The Establishment of Science in France

Science and Polity in France at the End of the Old Regime. CHARLES COULSTON GILLISPIE. Princeton University Press, Princeton, N.J., 1981. xii, 602 pp., illus. $40.

This is an authoritative book by one of our leading historians of science, the expression of many years' research spent in the company of the scientists and statesmen of the Old Regime. It will naturally command the attention of anyone interested in the way the history of science is now being practiced, in the development and achievements of French science during its most brilliantly productive period, and in the nature of the relationship between science and government in modern society.

As Gillispie explains in his preface, he offers a "civil history of work-a-day French science late in the Enlightenment and it is meant to be complete. If I have omitted important instances pertaining to the theme, the reason is inadvertence rather than selection" (p. ix). This is a bold claim, which will doubtless advance further work in this field by stimulating the competitiveness of future researchers (competitiveness, or *émulation*, was an essential ingredient of the scientific ethos that Gillispie is here describing). It is a misleading claim in at least one respect, since Gillispie limits himself largely to science and scientific institutions as they appear in or from the capital. There is relatively little in this book about the scientific activities and aspirations of the provincial academies that were an important feature in French intellectual life during this period, or about their relationship to the central scientific and political institutions of the Old Regime. Gillispie justifies this emphasis, in effect, by pointing out that it was only in Paris that science was clearly institutionalized apart from other branches of culture. And he would probably be willing to insist that relatively little of enduring scientific merit was accomplished in the provincial academies—in part, because the pull from the periphery to the center was so strong. Fortunately, the civil dimensions of the academic movement in the provinces have been treated at length by Daniel Roche in a recent work, *Le siècle des lumières en province: Académies et académiciens provinciaux (1680–1789)*, which offers a fascinating counterpoint to Gillispie's present study.

Science and Polity is loosely organized into three broad sections. The first begins in 1774 with the ministry of Turgot, the reforming Controller General for whom French social and economic problems were to be solved, and monarchical power redeemed, by the mobilization of science and scientists in the service of the state. Turgot has often been written off as a doctrinaire theorist whose abstract reforming ideas foundered on political realities within two brief years. Gillispie quite properly emphasizes his administrative background and connections, his commitment to scientific expertise in matters of government, and his influence over a generation of French scientists and statesmen who transformed the bureaucratic traditions of the absolute monarchy into a technocratic ideology of public service that still has deep roots in France. In developing this ideology, Turgot and the generation of scientists associated with him—the generation of Laplace, Lavoisier, and Condorcet—were heirs to a century in which French science had been organized in the service of the state in a manner that made its institutional practices and assumptions quite different from those obtaining across the Channel. Gillispie therefore proceeds to a survey of the classic institutions of French science inherited from the age of Louis XIV—the Académie des Sciences (a surprisingly brief discussion given the importance of the institution, but one that can be readily complemented by turning to Roger Hahn's *Anatomy of a Scientific Institution: The Paris Academy of Sciences, 1666–1803*), the Paris Observatory, the Collège de France, and the Jardin des Plantes. The discussion of these latter institutions is of considerable interest, drawing together much scattered information regarding their structure and inhabitants to provide an excellent survey of the range of their activities and concerns.

In the context of these official institutions, and particularly in the Académie des Sciences, the professionalization of science had proceeded as far as the conditions of the Old Regime would allow. Among other things, scientific professionalization implies authority: the authority to define proper knowledge and legitimate practice in certain domains. In his second section, Gillispie considers efforts made to extend the domain of scientific expertise, and the academic model of scientific practice, to new areas of intellectual and social life. This leads to an informative discussion of the efforts of the anatomist Vicq d'Azyr to transform a committee on epizootic diseases into a powerful new academy, the Société Royale de Médecine, dedicated to reforming medical practice and extending the study and organization of public health. But authority for some implies exclusion for others. Gillispie therefore turns his attention to the "charlatans" who found themselves excluded by the academic scientists, most notably Mesmer and Marat (to whom he devotes a sympathetic chapter explaining Marat's early scientific writings with admirable impartiality, but stopping short of any sustained discussion of the political implications of his repudiation by the Académie des Sciences).

The third and longest section of the book deals with applications of science to agriculture and industry (ceramics, textiles, mining, paper), with government efforts to stimulate technological innovation, and with the development of civil and military engineering. Gillispie tentatively distinguishes two phases in these efforts to apply science to agriculture and the mechanical arts: an earlier descriptive or encyclopedic phase (best represented by Duhamel's immense *Description des arts et métiers*, to which Gillispie devotes some most informative pages); and a bureaucratic phase, in which efforts at technological modernization were stimulated by direct government action. But in this section of the work, as in the earlier ones, the substantial interest lies as much in the individual cases as it does in the broad generalizations. For it is one of the striking characteristics of Gillispie's approach to his subject that he deals less with institutions in the abstract than with the men who shaped their individual lives within these institutions, or shaped the institutions to fulfill their own individual purposes. It is perhaps appropriate that the richest part of this work by the editor of the *Dictionary of Scientific Biography* should be found in the biographical sketches of the men famous and obscure, scientists and artisans, bureaucrats and entrepreneurs, whose activities are here brought to light with such vivid attention to detail and situation, ambition and achievement.

Thus *Science and Polity* offers by far

the most comprehensive account yet available of the conditions and practice of French science on the eve of the Revolution. Written in stately style and rich in archival and documentary evidence, it will be a source of pleasure and profit to students of French science for many years to come. For all its authority, it nevertheless remains a very personal book. It is not inappropriate, then, to ask why Gillispie wrote it. He offers several answers to such a question. The first is that "I have thought to explain the vitality of all French science at the end of the Old Regime through exhibiting the extent of its involvement in affairs" (p. ix). There can be little doubt that Gillispie demonstrates both the vitality of French science and the extent of its involvement in affairs at the end of the Old Regime, but it is not clear that this in itself constitutes an explanation of the former in terms of the latter. Gillispie himself seems to suggest that it was not the extent but the nature of this involvement in affairs—the nature of the links between science and the state—that was most crucial in this respect. In the course of the 18th century, the scientific initiative shifted from the Royal Society in London to the Académie des Sciences in Paris, from a liberal society of amateurs to a government-supported central academy of specialized scientists, a model imitated by absolutist regimes elsewhere in Europe.

> It is a liberal's vanity to imagine that freedom, for him the better cause, has been an historical concomitant of science, either as its condition or consequence. Neither a Bacon nor a Descartes ever prophesied that it would be, and the technical accomplishments of the Soviet Union are immense evidence that it need not be. Scientists, like most men, may enjoy freedom but seldom require it in the way that writers do. Instead they need standards. . . . They need support. . . . They need motivation. . . . All this was afforded by the prospect for election to the Academy in Paris [pp. 80–81].

This conclusion brings us to Gillispie's second aim in writing this book, namely to show that it was during this period in France that the relationship between science and government "began to assume a form characteristic of the modern state and of modern science" (p. ix). The form of that relationship, Gillispie concludes, was (and is) one of "partnership" rather than "partisanship." From science, governments have wanted expertise and instrumentalities, "powers but not power"; from governments, scientists have wanted "support, in the obvious form of funds, but also in the shape of institutionalization and in the provision of authority for the legitimation of their community in its existence and in its activities" (p. 549). Accordingly in 18th-century France "science was not the source of a reform movement or liberalism. Its role was to provide the monarchy with the services and knowledge of experts and in return to draw advantages from the state for the furthering of science" (p. 550). For students of 18th-century France, this will be one of the more controversial claims of Gillispie's book since it suggests a radical distinction between the norms and practice of science itself and the reforming spirit of an Enlightenment that looked to science for its model of rational knowledge and public action. Is this distinction justified? It seems to be problematic in the persons of *philosophes* such as d'Alembert and Condorcet, who were both practicing scientists and proponents of political and social reform (this may be one reason why Gillispie finds Condorcet so troublesome a figure); and it neglects the fact that in 18th-century France (as perhaps in all societies) the line of demarcation between means and policies was by no means clear. Lavoisier discovered as much when his scientific consideration of agricultural productivity brought him to the conclusion that the entire tax structure of the Old Regime needed reformation. It would be interesting in this respect to look more systematically at the lines of tension between science and government in 18th-century France, to identify those areas in which "polity" gave way to "politics."

Gillispie's final purpose in presenting this book—less an initial aim of the project than a reflection on its implications—concerns the most appropriate way of integrating science into history, which "is to be attempted with better prospects through the medium of events and institutions than through configurations of ideas or culture" (p. 549). As the author of *The Edge of Objectivity*, Gillispie can reasonably claim to have contributed to the practice of both intellectual and (now) institutional approaches to the history of science. But the dichotomy between "events and institutions" and "ideas or culture" seems to me to be an altogether artificial one which Gillispie's own practice clearly transcends. I would prefer to conclude that *Science and Polity* encourages us to move beyond the distinction between an external and internal history of science to an integral understanding of that activity in all its dimensions.

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Influences on Galileo

Prelude to Galileo. Essays on Medieval and Sixteenth-Century Sources of Galileo's Thought. WILLIAM A. WALLACE. Reidel, Boston, 1981 (distributor, Kluwer Boston, Hingham, Mass.). xvi, 372 pp. Cloth, $49.95; paper, $23.50.

More than anyone else, William A. Wallace has illuminated our understanding of 16th-century scholastic natural philosophy for its own sake and as it may have influenced the thought of Galileo, who, sometime around 1590, wrote three notebooks in Latin in the form of scholastic questions. In *Prelude to Galileo*, 16 of Wallace's articles ranging from the Middle Ages to Galileo have been reprinted. They are grouped under four subdivisions: Medieval Prologue (two articles), The Sixteenth-Century Achievement (five articles), Galileo in the Sixteenth-Century Context (six articles), and From Medieval to Early Modern Science (three articles), which describes and evaluates the different interpretations of the relationship between medieval and early modern science espoused by three great historians of medieval science, Pierre Duhem, Anneliese Maier, and Ernest Moody. Although there is some repetition among the articles because the same theme is considered from different standpoints, significant changes have been made, including the addition of numerous introductions, two appendixes, and useful cross-references.

There is an abundance of intellectual riches in this volume. Well-conceived interpretations and insights are intermingled with a mass of carefully organized detail. Although by the author's own admission the section on Galileo is the core of the volume, the articles in it are placed in a context that deepens our understanding of his relationship to his medieval and early modern scholastic predecessors. But Wallace's major contribution in these articles is undoubtedly his new interpretation of Galileo's handwritten early scholastic notebooks that were previously thought to have been "trite scholastic exercises, copied from another source, probably a professor's notes transcribed by Galileo in 1584 while still a student at the University of Pisa," and thus to be "his 'youthful writings,' or *Juvenilia*, not his own work, material for which he had no real interest and indeed failed to comprehend, and so could have exerted no influence on his subsequent writings" (p. 137). It is this long-standing interpretation that is challenged by Wallace, who