the definitive statement on the subject, and is now used worldwide.

Scientific societies establish committees to address matters of public policy of particular interest to their members. For example, the ASCB took a leading role in providing Congress with information on stem cell research. Cell biologists testified numerous times before Congressional committees, discussed the issues with their own members of Congress and wrote editorials for various newspapers. Patient advocacy groups have been particularly effective in lobbying for federal funding of human stem cell research. They have been joined by influential members of Congress who see the possible benefits of stem cell therapy. Together, they convinced President Bush to allow federal funds to be used for human stem cell research.

Practising scientists in the United States became actively engaged in politics only recently (during the past 20 years). Ideally, every member of Congress would know, and consult with, scientists from their local district. This would provide members of Congress with access to information on the benefits of scientific research and on policy issues with a scientific component. Although much progress has been made, more work is still required to meet this ideal.

Thomas D. Pollard is in the Department of Molecular, Cellular and Developmental Biology, Yale University, New Haven, Connecticut 06520, USA.
e-mail: thomas.pollard@yale.edu

1. Bishop, J. M., Kirschner, M. & Varmus, H. Science and the new administration. *Science* **259**, 444–445 (1993).

Online Links

FURTHER READING
National Institutes of Health: http://www.nih.gov/
American Society for Cell Biology: http://www.ascb.org/
American Society for Microbiology: http://www.asmusa.org/
American Society for Biochemistry and Molecular Biology: http://www.asbmb.org/
Society for Neuroscience: http://www.sfn.org/
Joint Steering Committee for Public Policy: http://www.jscpp.org
Access to this interactive links box is free online.

SCIENCE AND SOCIETY

Lessons in science politics

Kai Simons

Today, biology has become a big science, which devours huge amounts of money. In the United States, a phenomenal growth in biomedical science funding has paralleled the increase in research costs. But this did not occur spontaneously, and the American research community has had to learn how to influence budget policy. In Europe, we are now also faced with a similar problem and need to learn how to campaign for better research funding.

My own beginnings in science politics were more than shaky. Moving to the European Molecular Biology Laboratory (EMBL) in 1975, I was struck by the fact that most European institutions were purely western European. Coming from Finland, I thought that this could be changed, at least in scientific research. Finland had assumed a role as a gateway between the Communist east and the west of Europe, and, in this spirit, I started a 'campaign' to expand the membership of the European Molecular Biology Organization (EMBO) to the Eastern Bloc nations.

I managed to be included in a small group, which toured the Moscow biomedical scene under the auspices of a company that equipped the Soviet Union with ready-to-use biomedical laboratories. The Chief Executive Officer (CEO) of this company was a Polish emigrant whose headquarters were in Munich, Germany. He liked my idea very much and promised to introduce me to the relevant officials in the ministries. He had an overcoat with enormous pockets full of gifts that he laid on the table before starting discussions!

When I met the Ministry representatives, I told them that I knew the President of Finland — Urho Kekkonen — very well and that, if they agreed, Kekkonen would take up the issue of Soviet membership in the intergovernmental council that supports EMBO with the USSR leader Leonid Brezhnev. They all looked at me with consternation. How could this nobody be talking about meetings between Brezhnev and Kekkonen?

The truth is that I had never met Kekkonen, but I was sure that I could persuade him when the time was right! This, of course, never happened, and nothing came of my naive efforts. The only change I could detect was in the attitude of Yu Ovchinnikov, the Vice President of the Soviet Academy of Sciences, who had previously been quite friendly with me. When I met him at international meetings after this incident, he totally ignored me — I had probably caused him trouble with my East-meets-West initiative.

Learning a lesson: the EMBL

Fortunately for me, the EMBL was a great place to learn how scientists and policy makers interact. A stream of politicians visited the laboratory: heads of state, ministers, parliament members and science policy makers from all over the world. The institute was under continuous scrutiny from its member states. Moreover, because the EMBL was a centre of excellence, the German government used it as a showplace for visiting dignitaries. All these encounters taught me that politicians listen when you can connect basic science with society and with realistic applications.

The first Director-General John Kendrew's example was very instructive. The founder of the EMBL, he had to fight from the 1960s to 1974 before securing funding for a European laboratory for molecular biology. Unlike in the case of high-energy physics, the European governments saw no reason to start a multinational effort in molecular biology when research at the national level was affordable. So, Kendrew reformulated the mission of the EMBL to develop innovative instrumentation for molecular biology. He convinced the governments that this project was sufficiently expensive to justify funding a European institution. Only Kendrew could have succeeded in this task because of his political clout. There was no other molecular biologist in Europe so well connected. He was the chairman of the UK defence committee and this linked him to the network of science policy makers in all North Atlantic Treaty Organization (NATO) countries.

The EMBL took off to become a success. The laboratory innovated instrumentation by introducing synchrotron radiation in X-ray crystallography and by perfecting cryo-electron microscopy for high-resolution studies. But even more important were its roles in laying the foundations of developmental genetics through the work of Christiane Nüsslein-Volhard and Eric Wieschaus, in giving molecular cell biology a headstart in Europe and in initiating the first programme in bioinformatics in Europe (for which credit goes to Lennart Philipson, Director-General of the EMBL from 1982–1993).

Surprisingly, the EMBL's extraordinarily successful training mission, with hundreds of alumni in leading positions in Europe and elsewhere today, failed to generate much political clout. Despite many successes, the

EMBL always had a mixed reputation among the molecular biology establishment in Europe, and its budget was constantly under pressure. Leading molecular biologists simply calculated that if the budget that was given to the EMBL by their government was redistributed to them, their own labs would profit by closing this European facility. Kendrew and Philipson were constantly reacting to swings in support, as Fotis Kafatos, the current Director-General, still is today.

One of the most important lessons that I learnt during my years at the EMBL (1975–2000) is that, amazingly, scientific excellence is never a sufficient justification for obtaining funding. Only new programmes, such as bioinformatics, seem to attract the attention of politicians. In general, policy makers need convincing scientific and economic arguments before they will reach into the public coffers to fund new projects. The scientific community can and should be central to formulating these arguments, but we need to bear in mind that excellence in basic research alone does not carry much weight.

Using the knowledge: Biopolis Dresden

Profiting from these years of experience at the EMBL, I was ready to take on the new task of founding a Max Planck Institute of Molecular Cell Biology and Genetics in Eastern Germany together with Jonathon Howard, Wieland Huttner, Anthony Hyman and Marino Zerial[1]. Here, the political task was clearly defined by the federal government: to start a new research institute from scratch in the former East Germany. The institute was to be located in Dresden, a city with longstanding cultural traditions but effectively no molecular cell biology or developmental genetics.

One prerequisite for pulling off this mission successfully was a team of top researchers in the field. This we had. We also needed help in establishing contacts with the important policy makers in federal Germany and in the state of Saxony, where Dresden is located. Fortunately, we persuaded Konrad Müller, former head of personnel at the EMBL and uniquely well connected to the corridors of power in Germany, to participate in the team as a political consultant. He prepared the initial contacts to key people in the ministries and to the sponsors all the way to the top.

"…politicians listen when you can connect basic science with society and with realistic applications."

We also knew that it would not be sufficient to establish only one top-flight institute to shape a robust biology scene in Dresden. So we raised our goals to include two other new institutes under the umbrella name Biopolis Dresden: the BIOTEC Molecular Bioengineering Institute at the Technical University of Dresden, which is building bridges between biology, medicine and engineering, and the BIOPARC, a research institute for computational biology including the former Lingner castle, which will be used as a meeting place for Biopolis Dresden and for international gatherings. BIOTEC, on the other hand, will be housed in a new Bioinnovation Centre, which will also host the biotechnology build-up in the region. All the Biopolis institutes lie close to each other in the centre of Dresden where there are also several new start-up biotechnology companies and room for others in the future. BIOTEC is funded by the Saxony State government, and BIOPARC by the Klaus Tschira Foundation and by the European Union.

It was hard work to convince all the involved parties to agree on funding this new constellation of institutions in Dresden, but the sheer volume — more than 300 million Euro (~260 million US dollars) — of the project probably impressed the authorities the most. Paradoxically, making the project so huge made it easier to receive the necessary funding; big projects attract more political attention than modest ones. By making the programme innovative — combining engineering and computational biology with biology and medicine — we were able to convince the decision makers that this project is unique. Also, the enthusiastic support of the deans and leadership of the Dresden University helped to make the programme possible.

The management and creation of Biopolis Dresden was immensely helped by Ivan Baines, a former administrator for the National Institutes of Health (NIH). His experience of biomedical funding and the biotech scene in the United States has been essential for finding realistic solutions to the problems that a project of the size of Biopolis Dresden constantly faces. In these areas, the United States is far ahead of Europe, and we would have made many mistakes without his input. Our experiences from the Dresden project have clearly shown the need for a qualified team of both scientists and consultants with a wide range of expertise.

But to receive State funding, a project also requires trust and credibility. These can only be generated by a continuous dialogue with the public and the media, and an open discussion of the benefits as well as of possible problems of future developments. So, the Lingner castle will also be a centre for promoting the public understanding of science, an important factor in the creation of support for life sciences.

"…one problem that the ELSF has to face is that scientists rarely, if ever, speak with one voice in science policy issues."

Last, Biopolis Dresden is a project at the right time in the right place. In the context of the reunification of Germany, it was an important political issue for the German government to create poles of excellence — for example in biotechnology — in eastern Europe as well. And the spearhead for creating intellectual property to feed the build-up of biotechnology is excellence in basic research. So, above all else, Biopolis Dresden is important for the renaissance of Dresden, and was therefore from the start an excellent candidate for State funding.

An outlook on Europe

It is obvious that we Europeans have a lot to learn from the Americans, at least in the domain of science policy. The all but doubling of the NIH budget in the past five years did not come about by itself. Many advocates contributed to this effort, including scientific societies, such as the American Society for Cell Biology (ASCB), and the Joint Steering Committee (JSC) for Public Policy, and advocacy groups supported by the American Society for Biochemistry and Molecular Biology, the ASCB and the Genetics Society of America (see the article by Tom Pollard on page 929 of this issue). Several leaders of the NIH, notably Harold Varmus and Richard Klausner, who engineered the increased funding, also held important posts in the ASCB. Marc Kirschner, when he was president of the ASCB and later Chair of the JSC, supported the creation of the Biomedical Research Caucus on the Hill to inform senators, members of Congress and their staff about recent developments in biomedical research. The scientific community has constantly lobbied policy makers to keep them informed of the possibilities that the molecular life sciences hold for the future.

Biomedical research funding by the European Union is miserable by US standards — it amounts to only 5% of the total

national funding. Moreover, EU funding is often sadly misdirected because of all the restrictions that apply to EU grants. But as European scientists, we have to act, not lament. We have created the European Life Scientists Organization (ELSO) to introduce some of the innovations of the ASCB to Europe. The ELSO has started its activities and has been campaigning for changes to the next four-year research funding 'Framework Programme' of the EU. As one small organization cannot achieve wonders, ELSO has focused so far on a new funding programme for career development grants for young investigators to start their own independent laboratories with funding for the first five years.

In contrast to most European science organizations, which are federations of national societies, the ELSO is a grass-roots organization. Its members meet at the ELSO Congress, which is organized according to the successful formula of the annual ASCB meetings. The first was in Geneva in 2000 and the next will be in Nice (29 June–3 July, 2002).

One of the voices of the ELSO is an electronic magazine, *The ELSO Gazette*, which chronicles these activities as well as reports on science news, politics, policy and research in Europe. The Gazette is run by Carol Featherstone, and it has already made its mark. During its first year, it gained 2,000 subscribers and received 50,000 visits. This magazine will be a cornerstone for the activities of the ELSO's activities, for instance by mobilizing its membership for political action.

Another new organization that is attempting to shape life science policy in Europe is the European Life Science Forum (ELSF), an umbrella organization of existing European societies in this area of research, which also includes the ELSO. The mission of the ELSF is to coordinate policy and formulate common goals. But one problem that the ELSF has to face is that scientists rarely, if ever, speak with one voice in science policy issues. The problem is even worse at the level of scientific organizations, which often have different policies on the same issues. It is the present lack of coordination on European policy issues that the ELSF is trying to correct.

New winds are blowing in Europe. Obviously we have a long way to go before we establish ways to get our voice heard. Although we cannot copy exactly the United States's ways of promoting pragmatic and efficient life science policies, we can learn a lot from the other side of the pond. Despite all the problems in life science funding, European molecular cell biology is thriving, and promotion of this lively scene is certainly worth the effort.

Kai Simons is at the Max Planck Institute of Molecular Cell Biology and Genetics, Pfotenhauerstrasse 110, 01307 Dresden, Germany.
e-mail: simons@mpi-cbg.de

1. Huttner, W. B. Birth of a new institute — Biopolis Dresden. *Nature Rev. Mol. Cell Biol.* **2**, 699–703 (2001).

Online Links

FURTHER READING
European Life Scientists Organization: http://www.elso.org/
The ELSO Gazette: http://www.the-elso-gazette.org/
European Life Science Forum: http://www.elsf.org/
Access to this interactive links box is free online.

SCIENCE AND SOCIETY

Influencing science policy in Japan

Nobutaka Hirokawa

The administrative structure for the funding of science and technology in Japan is now going through a marked change. The newly formed Council for Science and Technology Policy (CSTP) has been given great powers — but how, in particular, is the funding policy being addressed by the new administrative structure, and how can scientists influence science policy in Japan?

The new science funding

The administrative structure for the funding of science and technology in Japan was markedly reorganized in January 2001, when the Ministry of State for Science and Technology Policy and the Council for Science and Technology Policy (CSTP) were founded. Their duty? To determine the general strategy and the basic policy for science and technology. These two organizations work together to determine the national strategy for science and technology, and the policy for allocating research and development (R&D) resources (FIG. 1). They also evaluate important national R&D projects. Included in this basic scheme is the Ministry of Education, Culture, Sports, Science and Technology (MEXT), which was formed by the amalgamation of the former Ministry of Education, Science, Sports and Culture (MESSC) and the Science and Technology Agency (STA).

The roles of MEXT include:

- Planning, promoting, coordinating and evaluating details of science and technology.
- Supporting basic policy plans, establishing the R&D infrastructure, and promoting the understanding of science and technology.

Based on these criteria, MEXT supports the basic structure and funding of:

- Universities — national, public (those belonging to prefectures and cities) and private.
- National research institutes and independent administrative institutions (56 out of 83 national research institutes were transformed into independent administrative institutions from 1 April 2001 to increase the flexibility of administration, while also increasing autonomous responsibility).
- Public corporations, which include large institutions such as RIKEN (Institute of Physical and Chemical Research), the Japan Atomic Energy Research Institute and the Japan Marine Science and Technology Centre.

The newly formed CSTP is expected to have a great influence in determining the science and technology policy in these new structures. Chaired by the Prime Minister, the CSTP is composed of 14 members: six government ministers, six scientists from natural, social and cultural sciences, and two from industry. It aims to provide a basic and comprehensive policy, planning science and technology and their general coordination. The CSTP is expected to have a supporting role as a 'source of wisdom' to the Prime Minister and the cabinet in scientific and technical matters.

In March 2001, the CSTP published the Science and Technology Basic Plan. Although this report states the importance of promoting basic research and upgrading research quality justly, it also emphasizes that, in accordance with national and social needs, R&D will be given priority. As such, it has selected several fields, such as life sciences, information technology, environmental science and technology, and nanotechnology and materials as priorities.

Grant application, review and funding

Professors, associate professors, research associates in universities and institute staff can apply once a year to MEXT for scientific