Science Policy Priorities 2001

ffiliated Societies of the Institute of Biology

What should Britain's priorities be for biology?

Over the past year the Affiliated Societies to the Institute of Biology have been asked to discuss their respective top science policies for the biological community as a whole. These priorities were first determined by a survey of the societies.

Summary

The principal areas of concern include:

- The state and status of the UK research community (top concern)
- Researchers' career structure and remuneration
- The post-genome challenge
- Public understanding of science
- Science underpinning sustainability
- Education

Over half of all the comments received related to either the state or status of UK research, or careers and short-term contracts.

The long-term perspective: a cross-priority theme?

1.0

No society was asked if they had one single unifying theme, but if one phrase kept recurring then it would be that of the need for a long-term perspective.

2.0

Comments were made as to:

- 2.1 The *short-term* nature of much of current **R&D funding**
- 2.2 The dominance of **short-term** contracts making science less attractive as a long-term career. There remains considerable concern within the biological community that the balance is far too weighed towards short-term contracts.
- 2.3 The need for a *longer-term* view to be taken regarding the **post-genome challenge**. We must recognise that the molecular expertise gained over the past decade or two now needs to be applied to whole-organisms and biological systems. We need to reassess the balance between molecular and whole-organism research in line with *longer-term* needs.
- 2.4 The need for greater 'public understanding of science'. These were made in part with the *longer-term* view that the research of today will have its technological applications tomorrow. A scientifically literate public will be better able to assess the benefits (and risks) of new technology.
- 2.5 Good science required to underpin environmentally sustainable policies. Here a *long-term* view is required due to the lead-time between scientific discovery, the development of related policy and implementation of sustainable practices.
- **2.6** Citing 'education' as a priority being again a long-term concern as good education is needed for the next generation of scientists, industrialists and consumers.

2.7 The need for the security of *longterm* research programmes

3.0

It is clear that if the UK wants to be a high-technology/high-income nation, not least one that retains its natural heritage as we enter the 21st century, then it needs coherent policies to ensure that scientific discovery and innovation can flourish. This begins with investment at a level (as a proportion of the economy) that is broadly comparable with that made by our principal competitors. It also requires a strategy for science so that this investment is used wisely.



Individual priorities in detail

State of R&D and scientists' career structures both top the priority list

4.0

Well over half of all the comments received related to *either* the state and status of UK research, *or* careers and short-term contracts. Both these priorities were of concern to the Affiliated Societies when last polled four years ago (1997). Both are fundamental to the quality of the next generation of UK researchers and the future of UK research.

The state and status of the UK research community (top priority)

5.0 Science performs well but...

It is accepted that in terms of the international picture Britain's scientific community performs well. For instance, more papers are published *per* \pounds of Government expenditure on R&D than by foreign competitors. However, despite this the Affiliated Societies, since their last survey four years ago, continue to have grave concerns as to the state and status of UK science. Here there are three principal concerns:



6.0 Funding

This has not been stable but has been in real-term decline by over 20 per cent since the early 1980s. Given that over this same period the economy has grown, the decline as a proportion of the UK economy (its GDP) has been even more marked. This decline is despite the real-term growth in the UK Science Base, and is because the Science Base only represents university and Research Council spending – it does not relate to research sponsored by Government departments or on defence.

7.0 Blue skies/applied balance

The balance between 'blue skies' (or fundamental) research and applied research needs to be redrawn. Despite the real growth of the Science Base, the real-term decline of R&D directly funded by the civil Government departments (which fund more applied research), and concerns about technology transfer (the development of research to a point where it is of commercial use), has placed pressure on those areas concerned with blue skies research. For instance, Government policy exercises such as (Technology) Foresight rightly focus on applied research. Yet, since the traditional funding of state-sponsored applied research has been in decline for over a decade, there is a perception that more with an applied dimension is being required of the Science Base. While blue skies research needs to be protected, the civil SET needs to return to the real-term level funding afforded it in the 1980s.

8.0 The status of science

The Affiliated Societies are concerned as to the status of British science within society. This is a multi-faceted problem and includes:

- a. Funding (as per above)
- b. Remuneration (which is explored below)
- c. Status within Government. Though science concerns are represented in the Cabinet through the President of the Board of Trade, there is no direct representation, yet issues such as

AIDS, BSE, Brent Spar, *E. coli*, fishing quotas, GM crops, etc., all have economic and political consequences that arguably require the best political representation in Cabinet. In the US, for instance, there is the Office of Science and Technology Policy within the White House, headed by the White House Science Advisor.

d. Status within Whitehall. The Office of Science and Technology has a pan-Departmental remit, though operates from within one Department itself. Indeed despite its remit, it has little control over how Departments allocate their resources.

Investment in science



If the UK is to lead the World in environmentally friendly technologies... If its food is to be safe and its farms productive (so freeing land for wildlife)... If health care technology is to continue to advance... If the nation's environmental quality is to improve... If Britain is to develop a high-technology/high-income economy in the 21st century... then the past one and a half decades of real-term decline in investment in science as a proportion of GDP needs to be reversed.



Researchers' career structures and remuneration

9.0 Adherence to Concordat

The dominance of short-term contracts. lack of career structure and remuneration continue to be of major concern to the Affiliated Societies despite some progress being made since the last Affiliated Societies survey in 1997. Since then a Research Concordat has been produced jointly by the Office of Science and Technology (OST), with the Research Councils and Funding Councils. The question now remains as to how the Concordat will be further monitored in sufficient detail? What mechanisms are in place to encourage universities to adhere to the Concordat, and to dissuade them from failing to live up to the Concordat's qoals?

10.0 Academic remuneration

In 1998 The Institute of Biology's response to the Independent Review of Higher Education Pay and Conditions noted that: in real terms academic pay has halved since the 1970s; salary comparisons for salary levels with non-academic science professionals have fallen; and the increase in both the numbers of part-time employees and those on short-term contract will, in the long run, be detrimental to the standards of teaching and research.

11.0 Others share concerns

We note that before the 1997 survey of Affiliated Societies policy priorities that others shared concerns as to that state of academic careers. In 1995 the House of Lords Select Committee for Science and Technology's report on *Medical Research and NHS Reforms* expressed serious concern over the state of clinical academic medicine. These were 'so great as to warrant an immediate enquiry in their own right.'

12.0

Since the 1997 Affiliated Society survey others have continued to express concern over short-term contracts and remuneration. *The Independent Review of Higher Education Pay and Conditions*, chaired by Sir Michael Bett, concluded in 1999 that the lowest grade of university lecturer should be paid £20,000 instead of £15,000, while the minimum professorial salary should rise from about £33,000 to £46,500 a year. Recently (November 1999), in response to the Bett Committee, the Royal Society statement *Academic Pay and Conditions* noted that: 'it should be possible to offer longer contracts to academic staff, on higher salaries and with reasonable prospects for contract renewal based on good performance.' The concern of others for the state of academic careers still continues, for instance as recently raised in the Commons' Select Committee report *Cancer Research* (2000).

13.0

The *Research Careers Initiative* (2000), led by Professor Sir Gareth Roberts, concluded that 'university funding systems have offered academics no incentive to attend to the development of their research staff... This has been the missing ingredient for too long.' It further concluded that it is 'clear that the single most important initiative that can now be taken to embed improved management of staff... is by the Funding Councils.'

14.0 Need for decisive action

That the concerns still expressed by the Affiliated Societies are also expressed by independent third parties should underline the need for decisive action. It would appear that we are no longer talking about whether poor terms and conditions will affect university research. Save British Science highlighted (winter 1999) that the Bett Report noted that: '95 per cent of institutions have experienced difficulties in retaining their existing academic staff and more than half say that problems are not rare.' The question now is that if things continue, how badly will the detrimental effects become, and what will be the consequences for UK PLC? Are we training too many researchers?





The post-genome challenge

15.0 We must prepare now

The sequencing of the human genome will be a landmark moment in biology. It is expected that the human genome will be fully sequenced at the beginning of the 21st century in either 2001 or 2002. *If* Britain is to capitalise on the results of the Human Genome Project *then* it must prepare now for the post-genome challenge. The Affiliated Societies have expressed a number of concerns that relate to the tasks that the biological community is almost certain to face following the sequence's completion.

16.0 The molecular & whole-organism balance

The past two decades have seen a tremendous growth in the molecular sciences, and this has been accompanied by much success especially, but not exclusively, for the technology and services relating to the biomedical sciences. The completion of the human genome sequence (and those of other species) is the essential step for our ultimately being able to produce every biochemical associated with



human metabolism. It is also fundamental to genetic screening. Notwithstanding these, the implications for gene therapy and the therapeutic use of cloning technology will be considerable. In short, the molecular sciences will continue to be important. However, because the genetic and molecular implications resulting from knowing complete genomes also relates to whole-organisms and communities of whole-organisms, molecular biologists will increasingly turn to those with expertise in whole-organ biology and ecology. Therefore, we urgently need to comprehensively reassess the balance between whole-organism and molecular specialisms, as well as the relationship between the two.

17.0 Interdisciplinary activities

Following on from above, concerns have been expressed as to the need to facilitate interdisciplinary (and multidisciplinary) research. This concern has previously been expressed by a number of Affiliated Societies in their joint responses with the Institute of Biology to the university Funding Councils in 1998 and 1999 on the Research Assessment Exercise (RAE). In addition, the importance of a balanced and integrated research portfolio including interdisciplinary work for future medicine was underlined by Professor George Radda, of the MRC, at a Parliamentary and Scientific Committee meeting in 1999. He noted: 'the growing interdependency between scientific areas.' Also that: 'genetic, molecular and cellular research, clinical research and population studies confront human disease at different levels, but also continually feed off each other in the quest to improve human health. (Science in Parliament 56 (3), pp. 2–3.) However, as the genomes of other species are sequenced so the relevance of the postgenome challenge will also increasingly impact on the zoological and botanical sciences. Finally, debate will be further engendered as the ethical, social, and legal implications become apparent.

Consequently, the interdisciplinary activities arising out of the post genome science and use of technology will go beyond the natural sciences. (See also *Public understanding of science*, p. 8.)

18.0 Underpinning science

This does not mean that future new development should focus solely on interdisciplinary research; there are concerns within disciplines that some existing specialist areas are falling between initiatives and funding bodies. Already mentioned above have been the concerns as to the balance between whole-organism and molecular biology. In addition there are concerns that some underpinning science is also being eroded (as opposed to specialist research itself). One example is systematics. This specialist area of life science underpins research into, for example, the conservation of biodiversity (see Sustainability, p. 10), or crop cultivars as used in agriculture. It also has a role to relate the molecular genome of species with that species' characteristics. Yet systematics is under real threat. Given declining Departmental budgets and the additional pressures placed upon the better funded Research Councils (whose priorities have, rightly, a blue skies focus), systematics ventures in their purest form have not been properly supported.

19.0 Animal use and welfare

Being able to produce all the biochemicals associated with human biology (and those of other species whose genome has been sequenced) is one thing, but using them commercially is quite another. The need for trials and testing will increase, as potentially new products become available. One controversial consequence is that the need for animal testing is likely to increase. There is already considerable tension between a vocal proportion of the public and those involved in the use of laboratory animals. Ironically, it is not



unlikely that the concerns over the use of animals here in the UK will drive research overseas to those places where ethical standards are lower, as are those for animal welfare. While nobody with any degree of compassion likes the thought of animals in laboratories, there is sometimes no choice if we are to realise the benefits (both to humans and other species) of having sequenced complete genomes. Part of the post-genome challenge will be to ensure that the clear majority of the UK public is aware of the need for a minimum of animal work and that the public accepts that the welfare of the animals involved in the UK is the highest in the World. (See also Public understanding of science, p. 8.)

Public understanding of science

20.0 Importance

That the public has an understanding of science (here used in its broadest sense) is important for a variety of reasons including the following:

20.1 'Technology' is directly related to, but not the same as 'science'. The poor understanding, if not 'mishandling', of technology has led to public scares. If the public is to be reassured as to the potential benefits of new technologies, it must have an understanding of the science from which it arises. In other words, if the UK is to become a high-technology/ high-income society then its citizens will need to have a sufficient familiarity with science so as to be able to meaningfully question new developments, as opposed to having concerns arise

out of science and technology appearing incomprehensible.

- **20.2** Society will need to adapt to living with its new abilities arising out of the post genome challenge (see above). It will need new economic, legal and ethic protocols. To determine these will require scientific understanding.
- **20.3** State-funded research is paid for by the public and the tax-payer has a right to know how taxes are spent and be assured that the spending is of value.

21.0 More welcome progress

The 1990s have seen increased attention to the public understanding of science both by Government and the scientific community. This has been most welcome but more needs to be done. The potential for the new information technologies to deliver knowledge has never been greater. The membership of scientific learned

Public understanding of science

The public and political concerns of a number of biological issues are great. As comparable are their economic (or potential economic), social and biological impacts. Such issues include:

- AIDS
- Antibiotic resistance
- Bioremediation
- Biodiversity conservation
- BSE
- Climate change
- Cloning (therapeutic)

And we have not finished the 'Cs' yet, let alone included last year's hot issues such as xenotransplantation or GM crops and food. If the public at large is to be realistically able to appraise the risks and benefits associated with these issues, a general understanding of the underlying science is required. societies in the UK is as large now, if not larger, than it has ever been before. The potential for industry, Government and the independent and charitable learned and professional bodies to further public understanding remains considerable. All three can bring different strengths to bear be they: resources, a suitable policy environment, and independent expertise.

22.0 Erosion of scholarship activities

However, the system does not encourage what the Funding Councils call 'scholarship activities'. (Scholarship activities being the writing of books, participation in symposia, learned society activities and so forth.) All relate to public understanding: specialist science is placed into a broader context by symposia, learned societies speak on behalf of specialists, and books are still the principal means of communicating complex issues in some depth. What is of particular concern is that some university departments actively discourage any activity (including scholarship activities) that does not generate income (such as through improved citation raising the department's RAE score). The Institute of Biology has received much anecdotal evidence over the years as to the increased pressure on scholarship activities. The Institute also noted with interest the evidence the co-publishers of its Studies in Biology series of texts, Cambridge University Press, gave the House of Lords' Science and Society enquiry. They said: 'we have encountered younger academics who have received instructions not to write books and established professionals who are not willing to risk the dropping of a department grade if they take time out to write.' Scholarship activities require the restoration of proper funding.

23.0 The Scientific Advisory System

Politicians in a democracy rely on open, fair and informed public debate based on the best scientific advice available.



However our experience is that consultations run by Government Departments in the main do not follow Cabinet Office quidelines; the deadlines are, without explanation, frequently shorter than the minimum recommended and the provision of bulk copies of consultation documents is patchy. Furthermore, despite the cost savings to Government of providing consensus joint-responses from a number of organizations, co-authors are not always cited in main reports (so, contrary to openness, leaving in doubt as to who exactly is submitting advice), nor are copies of the consultation's conclusions always made freely available to principal co-authoring bodies. (Ironically if several bodies were to respond independently, then not only would each response have to be individually assessed, but each body would receive a copy of the consultations' outcome. In short, those providing coauthored consensual responses from a number of bodies are being punished for saving Departments the cost of assessing multiple responses.) Finally, some consultations are terminated before their conclusions are drawn. We believe all of the above undermine openness and fair debate based on best science, and that they invite public unease and dissent over the prospect of new (hence unfamiliar) technological developments. These problems have been long-standing and are not due to any one Government.

Science underpinning (environmental) sustainability

Tackling sustainability threats 24.0

Sustainability (as defined by the World Conservation Strategy (1980), the Bruntland Report Our Common Future (1987) and the UK Strategy for Sustainable Development (1994)) is of increasing importance. Not only are human numbers continuing to increase in our finite world, but the per capita consumption of resources is also rising. That sustainability is of increasing importance is also indicated by its appearance as an issue of concern by the Affiliated Societies.



The World population at the beginning of the last century was just under 2 billion, then the highest level in the history of our species. By the end of the century this record was broken as the World population exceeded 6 billion. By the middle of the 21st century it will almost certainly be more than 9 billion (it could even be higher). The demands on natural systems to provide food and clothing, the pressures on wildlife, and the threats to the biosphere's integrity will never have been greater. It is therefore vital that we develop and employ our knowledge to ensure the sustainability of living systems for we, and our children, are living creatures born of these systems.

25.0 **Biosciences are fundamental**

The biosciences underpin the fundamental areas of human activity including food production, health, and clothing. Consequently, true sustainability will not be possible unless policies are based on proper scientific understanding. (See also Public understanding of science, p. 10.)

Education

Importance to the UK 26.0

Education at all levels is an Affiliated Society concern for two principal reasons. First, education facilitates the public understanding of science. Second, those seeking to become scientists will need to have had a good education. Education is fundamental to the UK becoming a hightechnology/high-income society in the 21st century.

The biological community's 27.0 contribution

The Institute of Biology's Education and Training Board is continuing to network with interested Affiliated Societies to further their policy interests in matters relating to biology and education in the UK.



Recommendations

28.0 Careers

It is recommended that clarification by the Office of Science & Technology (OST) be given as to what steps have been, and will be, taken to ensure the effectiveness of the Research Concordat on researchers' careers, and secondly what steps can be taken to ensure that institutions abide by the Concordat. Finally, we ask what steps have been taken to ensure that highcalibre researchers just embarking on their career will have assured future prospects for career development. Given the continued strength of feeling within the lifescience community, this is a matter of great urgency that should not continue to be marginalised.

29.0 Research population

We recommend that the Council for Science and Technology ascertain the view of the scientific community as to whether the UK is training the appropriate number of researchers.

30.0 Strategy for Science

While we welcome last year's (1999/2000) halting of the decline in Grand Total Science, Engineering and Technology (SET) investment, we nonetheless urge the next Government to review the way science is funded across departments and to continue the recent reversal in decline in Departmental R&D as a matter of importance. Ideally, the Affiliated Societies would like to see a return to the early 1980s Grand Total level of funding as a proportion of GDP. This would enable the UK to develop and support a meaningful strategy for science across Government and involving industry.

31.0 Research balance

We ask that the OST review the **balance between blue skies (fundamental) research, applied and policy-driven research** in state funded research.

32.0 Long-term research programmes

We ask the Chief Scientific Adviser to review the nation's **long-term research programmes**, as conducted by both the Research Councils, Government departments and their Agencies, with a view to ensuring stability of funding and standardization against time.

33.0 Departmental research

We suggest that the House of Commons Select Committee for Science & Technology examines the way **civil Departments invest in and conduct research** with regard to the national interest.

34.0 Researchers' remuneration & research student population

We ask the Government whether the *Independent Review of Higher Education Pay and Conditions* conclusions can be implemented and that the steps required for implementation (or to overcome obstacles) be identified. Secondly, given that implementation will most likely depend on both budget and the number of those engaged in university research, we ask that the Science Council (which includes the Institute of Biology and through it its Affiliated Societies) recommend whether the number of postgraduate students should be increased, remain the same, or decrease.

35.0 Molecular & whole-organism balance

We ask the Director General of the Research Councils to review **the balance between molecular and whole-organism research** as part of the called-for strategy for science (see paragraph 30.0). There is an argument for a proportion of any extra investment in biology to fund wholeorganism biology as it will be through whole-organisms that many of the benefits from molecular biology will be realised.

36.0 Interdisciplinary research

We ask that the OST examine ways to facilitate interdisciplinary and multidisciplinary research. Currently there are barriers impeding work between departments let alone between universities, for instance the Research Assessment Exercise.

37.0 Threats to UK animal work and welfare

We ask that the OST examine the **regulations relating to animal work** in the UK to ascertain whether there is risk that research might be placed overseas to those countries with lower ethical, and animal welfare, standards.

38.0 Public understanding initiatives

We welcome the various **public understanding of science** initiatives. We recognise the potential for industry, Government and the independent and charitable learned and professional bodies, to further public understanding remains considerable. We ask that there **be regular co-ordination of public understanding initiatives across Government** (both the Research Councils and Departments).

39.0 Scientific advice

We urge the Government to make a detailed review of the scientific advisory system with regards to its reform.

Should policy-makers require further information, then in the first instance they should contact:

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For general information about the Institute of Biology, see the web site at **www.iob.org**



While the views within this priority document may not necessarily reflect the priorities of any single society, they do represent, as far as is possible, shared concerns. All of the following societies submitted views that were incorporated into this document:

- Association of Clinical Microbiologists
- Association for Radiation Research
- British Association for Lung Research
- British Biophysical Society
- British Ecological Society
- British Grassland Society
- British Lichen Society
- British Society for Animal Science
- British Society for Cell Biology
- British Society for Crop Protection
- British Society for Immunology
- British Society for Parasitology
- British Society for Plant Pathology
- British Society for Soil Science

- Freshwater Biological Association
- Genetical Society
- International Biometric Society
- Institute of Trichologists
- Physiological Society
- Primate Society of Great Britain
- Research Defence Society
- Society for General Microbiology
- Society for the Study of Human Biology
- Scottish Association for Marine Sciences
- Systematics Association
- Zoological Society of London

The following groups have within them representatives from a number of IoB Affiliated Societies and also submitted views:

- Agricultural Sciences Committee
- Biomedical Sciences Committee
- Environment Committee
- UK Life Sciences Committee



Institute of Biology

Chair of the Science Policy Board Professor Peter Caligari cBiol FIBiol

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