Book Reviews

Physics in France

Physique et Physiciens en France, 1918–1940. DOMINIQUE PESTRE. Editions des Archives Contemporaines, Paris, 1984. xvi, 356 pp. Paper, 295F. Histoire des Sciences et des Techniques.

In this book Dominique Pestre has made a major contribution to the history of French science and 20th-century physics. He provides a thorough survey of the physics community in France between the two world wars, a description amply documented with graphs, tables, notes, and index (the last a rarity in French books). Pestre identifies major groups of physics teachers and researchers, both in Parisian institutions and in provincial universities. He describes textbooks and methods of instruction, laboratories and research, drawing comparisons with what was taught and published by physicists elsewhere in Europe and in America.

Beyond this, Pestre offers analytic interpretations that give the book special strength and originality. It often has been claimed that French physicists were less innovative in the 1920's and 1930's than their German, English, and American colleagues. It has been observed that French physicists, with some notable exceptions, neither developed nor favored the new relativity and quantum theories. It also has been said that French scientists characteristically have combined a phenomenalist or empirical approach with "Cartesian" rigor in a distinctive national scientific style. Pestre brings concrete evidence to bear on these generalizations for the period 1918–1940.

Pestre divides physicists of the interwar period by generations and by influence, identifying small "central groups" for the periods 1920–1940 and 1945–1960 (among them: Louis and Maurice de Broglie, Aimé Cotton, Marie Curie, Charles Fabry, Paul Langevin, Jean Perrin; and Pierre Auger, Frédéric Joliot, Irène Curie Joliot, André Kastler, Louis Néel, Francis Perrin). Analyzing general physics textbooks written by University of Paris professors Charles Fabry and Georges Bruhat, Pestre demonstrates that a privileged place was given in university physics courses to classical theories of electricity and optics. Typically, the plan of exposition was historical and inductive, reproducing the order of discoveries and employing empirical inference to simple laws. Comparing Fabry's presentation of Ohm's law to Max Planck's, for example, Pestre notes that Ohm's law is a simple, experimental law for Fabry, whereas for Planck it is a particular form of a more general law. French pedagogy characteristically has represented science as a finished and complete pyramid of knowledge, rather than an evolving set of theories still under construction. Pestre argues that the French approach not only oriented students toward establishing phenomenological laws (rather than delving into the nature of things) but also made the newest developments in physics marginal to students' interests. Thus, Fabry's presentation of Ohm's law ignores the kinds of problems that led Planck to quantum theory or Einstein to the special theory of relativity.

Associated with this orientation in general physics is what Pestre deems the *marginalisation* of theoretical physics in France. Typically, the aim of mathematical physicists in France was the mathematical systematization of empirical laws, rather than the construction of theories employing physical hypotheses. Thus, when theoretical physics was first institutionalized in France, its practitioners were identified more specifically with mathematics than with physics. Notable exceptions in the 1920's and 1930's were Louis de Broglie and Léon Brillouin. Pestre further argues the marginality of other new subdisciplines within French physics, noting how few students followed courses oriented toward electron theory and radioactivity. In Paris only 3 to 5 percent of physics students followed these kinds of courses in the 1920's and only 8 percent in the 1930's. Often one could find more innovative courses in provincial universities than in Paris—for example, courses given by André Kastler at Bordeaux, Jean Cabannes at Montpellier, and Pierre Weiss at Strasbourg. Nor did French students follow these new research fields abroad. Only five physicists among 53 whom Pestre locates at the core of French science during the period 1920–1955 spent any time in laboratories abroad.

Analyzing publications in the *Journal de physique*, Pestre finds a persistent interest among French experimental physicists in optics and spectroscopy. He highlights, as one expects, the importance of the Curie-Joliot group, which published 11 percent of articles in the *Journal de physique* during 1920–1940. Pestre notes, too, the innovative work carried out at the laboratories of Maurice de Broglie and of Jean Perrin and Pierre Auger, who were especially *au courant* of trends and fluctuations outside France.

A striking characteristic of many French laboratories in this period is the astonishing variety of subjects under research in a single laboratory, both by the same individual (Paul Langevin, for example) and by different individuals. Pestre suggests that the Curie laboratory researchers were unusual in the interwar period in focusing as a team on closely related topics. In contrast, most laboratories operated as groups of independent individuals working autonomously on their own subjects of interest. These observations lead Pestre to the general conclusion that scientists continued to demonstrate the ongoing French cultural values of individualism and universalism. The ideal scientist was the *savant polyvalent* rather than the specialist. Thus pure science, rather than applied science, and mathematics, rather than theoretical physics, enjoyed privileged places in the hierarchy of cultural values.

In examining the images and aims of French physics in its cultural context, Pestre even tackles the problem of distinguishing and delineating the traditions of "reason" in France, one rooted in Descartes and another in Comte. He offers a perceptive analysis of oft-quoted texts by Pierre Duhem and Emile Picard comparing the French, English, and German scientific minds.

Though the use of a variety of historical tools results in some choppiness and repetitiveness in the book, the result is nonetheless an admirable account of the nature and structure of modern French physics. No one has so well linked the characteristics of modern French physics to the aims and texts of French scientific education and cultural values. This is a book that merits careful reading.

MARY JO NYE
Department of History of Science, University of Oklahoma, Norman 73019