Integration of European Life Sciences

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A European scientist often spends his entire scientific training period and subsequent career in a country similar in size to Rhode Island, a professional situation which to his colleagues in the United States would be unthinkable—if not forbidden. Attempts to increase the mobility of the European scientist have only been partially successful, and we may in the future need to establish a European "National Institutes of Health" modeled on that of the United States.

It is often said, at least in the banking offices of Europe, that when the United States sneezes, Europe gets a cold. In the case of science policy, Europe has not been so quick to follow the lead of the United States. In contrast to other nations, the United States has provided more resources for basic than for applied research, particularly in biology. The United States supports the life sciences three times more generously than do most countries in Europe. This has probably led to the prime position of the United States in both basic biology and its applied aspects, such as biotechnology.

A stable structure requires a minimum of three points of support. But this truism has not yet been generally accepted for European science strategy. Support for applied and industrial science is relatively abundant in Europe, but the third point, the resources for basic science, has not yet been properly considered by the European governments. The major expansion of funds for research and development in the last few years in Europe has been provided through the European Community (EC) and the so-called EUREKA programs. The EC, with its headquarters in Brussels and its parliament in Strasbourg, constitutes the European Common Market, with 12 member states. The EUREKA involves all Western European governments and supports precompetitive industrial research. However, both of these programs primarily fund earmarked projects in the applied and industrial sectors. Although many billions of dollars flow through these two routes for support of European research each year, the amount corresponds to only 4 percent of the combined budgets of all Western European nations for research and development.

Through the 1987 amendments to the Treaty of Rome, which established the European Common Market, the EC now governs all aspects of business and society. It has a research and technological development policy that has been given equal status with the policies for economy and social welfare. The major aims of the EC research policy are to develop cross-border cooperation between industry and science, to support basic science, and to integrate research and technology for a single internal market in Europe. Although basic research is often still considered to be a national obligation, extensive fellowship programs were introduced in 1986 by the EC to increase mobility and cooperation among European universities. More recently grants have been made available to fund research in areas such as AIDS, the human genome, and biotechnology. The EC projects have often more political flare than scientific interest and they have therefore not attracted attention from the very best scientists. On the other hand, the support for biologically relevant basic research amounts to only around $100 million each year out of the total $2 billion for research in the EC.

The European Molecular Biology Organization (EMBO) has administered a successful program for basic research in biology for the last 25 years. The EMBO program, which is devoted to courses and workshops as well as exchange fellowships, could form a basis for a more integrated biology program in Europe. Since 1978, EMBO's sister organization, the European Molecular Biology Laboratory (EMBL) has also made numerous scientific contributions and now fulfills an important catalytic role. Both programs have been instrumental in enhancing the scope and quality of the molecular biology laboratories in Europe and a considerable expansion of both is now being proposed to the Western European governments and Israel.

Among scientists in Europe there is an increasing interest in European collaboration and exchange of ideas, and there are numerous organizations that facilitate these goals. Among them are the European Science Foundation (ESF), an association of Western European research councils, and the Federation of European Biochemical Societies (FEBS), which includes the Eastern European countries. All of these organizations, whether consisting of scientists or governmental bodies, have however minimal funds.

Although the United States now holds the lead in molecular biology, Europe is in fact not far behind. Breakthroughs in technology occurred largely in the United States, and this, combined with adequate support and control of funds, gave the United States an advantage. The growing European awareness of the importance of collaboration across national borders may, however, soon change the balance. Notable contributions from Europe in recent years include the dissection of the cell lineage and the genome of the nematode *Caenorhabditis elegans* and studies on early steps in development both in the fruit fly *Drosophila* and the mouse. The interplay between intracellular vesicles in the exocytotic and endocytotic pathways and the detailed mechanisms of these events has a comparable scientific base in Europe and the United States. Molecular virology, which has been critical for understanding gene expression both in bacteria and mammalian cells, is also well represented on both continents. Although the cellular aspects of immunology had a strong base in Europe, the combination of classical immunology and gene technology led to an advantage for the United States, but plant molecular biology is well represented in Europe. European scientists also have a strong tradition in structural biology, mainly through the development of crystallography in the United Kingdom but also through the more recently introduced nuclear magnetic resonance technique. By a combination of efficient expression systems, site-directed mutagenesis, and powerful synchrotron facilities, structural and functional studies in biology may soon be inseparable, and Europe may then be in the forefront.

Against this background it is clear that Europe must make a major effort to combine and expand its resources for basic life sciences. Mobility and integration may be fostered by creating many more EMBLs that provide flexible, interdisciplinary, and multinational research centers. By introducing grants for transfer or repatriation of research groups to multinational collaboration sites, national borders may also be eliminated. All this requires, in addition, a major expansion of predoctoral and postdoctoral fellowships—ideally governed by the same principles as the EMBO program. As the last and perhaps most important step, it is essential that a European grant system based on scientific excellence be established, as exemplified by the National Institutes of Health in the United States.

The biosciences should not be allowed to become a field of competition between the politicians of different nations or continents. The Nobel Prizes cannot be regarded as gold medals from the Olympic games. We should instead work together to understand the secrets of biological systems and hope that by doing so we will help to improve the conditions for life on this planet. Competition between individual scientists or research groups is an asset in this process, irrespective of where they work. But first we must convince the European politicians that basic biology encompasses the very essence of life and so is worthy of study and support.

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