Scientists in Politics

The convergence of "politics" and "science" has become one of the salient public issues of our times, made so not only by the force and drama of scientific and technological events of several decades but also by the mounting attention given to the matter by natural and life scientists, by politicians and publicists, and by social scientists—especially, among the latter, by the political scientists who are by occupation the professional "watchers" of all the others. The commentary on politics-and-science is now quite striking in both range and quality, and the flood shows no sign of abating. In varying proportions the observers engage in description or analysis of the phenomenon, or indulge in prescriptions for improved relations, but almost all impart an air of surprise, fresh discovery, alarm, or hope. The cumulative effect of this outpouring on the attentive reader is the steady growth of a conviction that, while the convergence of politics and science has reality, it is exaggerated and that its recency, novelty, and cruciality are especially overstated. C. P. Snow's *Science and Government* illustrates this characteristic most sharply, as did also his earlier *Two Cultures*.

The largely unarticulated striving of many of the commentators is seemingly toward what might be called a "social science of science." This not very felicitous phrase suggests the aspiration for a more systematic, detached conception and examination of the relevant data than is now provided in most instances, and greater restraint on the temptation to prescribe large remedies for imagined impending disasters. If that is in fact the desired and desirable objective, it will not be achieved quickly or easily. One dilemma may be taken as an example of several initial and continuing difficulties to be encountered. That dilemma is whether to focus first attention on science-and-politics, or on scientists-and-politicians. The strong tendency of most commentary on the issue of government and science has been to choose the first approach, although the development of modern social science suggests that it is the actual behavior of scientists and politicians that is the more relevant, indeed the necessary, object of attention. It would appear from the recent literature on the issue that natural and life scientists prefer to write about science, a preference to which other commentators have generally deferred in their own approach. The consequence is not only a continuing ambiguity about what is being discussed but also a persistent confusion of what-is-hoped-for with what-is.

The problem is not a new one for social scientists. They have long known that rulers, clergy, lawyers, and physicians do not relish being themselves regarded as data but prefer instead to have discussion centered on the state, religion, law, or medicine. It is perhaps a tribute to the special contemporary status of the natural scientists that the social scientists, particularly the political scientists who might be expected to be especially aware of the tendency, have been so slow or reluctant to recognize the analogy. This is not to say that science as such is irrelevant to the inquiring social scientist; it is rather to suggest that what scientists do is as relevant as what they profess to be or profess to be doing. And it is also to ask that social scientists perceive that whatever else it may be, science is also a strategic doctrinal resource for the scientist, just as the law is for the lawyer or the state is for the ruler. Particularly for political scientists interested in the supposed new confrontation of government and science, it would seem that their professional curiosities most effectively begin, though they need not end, with the varied roles of scientists in the political system—the scientist as activist and influential in the political process, as leader of scientist interest groups, as governmental official or bureaucrat, as consultant or adviser to governments—rather than with an elusive abstraction labeled science.

The Scientific Estate (Harvard University Press, Cambridge, Mass., 1965. 335 pp., $5.95), by Don K. Price, is a provocative and insightful study that does not wholly escape the dilemmas described above. It is intended, as the author puts it, "to tackle the problem of the relation of science and scientists to the political ideas and the constitutional system of the United States." More a series of connected essays than a tightly knit study with a sustained thrust, the range of Price's interest is broad and philosophical, concerned mainly with the confrontation of ideas and doctrines, but often interspersed with sophisticated exposition and appraisal of concrete situations. In both moods, the argument is presented with verve and elegance.

The stage is set by three general assertions: (i) "the scientific revolution is moving the private and public sectors closer together"; (ii) "the scientific revolution is bringing a new order of complexity into the administration of public affairs"; (iii) "the scientific revolution is upsetting our system of checks and balances." Although these generalizations are clearly not meant to be precise statements, but rather to dramatize a theme, they nevertheless illustrate the risks of overstatement. Only by stretching the meaning of the phrase "the scientific revolution" much beyond all its ordinary connotations can such large claims for its causal effects be supported. The difficulty inherent in such sweeping assertions may be illustrated by asking whether the statements are made any less plausible by substituting for the role of science other such mid-century forces as, for example, urbanization or bipolarization. A great deal of our political and governmental history has to be oversimplified, and much of our contemporary condition overstated, to sustain the assertions unless they are significantly qualified. The price of emphasis is usually exaggeration. And diagnosis based on exaggerated premises often leads to exaggerated therapy, with unanticipated, even undesired, consequences.

As suggested by its title, a major thesis of *The Scientific Estate* argues that there are today in the United States four distinctive "estates" performing separate broad functions in government and public affairs. The estates are (i) the scientific, (ii) the professional, (iii) the administrative, and (iv) the political. These estates

and their corresponding functions are, the author explains, "by no means sharply distinguished from one another even in theory, but fall along a gradation or spectrum within our political system. At one end of the spectrum, pure science is concerned with knowledge and truth; at the other end, pure politics is concerned with power and action. But neither ever exists in its pure form." These broad and inexact categories provide the author with an expository scheme for an enlightening exploration of a new "constitutional relativity" in which he foresees the emergence of an important principle: the closer the estate is to the end of the spectrum that is concerned solely with truth, the more it is entitled to freedom and self-government; the closer the estate gets to the exercise of power, the less it is entitled to autonomy. That is to say, the scientific estate has a valid claim to govern itself, but the political estate must be subordinate to the ultimate decision of the electorate, while the professional and the administrative estates presumably enjoy intermediate claims to autonomy.

These categories of estates have their evident uses to the author's exposition of broad contemporary aspects of the relations of government and science. That they have their costs is also evident. One consequence is that the discussion is persistently lured into treating the subject in terms of what-ought-to-be, while often appearing to be describing what-is. This tendency is most clearly demonstrated by the contrasts that emerge when the author turns to the description of actual events—for example, his engaging and insightful case study of recent attempts to establish a national program of oceanographic research—events in which real-life scientists, professionals, administrators, and politicians behave with minimum regard to the respective roles expected from them by their supposed membership in separate estates. (Nor can it be prudently assumed that they will act very differently in subsequent comparable situations, even though all may in the meantime have thoughtfully read *The Scientific Estate*.) The oceanographic research example, so persuasively analyzed by the author, suggests that the expository device of four estates does not effectively explain the event in either its origins, progress, or culmination. Nor does the estate concept serve as a successful explanatory tool in any of the several other concrete situations examined in the volume. The utility of the concept appears thus to be limited to the exposition of the ways in which the members of the separate estates *should* behave; that is, the concept is hortatory, not heuristic.

The Scientific Estate is a highly valuable essay in political and constitutional theory. It is strikingly original in its sweep, imaginative in approach, and informed by a high intelligence. The argument which it presents is graceful and persuasive in style, and is supported by an intimate knowledge and sharp perception of the arena in which politics encounters the "new science" in the United States. Its excellence as a venture in theory stands as a strong invitation to an empirical testing of its wide-ranging conclusions.

WALLACE S. SAYRE
Department of Public Law and Government, Columbia University

Retinal Interaction Processes

Mach Bands: Quantitative Studies on Neural Networks in the Retina. Floyd Ratliff. Holden-Day, San Francisco, 1965. xiv + 365 pp. Illus. $13.95.

One hundred years ago, Ernst Mach described a visual effect that now bears his name. The phenomenon, a Mach band, occurs when a spatial distribution of luminance shows, at some point, a sharp change in gradient. When the change is negative, a band, brighter than its surroundings, appears in the region of the sharp change. When the change is positive, a dark band appears. The phenomenon was investigated in great detail by Mach in five papers between 1865 and 1868. A sixth appeared in 1906. The papers are fully translated in part 2 of Ratliff's book.

Of course no physical basis exists for Mach bands; they have a physiological basis. Mach's experiments provided the beginnings of a theoretical understanding of retinal interaction processes, in particular, of inhibitory effects. Mach saw clearly the implications of his experiments for this type of process which today plays an accentuated role in neurophysiology and psychophysiology.

Mach's experiments were done during the years when the great figures in the study of vision—Helmholtz, Hering, Maxwell, and others—were providing a great surge of research and theory, unmatched certainly until the present time, and possibly not even now. Unlike the work of the other great workers, Mach's theories and results received little attention; his findings were nearly forgotten until about 1950. It is true that the bands were "rediscovered" by other individuals a number of times in the interval, but little attention was paid to them.

After World War II, a number of developments caused new interest in Mach's work, and it became clear that Mach's statements on retinal inhibition merited consideration in line with newly developing concepts of neural networks to which Hartline and Ratliff's studies on *Limulus* have contributed a great deal.

Ratliff considers six models of neural networks including Mach's, the oldest. Among the others, the next oldest was described in 1948. Of the theoretical and experimental contributions made since 1948, those of Ratliff and Hartline are probably the most important.

Like Helmholtz, Mach was interested in several areas, specifically, physics, physiology, psychology, and philosophy. Both men were probably more attuned to the spirit of Hume than they were to the then prevailing types of German philosophy.

Ratliff characterizes an important motivational aspect of Mach's personality in the statement, "He sought only to adopt a view of science that he would not have to abandon each time he moved from one special area of his diverse interests to another." The author considers in the fifth chapter of the book some implications of Mach's philosophical position, including his well-known attitude toward atomic theory. In a later chapter Ratliff takes up, under the title "Appearance and reality," some issues involved in the concepts of (i) reality as appearance and (ii) reality as transcending appearance. He considers how problems centering on these issues have been resolved in actual scientific practice. An interesting section deals with the meaning of objectivity.