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Science in Europe

“Infinite riches in a little room” is a phrase of Christopher Marlowe’s that aptly describes the past history and present accomplishments of the region that was the cradle of professional science as we know it today. Individual scientists in mathematics, chemistry, and physics existed in the early history of India, China, and the Middle East, but the great names of modern science began to emerge in the 17th and 18th centuries in Europe. It is of interest to speculate on the particular combination of factors that led to this flowering. Europe in that era combined qualities of elitism and democracy, respect for authority and rebelliousness, philanthropy and industrial aggressiveness, on which science flourishes. Science requires elitism, an elitism of ability and dedication rather than entrenched privilege, and it establishes a measure of accomplishment that is not based on the assumption that all are equal. However, science will flourish only in a democratic environment in which unknown investigators in a veterinary college can challenge the leading chemists in the most illustrious institutions. Science is built on respect for previous scientists but is accelerated by rebellions that overthrow dogmas of the past. Scientists must be adventurers, but they are usually impecunious and need wealthy patrons, either private individuals or government treasuries.

The political ferments, nascent democracies, industrial revolution, and geographical explorations by Europeans in that period undoubtedly provided an encouraging atmosphere for scientists. Gradually the gifted amateur was replaced by the paid professional, and larger laboratories and organized structures emerged. Today, science in Europe is flourishing, even though impending changes in funding pose some serious problems.

This issue of *Science* selects a few individuals out of hundreds who might have been chosen to represent the colorful spectrum of developments radiating from Europe. Müller and Bednorz describe the new class of superconductors that has turned solid-state physics into a turbulent fluid of publication and excitement. Samuelsson and colleagues describe the expanding universe of arachidonic acid metabolites that have been shown to play a dramatic role in cellular responses associated with immunity and inflammation. Wiersma and Duppen demonstrate that picosecond spectroscopy is an advance of many orders of magnitude over Galileo’s use of his heartbeat for timing purposes. Schell moves plant genes ad libitum in another green revolution. Courtillot and Besse show that the earth’s mantle moves too, but at 5 centimeters per year and even hesitates occasionally for a few million years. Nasmyth and Shore use modern techniques to clarify the cell cycle of the most domesticated of our eukaryotes, yeast, and Levi-Montalcini describes the growth factor that shapes our brains even as we sleep.

Therborn describes the movement of labor and the treatment of immigrants, and the policies and funding of science in representative countries in Europe are compared to that of Japan and the United States by Lederman. The personal and political aspects of those policies, particularly their international relationships, are described by staff writers Dickson and Norman. These articles show that the diversity of cultures in Europe, which possibly was a major factor in the development of science in its early days, has posed problems for science as bigger projects and large-scale interactions are needed. The manner in which the pride of nations is handled, the individualism of scientists and limitations of budgets, may be important not only for science but for other types of international cooperation.

No series of books, nor even a particularly perceptive issue of *Science*, could possibly do justice to science in Europe. A sampling of its variety and productivity, its differing patterns of funding and support not only pays tribute to a glorious past but highlights the productive present. Those who think that science is merely technology turned on by money can learn from the example of Europe, where a combination of adventurous individuals and farsighted supporters led ultimately to worldwide scientific productivity. Europe had the combination of established tradition and anarchic individualism that is essential for a discipline that depends on its past but should not be controlled by it. The scientific system that grew out of the European experience has led to increases in the standard of living that are more widespread and permanent than any territorial discovery. The entire world, as well as present Europeans, has benefited from this great legacy.—DANIEL E. KOSHLAND, JR.