The Development of French Science

From Knowledge to Power. The Rise of the Science Empire in France, 1860–1939. HARRY W. PAUL. Cambridge University Press, New York, 1985. x, 415 pp. $49.50.

Science in the Provinces. Scientific Communities and Provincial Leadership in France, 1860–1930. MARY JO NYE. University of California Press, Berkeley, 1986. xii, 328 pp. + plates. $39.95.

"The history of modern science," Harry Paul observes, "makes it clear that knowledge can be achieved only through the medium of some type of power, by the close alliance of scientists with the state while forging or maintaining their own cognitive and disciplinary identities" (p. 3). Building on this thesis, Paul sets out to show in the first of the two books reviewed here that today's world of "big science" in France did not emerge de novo after World War II but had been prepared from the 1860s on by the remarkable growth of French science and its relationship to the state and industry.

In support of this thesis Paul ranges over a broad field of French scientific development. Beginning with the faculties of science, he notes that in 1860 these were little more than 15 somnolent teaching and examination institutes. During the early Third Republic, however, a half-hearted policy of decentralization, infusions of new state funds, and the ideal of research inspired by competition with the hated Germans raised the faculties of science to new levels of vigor and scientific importance. Regional, municipal, and industrial support enabled many provincial faculties to create institutes and programs for teaching and research in applied science. As the provincial faculties and the Sorbonne waxed in scientific importance, and as the Museum of Natural History, the Ecole Polytechnique, and the Collège de France underwent a comparative decline, the faculties of science assumed the leading research role by 1900.

Paul also examines relatively unexplored byways of French science, among them marine biology, agricultural research, public health testing of foodstuffs, and funding mechanisms for research. As well, his interests run to the ideological uses of science. He examines the alleged connection between positivism and French biology, the efforts of Catholic educational reformers to counteract perceived currents of anticlerical scientism, and the efforts of the Third Republic "to concoct an ideological marriage" between democratic republicanism and science. None of these efforts were successful, in Paul's view; positivists, Marxists, Catholics, and republicans alike all found it difficult "to squeeze much ideological sap out of science" (p. 6).

The scope and ambitions of Paul's book make for some problems in the narration. A torrent of information flows through its pages, sometimes obscuring the central themes. Paul intersperses the flow with witty asides and swift, mordant judgments, occasionally succumbing, however, to the temptation to submerge an issue in an epigram. The chief actor in Paul's work is Science: Science pursuing its sovereign course toward sophistication, specialization, and integration with industrial, military, and political power. This perspective lends a satirical, sometimes flippant, edge to Paul's handling of the human actors who tried to serve, exploit, or direct the growth of science; they emerge as figures in a Gallic comedy, pompously unaware of their epiphenomenal roles.

Mary Jo Nye adopts a very different narrative strategy in examining the provincial faculties of science between 1860 and 1930. She treats a limited number of faculties as case studies, presenting for each a general institutional survey coupled to an analysis of one central figure in the faculty. The approach is brilliantly successful, yielding a fine integration of scientific biography, institutional history, and internalist analysis. Her case studies include the faculty at Nancy, where faculty growth fed upon the bitter rivalry with Germany and where the physicist René Blondlot precipitated the tragic scandal over N-rays. At Grenoble, with its vigorous promotion of electrotechnology, Francois Raoult worked as the lonely pioneer of physical chemistry in France. The vigorous faculty at Toulouse boasted entrepreneur and chemist Paul Sabatier, a pious Catholic who fled the Parisian milieu of anticlericalism and materialistic positivism to find in the provinces the intellectual freedom and the material support necessary for this revolutionary work on organic catalysis. The dynamic science faculty at Lyon epitomized the fruitful union of academic, industrial, and municipal support for science. There worked chemist Victor Grignard, who shared the Nobel Prize with Paul Sabatier in 1912 and led the French research on gas warfare during World War I. A counterpoint to these tales of provincial success was the stagnant and ingrown faculty of science at Bordeaux, where a fruitful interaction of fundamental and applied science never developed, in part owing to the personality and intellectual presence of Pierre Duhem.

On the persistent, larger questions of French science and its history, Paul and Nye differ only in emphasis. More decisively than Paul, Nye finds French science before World War II guilty of the old charge of overcentralization. The Parisian government distrusted the provincial faculties as hotbeds of Catholicism, monarchism, and rightist politics; it radically decreased its funding to provincial faculties in the 1890s; and it engineered measures after 1903 that effectively channeled research students into Paris and left the provinces a clientele of secondary teachers, medical students, and engineers. Nye, however, strongly rejects the "centralization thesis" if it implies that impetus for change originated exclusively in the center; on the contrary, the provinces as much as or more than Paris were the centers of institutional and disciplinary innovation. They offered opportunities to mavericks and outsiders that were absent in Paris, as well as a favorable milieu for the creation of vigorous research schools.

Paul and Nye agree that the close integration of fundamental science with applied science that developed in the provincial faculties (not in Paris) benefited scientific research in both areas in the decades before World War I. They reject the charge that the industrial orientation worked to the detriment of pure scientific research, although they acknowledge that pure scientific work was declining in the provincial faculties by 1925. Both are highly skeptical that German science was qualitatively superior to French achievements; any French deficiency had mostly been made up by the end of the 19th century. For all these positions Nye and Paul are able to mobilize a persuasive mass of evidence. Their fine books provide further correction of the stereotypical image of French scientific institutions that has been long in vogue.

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Tales of Paleontology

Kadimakara. Extinct Vertebrates of Australia. P. V. RICH and G. F. VAN TETS, Eds. Frank Knight, illustrator. Pioneer Design Studio, Victoria, Australia, 1985 (U.S. distributor, Australian Book Source, Davis, CA). 284 pp., illus. $45.

"Kadimakara," the rich bestiary of Australian Aboriginals, is borrowed for this book's