

Editorial

European Science:

It seems odd in one respect to mention science in connection with a territory, since we think of the results of science as being universal and having no nationality. Indeed when we talk of British science or French science we are not talking of the content of scientific knowledge, but about individuals and institutions and their contributions to the body of scientific knowledge. We can have a national pride and loyalty in them in the same way that we have for a football team or a tennis champion. In this way the Germans can be proud of Leibnitz as a German scientist, and the Italians of Galileo as an Italian scientist; it is pure chauvinism. However, these days it does not stop there but carries over into the funding of research. Tables are published of the percentage of GNP that each nation spends on research (incidentally, by no means a straightforward calculation since it depends on how you define research and how you attribute the costs) and governments are urged to enter into a race with the leaders. The arguments used are nearly always based on the proposal that research feeds industry and hence, by increasing funding for scientific research, you are *ipso facto* creating prosperity and increasing the GNP – a virtuous circle. Since so much of modern industry is directly connected with scientific advance, one can only applaud when this argument has influence on those who control the provision of funds

But you will say that not all research is of immediate value to industry, so we must divide it into pure research, undertaken out of curiosity about the world, and applied research that has immediate effects on industry. This division causes a great deal of trouble. Most modern industry is based on research that started out as quite pure. As industry has become increasingly science based, the interval between the basic discovery and its application has become very short and has also shifted the location where the basic science is carried out; a surprising amount of basic research is now carried out in industry itself. There needs to be a good balance between basic research and the application technology and just where to strike the balance leads to much argument and politicking in our nations. It has also led to the ridiculous and rather absurd requirement of some funding bodies to have indications from applicants of the likely economic spin-off of the work they propose to do.

Let us now turn to European science; why bother, isn't it just the sum of the research done in whatever we call Europe at any moment? Of course it is, but it is not so simple as that. We are all aware that, after 1945, science in the United States came to dominate world science (note: the 1998 Nobel Prizes in science and medicine, 100% American!) and makes a much greater contribution than any single European country, so there is a way in which pride requires that we sum up science in Europe and see how this sum compares. It is also highly desirable that the different actors in European science should know what each is doing, and for this

purpose several bodies have been established. One is the EUROHORCS, which brings together the Heads of Research Councils in Europe, i.e. the bodies that are intermediary in the distribution of that part of government research support that is not directly awarded by Ministries. There is also the much wider ranging body, the European Science Foundation (ESF) which has representatives of learned societies and academies as well as the research councils. ESF sets up networks that bring together people working in various areas and projects that address problems of common interest. Examples have been a European geotraverse, the acquisition of a second language by immigrants, the origins of the modern state, oxide crystals, databases of gene expression, and social transformations in central and eastern Europe. It regularly prepares reports on various aspects of European science which draw attention to the state of activity or to what is going on elsewhere. It regards Europe as glorying in diversity, in Eugene Seibold's words a mosaic that needs some adhesive. The ESF has the relatively modest budget of 9.8 million ecu and does not have funds to provide the means to do research nor to provide scholarships or fellowships.

But Europe has another connotation because of the existence of the European Union, which has its own idea of what science is and how it should be funded. The EU operates its science policies under two main directives, *subsidiarity* which means that work should not be undertaken by the Union that can be (better) carried out in the individual nations of the Union. The second is *harmonization*, which is concerned with trying to establish a common level of competence across Europe. Both these principles lead to difficulties. There are very few scientific activities which cannot be done successfully in the individual nations or where simple bilateral arrangements cannot be made. Harmonization tends to place political considerations ahead of competence and can be the enemy of excellence.

The EU has had four previous multiyear plans for science called Framework Programs; the fourth of these started in 1994, is just concluding and is being replaced by a fifth after a long period of discussion and negotiation. The fourth Framework Program disbursed 12.3 billion ecu, so it was larger than the science budget of many of the smaller states in Europe.

Since the Union started as an Coal and Steel Community and then as an Economic Community it is not at all surprising to find that the Framework Programs have concentrated heavily on creating industrial advantage and that the emphasis has been on applied science and technology. It is interesting to consider the criteria that the EU applies in assigning priority to programmes in science as detailed in the protocols of the programme. These are: (a) social (employment, quality of life, environment), (b) economic (growth, competitiveness, technological advances) and (c) European 'added value', (support for Union policies, European scale of problem, critical mass). Few of these would be recognized as criteria for choosing the best science and I suppose that it is the European scale that strikes a chord. Modern high energy physics needs large, expensive machines and establishments whose costs are beyond the means of single nations in Europe.

CERN (the European Centre for Nuclear Research reviewed elsewhere in this issue by its Director-General) was established for this purpose, not through the EU, but by treaty between the participating countries; it has been a great success, fully matching establishments elsewhere. It has grown into a global organization with major participants outside Europe. It has the intriguing situation that it is located at the Swiss–French border and that the ring of the cyclotron actually crosses the border, i.e. between EU and non-EU Europe. The European

Space Agency (ESA) has a rather similar constitution but has established a closer relationship with the EU.

The third example is the European Molecular Biology Organization (EMBO, one of its activities, the European Molecular Biology Laboratory, EMBL, was reviewed in the last issue of the *Review*) also established separately from the EU. EMBO has recently been responsible for the establishment of the European Bio-informatics Institute. EMBO was established for slightly different reasons from CERN; this was a rapidly growing and increasingly expensive area of science and there were worries that Europe would not be able to respond rapidly enough. In fact individual nations have responded rather well, but the organization and EMBL have proved their worth. It is therefore very interesting that in the areas of 'European scale' where one would have expected the EU to be making a major effort, this has not happened. The EU does have Joint Research Laboratories, notably one at Ispra in Italy, they have mainly been concerned with problems of nuclear energy, but are now being reoriented.

However, beneath the formal EU descriptions of criteria there is room for science as well as technology to gain, as was illustrated in the practice of the fourth Framework Program. I have no doubt that this will continue to be the case and, for instance, the programme going by the technological title of the 'Cell Factory' will actually support rather a lot of basic molecular genetics and cell biology. There is no question that, in the present situation where national science budgets are stretched and in some cases contracting, the EU science programmes find many eager takers.

There are other areas where activity is appropriate, for instance in setting standards for the environment, which is no respecter of national boundaries, for epidemiology, and probably for measurement standards. The danger is in going too far in trying to 'harmonize' aspects of European life that are best left alone and in their diversity.

It is generally agreed that the most successful EU activity coming from the Frameworks has been the encouragement of movement of students and postdocs, particularly through the Erasmus programme and the training and mobility programme (TMR). In most countries, support for individuals is largely restricted to the country's own nationals; the EU programmes have encouraged movement within Europe – perhaps they should now direct attention also to movement between Europe and North America and Asia. An important problem that has so far resisted solution is the transportability of pensions, a major inhibitor of movement for older workers. The EU Network programmes have not escaped criticism for their artificial character, for instance in requiring a minimum of three participants, with emphasis on the less developed areas and on industry. Transnational research in science has become a commonplace, required as it is by the complex specialized technologies and exotic materials required in modern science, but it occurs as needed across the world, facilitated by e-mail and real time links; it is hard to see any *special* value in a European collaboration.

In order to aid it in judging what its scientific effort should be, the EU set up an advisory body, the European Science and Technology Assembly (ESTA). Although ESTA was appointed by the Commission it enjoyed considerable independence; however, it has recently been disbanded. There is yet another advisory body in the air, proposed by the French Minister of Science, Professor Claude Allègre; while discussions about it are still proceeding it is hard

to see what advantage it would have over ESTA which apparently was not an effective body as seen by the Commission.

Perhaps what is needed is a body that represents European Scientists rather than a body appointed by a funding body. A body that has genuine independence. This could readily be created within the context of the Academia Europaea, although whether its advice would be listened to is quite another question. Bureaucracies with money to spend like the European Commission are not the best of listeners to advice. We should recall that national research councils operate on the principle that they have an allocation of funds and that the independent scientists on their councils make the main decisions as to what the funds should be applied to. Mostly this is to projects originating with scientists, a bottom up approach. It seems unlikely that its constitution would allow the EU to behave in such a delegated fashion. An editorial in *Nature* (15 October 1998) came to the conclusion that there is a pressing need for a body of this sort that needs to have funds at its disposal actually to support projects, it suggests that this might come from allocations made by the national research councils. This means them segregating part of their budget, a very difficult matter, but perhaps not impossible.

What is the view on how European science is doing? In 1997 ESTA and the EUROHORCS issued an evaluation of the 'Strengths and Weaknesses of European Science'. They pointed to an unevenness of the state of science across Europe; there were some areas of great strength and others where a considerably greater effort was needed. Despite these reservations expressed here, the conclusion is that European science is in a not unhealthy state and benefits both from its diversity and also from the availability of not ineffective means for its coordination.

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