

## Sold on application in France

Robert Fox

**From Knowledge to Power: The Rise of the Science Empire in France 1860–1939.** By Harry W. Paul. Cambridge University Press: 1986. Pp. 415. £32.50, \$49.50.

THE most casual visitor to France cannot fail to observe the signs of modernity that spring from a confidence in science and technology. A decisive national policy for science, implemented since the Second World War through a series of five-year plans, has borne fruit ranging from the spectacular new Cité des Sciences et de l'Industrie at the Parc de la Villette to such conveniences of everyday life as an incomparably efficient telecommunications system and a high-speed train that covers the 300 miles between Paris and Lyons in two hours. Clearly, in today's France science is at the centre of public and private life, and there is every sign (not least in the overwhelming popularity of the scientific options in the *baccalauréat*) that what has happened is irreversible.

For well over a decade, Harry Paul has explored the early history of France's emergence as a pace-maker in European science and technology. His writing has always been richly documented and witty, and this book is no exception. It elucidates in unprecedented detail the process by which, between the 1860s and the beginning of the Second World War, the French scientific community grew not only in size but also in the funds it consumed and in the attention it commanded in the fashioning of governmental and industrial policy. There were, of course, other economically advanced countries where comparable growth occurred. But what happened in France is made especially remarkable by the circumstances; the period treated by Paul was punctuated by financial crises, crippling bouts of political conflict and wars, in 1870 and 1914–1918, which in different though equally terrible ways sapped national morale.

Paul recognizes, at least by implication, the complexity of the historical problems that lie in this paradox. For him, the heart of the matter lies in a fundamental transformation in the role of the *savant*. From being pre-eminently men of knowledge, French scientists became men of power. Marcellin Berthelot, Paul Bert and Adolphe Wurtz were among those who secured power by political means, serving either as ministers or as prominent members of the Senate or the Chamber of Deputies. But even greater power was achieved through the repeated and eventually successful peddling of the notion that science was, above all, useful.

The main articulators and beneficiaries of this approach were the professors in the faculties of science, who from the later nineteenth century began to develop a degree of involvement in applied studies that would have been unthinkable in the original conception of the Napoleonic University. Between 1890 and 1914, more than 20 institutes of applied science were created either within or as annexes to the science faculties. Most of the new foundations were successful, whether we judge them by the numbers of students who enrolled or by the financial support they elicited from industrial and agricultural interests and from councils intent on promoting the local economy and civic pride. At Nancy, for example, more than three-quarters of the students in the faculty of science on the eve of the First World War were working in one or other of the specialized institutes (for chemistry, electrical technology, aeronautics and brewing), and a high proportion of the faculty's income came in the form of grants from the departments of the region and from industrial benefactors, among them Ernest Solvay.

Generally, Paul takes a benign view of this shift in the balance between the pure and the applied, and there are important respects in which he is plainly correct. How else could the faculties have justified the new buildings and new posts that were provided in such abundance about the turn of the century? And how else could they have suddenly begun to attract students after decades in which they had done little more than mount polite lectures for a bourgeois public? Yet the losses and the failures deserve attention (notably in Britain, where the universities are being asked to strike out on a road not unlike the one that the French faculties took a century ago). There is some evidence, for example, that the emphasis on utility in higher education weakened France's position in fundamental research and may not even have satisfied the expectations of industrialists and agriculturalists. On the latter point, Paul's discussion of the employers' lack of enthusiasm for the men and ideas emerging from the academic system between 1919 and 1939 is tantalizingly brief though it is no less arresting as a cautionary tale. The lesson, it seems, is that educational reform is an eternally alluring panacea but that, in itself, it can do little (except perhaps in the very short term) to solve the problems of a flagging economy.

By the 1930s, therefore, French academic science bore the scars of at least partial failure. But, by then, the growth of the scientific community, combined with the public acclaim of such great figures as Marie Curie and Frédéric Joliot and the spectre of economic depression and war, had created a receptive ear in ministerial circles. The scientific lobby duly trium-

phed, first in the enhanced funding for research that came with the Popular Front and then, in 1939, in the creation of the Centre National de la Recherche Scientifique.

Throughout the book, Paul balances his dominant expansionist theme with reminders that the rise of what he calls the science empire was neither natural nor inevitable. His discussion of the reactions, within and outside the scientific community, to the potentially disquieting bond between science and positivism reminds us, for example, that it was as important in the nineteenth century as it is now for *savants* to maintain a wholesome public face. In all but the most conservative religious circles, it seems, the ideological neutrality of science came to be accepted, despite the potent mix of Darwinism and materialism that was purveyed in much biological writing in the later nineteenth century. Once doctrinal fears were allayed, the Catholic universities did not hesitate to embrace science; indeed, they turned to the task of training men for the modern industrial world quite as enthusiastically as any of the aggressively secular faculties of the state.

Paul also underlines the importance of war and other misfortunes in providing new opportunities for scientists to convince the public and governments of the capacity of science to serve the national interest. The First World War, in particular, seems to have been the occasion for the deployment of every conceivable rhetorical device in support of science. For the scientific community, the rewards were to be seen in the favourable attention of ministers, sponsored research and an opportunity of appearing before the public in an exhilaratingly heroic guise. (The question whether the mobilization of *savants* really did help the war effort is, of course, a quite separate one, and it is largely ignored in this book.)

With the publication of *From Knowledge to Power*, the study of French science in a period which until recently was neglected in favour of the more glamorous episodes of the seventeenth century and the Revolution and First Empire has been notably advanced. Harry Paul has always been regarded as an adventurous historian, and now, once again, he has worked barely tilled soil to produce a book of characteristically absorbing interest. □

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● Shortly to be published by University of California Press is *Science in the Provinces*, by Mary Jo Nye. The book concentrates on university science in France during the period 1860–1930, the author arguing that “provincial scientists and administrators often took the lead in developing research and organizational initiatives”. Price will be \$39.95, £33.95.