioscience courses.

The unit of resource for teaching science subjects in Higher Education is insufficient to provide the necessary practical training, in particular. The steep gradation in funding between RAE 4 and 5 grades means that departments falling below 5 find it increasingly difficult to sustain research and teaching. The Government must act through the funding councils to determine the real cost of providing science courses and increase the unit of teaching resource accordingly. It is clear that to remove or reduce funding from departments rated as being at least 'nationally excellent' (grade 4) is not healthy for the long-term strength of the science base. The weighting for research of national importance that has the potential to develop to become internationally competitive needs to be restored to something like its value prior to RAE 2001.

We appreciate that not all bioscience students need to be exposed to a high level research environment and that there is scope for much more collaboration in provision between universities. The government must encourage universities to play to their strengths in the provision of different types of bioscience courses, and work with institutions to develop improved collaborative provision of expensive components of courses.

The biosciences are of fundamental importance for the health and wealth of society; the UK biotechnology industry is the strongest in Europe and second only to the US[14], but requires a continuing injection of talented young scientists if it is to be sustained. We are concerned for the future of agriculture and horticulture research; students in specialist colleges increasingly follow a very restricted curriculum and are not exposed to biology as a whole. There has also been a significant decline in specific disciplines such as systematics. The government must ensure that all branches of biology are strongly supported in the UK.

Science these days is cross-disciplinary; insights from chemistry and physics are increasingly important for research in the biosciences. The present decline in popularity of the chemical and physical sciences is thus a threat to future progress in the biosciences. The government must ensure that the levels of expertise in the physical, chemical and mathematical sciences are sustained.



Fostering closer links with the European science base

European-wide research is vitally important for UK universities and research institutes as a source of grant funding. Strong European science feeds through to strengthen the UK science base and provides an opportunity to reach critical mass and avoid duplication. The government must seek to ensure that there is active dialogue between UK researchers, those who set European science policy and those who administer it.

Accepting European grant funding currently costs UK institutions money since the grants do not cover the full costs of the work that they support. In most other European countries specific provision is made for the national government to fund the difference. As part of its drive to ensure that institutions recover the full economic costs of research that they perform, the government must press the EU for European grants to cover a larger proportion of real costs and be prepared to contribute to the balance through the Funding Councils. Only then can our institutions continue to put themselves forward enthusiastically as partners in European research initiatives. The government must not seek to compensate for Britain's financial contribution to the European Research Council by cutting back funding of our national Research Councils.

The criteria for selecting Framework research programmes and for identifying researchers to receive grants are not always transparent. Where socio-political criteria such as the desire to build the science base in certain parts of the EU are included this needs to be made clear. There must also be a serious joint attempt by those awarding and those receiving grants to ensure that bureaucracy is minimised so that decisions are made more quickly in response to rapidly advancing science, and grants arrive on time. The Commission is aware of the problem but has so far not found a solution; failure to do so risks compromising European competitiveness. The bureaucracy of EU grants is often the reason stated by industry for not taking part in European research initiatives. The Government must press for increased transparency in the selection of Framework programmes and grant recipients, and should implement procedures to overcome the bureaucracy in administering European grants.

The UK Government, in turn, needs to ensure that its implementation of EU regulations does not damage our research base. It must also ensure that it has an effective monitoring system to provide early intelligence on legislation passing through the European Parliament that could impact adversely on UK life sciences research (eg Clinical Trials legislation). The Federation's European Liaison Group, which brings together a number of major organisations from the government and charity sectors, would be happy to collaborate in this area.

The failure to agree on a European patent because of disagreements over language means that the cost of protecting intellectual property across Europe is substantially higher than in the US. The government should press the European Union to overcome the obstacles to introducing a low cost patent system that applies across all European countries.

References

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Appendix

Member Societies of the Biosciences Federation

Association for the Study of Animal Behaviour
Biochemical Society
British Andrology Society
British Association for Psychopharmacology
British Biophysical Society
British Ecological Society
British Lichen Society
British Mycological Society
British Neuroscience Association
British Pharmacological Society
British Phycological Society
British Society of Animal Science
British Society for Cell Biology
British Society for Developmental Biology
British Society for Immunology
British Society for Medical Mycology
British Society for Neuroendocrinology
British Society for Proteome Research
British Toxicological Society
Experimental Psychology Society
Genetics Society
Heads of University Biological Sciences
Heads of University Centres for Biomedical Science
Institute of Animal Technology
Institute of Biology
Institute of Horticulture
Laboratory Animal Science Association
Linnean Society
Nutrition Society
Physiological Society
Royal Microscopical Society
Society for Applied Microbiology
Society for Endocrinology
Society for Experimental Biology
Society for General Microbiology
Society for Reproduction and Fertility
Universities Bioscience Managers Association
UK Environmental Mutagen Society

Additional Societies represented by the Institute of Biology

Anatomical Society of Great Britain & Ireland
Association for Radiation Research
Association of Applied Biologists
Association of Clinical Embryologists
Association of Clinical Microbiologists
Association of Veterinary Teachers and Research Workers
British Association for Cancer Research
British Association for Lung Research
British Association for Tissue Banking
British Biophysical Society
British Crop Production Council
British Grassland Society
British Inflammation Research Association
British Marine Life Study Society
British Microcirculation Society
British Society for Ecological Medicine
British Society for Parasitology
British Society for Plant Pathology
British Society for Research on Ageing
British Society of Soil Science
Fisheries Society of the British Isles
Freshwater Biological Association Galton Institute
Institute of Trichologists
International Association for Plant Tissue Culture & Biotechnology
International Biodeterioration and Biodegradation Society
International Biometric Society
International Society for Applied Ethology
Marine Biological Association of the UK
Primate Society of Great Britain
PSI - Statisticians in the Pharmaceutical Industry
Royal Entomological Society
Royal Zoological Society of Scotland
Scottish Association for Marine Science
Society for Anaerobic Microbiology
Society for Low Temperature Biology
Society for the Study of Human Biology
Society of Academic & Research Surgery
Society of Cosmetic Scientists
Society of Pharmaceutical Medicine
UK Registry of Canine Behaviourists
Universities Federation for Animal Welfare

Additional Societies represented by the Linnean Society

Botanical Society of the British Isles
Systematics Association

The Biosciences Federation was founded in 2002 in order to create a single authority within the life sciences that decision-makers are able to consult for opinion and information to assist the formulation of public policy. It brings together the strengths of 35 member organisations, including the Institute of Biology, which represents 45 additional affiliated societies.

The organisations that have already joined the Biosciences Federation represent a cumulative membership of some 65,000 bioscientists and cover the whole spectrum from physiology and neuroscience, biochemistry and microbiology to ecology and agriculture.

The Biosciences Federation is a registered charity (no. 1103894).