Book Reviews

Scientists and Politicians

Science at the White House. A Political Liability. EDWARD J. BURGER, JR. Johns Hopkins University Press, Baltimore, 1980. xxii, 180 pp., illus. $14.95.

The White House Office of Science and Technology had an 11-year life prior to its abolition by President Nixon's Executive Order No. 1 in 1973 and the transfer of many of its functions to the National Science Foundation. Upon its establishment in 1962 the OST was charged with assisting the president in "the proper coordination of Federal science and technology functions." There were also hints of a broader analytical role: the "assessment of selected scientific and technical developments and programs in relation to their impact on national policies." Edward Burger's book, based on several years of service with the agency during the Nixon Administration, seeks "to compare the nominal charter for the President's science adviser and his staff with the realities of that office."

The "realities," Burger concludes, show these advisers to have been quite limited in their ability to influence federal research priorities or to bring scientific resources to bear on a broader range of policy problems. This experience, he feels, points to a problem that transcends any particular administration: a gap in goals and perspectives between scientists and politicians that generally dooms "explicit analysis and planning for domestic issues" to irrelevance. Thus, Burger argues, if such long-range analysis is to be done it "may well have to be performed not within but outside the structures of government" (p. 123).

Burger's central chapters outline the involvements of OST and other science advisers in major policy areas—national health policy, health research, environmental protection, and population and family planning. The impact of the science advisers ranged from negligible, for example in attempting to interject cost-benefit criteria into the development of a National Health Strategy, to substantial, for example in making chemical substances a focal point for environmental regulation. The case histories display a greater range of impacts than Burger's generally pessimistic conclusions would lead one to expect. In a number of instances, moreover, the fit between scientific advice and the president's political needs was a close one, providing him with a rationale for delaying or altering what Burger regards as dubious regulatory decisions.

These stories are quite crisply told, albeit at the expense of some narrative detail that might have proved illuminating. Burger sometimes displays an acute sense of the conditions of political influence, as when he describes the results of the President's Science Advisory Committee's offering a report without having identified a "patron within the political machinery" to whom the information might have been made useful and without having framed the advice to fit the concerns being voiced in public discussion (p. 66). Too often, however, he is content with explaining the failure of a given initiative in terms of a generalized tendency of policy-makers to defer to powerful interests, to blanch at the thought of national planning, to stay within the bounds of conventional wisdom. A more probing inquiry as to which actors or agencies adopted which posture toward a given initiative, why they did so and were or were not able to prevail, might have given a more differentiated picture of the incentives and perspectives of policy-makers than Burger has provided. Such discrimination might also have enabled Burger to offer more in the way of strategic suggestions, identifying leverage points at which scientific analysis and advocacy might be brought to bear on the policy process.

Referring to C. E. Lindblom as the best-known critic of synoptic aspirations in policy-making, Burger argues (p. 18) that the fragmented process of advocacy that Lindblom defends "would be measurably strengthened . . . by arming the various points of view with good analysis and good information" (a proposition with which, incidentally, it is hard to imagine Lindblom disagreeing). But neither his analyses of specific failures nor his prescriptions suggest that Burger has thought very extensively about how analytical instrumentalities might be adapted to a pluralistic political setting.

The book's main value, then, is not in its political analyses or as a source of strategems for influence, but in the case histories it presents. Burger seems strangely reluctant to analyze or evaluate Nixon's 1973 reorganization decision itself. But his policy-area discussions provide a candid and concrete account of the major involvements of the science advisory staff, and an account that would be very difficult to come by otherwise of the eventual fate of the ideas and critiques thus generated. These narratives can prompt useful critical reflection regardless of whether one shares the author's convictions as to the role scientific analysis can and should play in policy formation.

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Rotifers

Rotatoria. Proceedings of a symposium, Gent, Belgium, Sept. 1979. H. J. DUMONT and J. GREEN, Eds. Junk, The Hague, 1980 (U.S. distributor, Kluwer Boston, Hingham, Mass.). 264 pp., illus. $79. Developments in Hydrobiology 1. Reprinted from *Hydrobiologia*, vol. 33, Nos. 1-3.

The Rotatoria (rotifers) are small aquatic animals, almost entirely restricted to fresh-water habitats and found most abundantly in highly productive or soft-water lakes and ponds. They reproduce by parthenogenesis, but most groups (except the bdelloids) can produce resting eggs sexually from males and mictic females. Rotifers have spiral cleavage and adults have a fixed number of cells (eutely). They are easily cultured in the laboratory; early ideas on aging, the "Lansing effect," resulted from rotifer studies, and rotifer species are the only metazoa to have been continuously cultured in diaxenic chemostats of algae and a herbivore.

This symposium volume is a collection of over 40 papers by some well-known scientists (including J. Gilbert, C. King, J. Green, H. Dumont, A. Ruttner-Kolisko, R. Pourriot, and B. Pejler) and some bright young scientists (including P. Clément, P. Starkweather, R. Wallace, C. Ricci, T. Snell, and K. Bogdan). There are two excellent series of papers. One by Clément and his colleagues describes electron microscopy studies of the digestive system of rotifers and reports on the structure of photosensitive organs and their significance with respect to the phylogenetic relatedness of rotifers to other lower metazoa. An additional paper by Wurdak and Gilbert describes the glycogen energy reserves of the reduced intestine in nonfeeding males. The second series of papers, on in situ feeding studies of rotifers (Bogdan, Gilbert, and Starkweather) using Haney's incubation chambers, emphasizes the high rates of feeding relative to other zooplankton and describes selective feeding, including an apparent preference for dead algae. Other papers describe culture techniques, aging studies, the stimulus for mictic egg production and hatching, cyclomorphic changes, selective predation, the ecology of the mobile larvae of sessile species, and biogeography.

This was a small symposium with 51 attendants. It must have been fun to be at the meetings; I found reading the resultant papers both enlightening and enjoyable.

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Pioneer Seismologist

John Milne. Father of Modern Seismology. L. K. HERBERT-GUSTAR and P. A. NOTT. Norbury, Tenterden, Kent, 1980. xvi, 200 pp., illus. + plates. £10.

In 1893, the first modern seismograph capable of detecting earthquakes in any part of the world was invented by John Milne in Japan. The debt of modern seismology to Milne is great, yet he has always been a personality in the shadows. It is thus fortunate that we now have this illuminating and well-written biography.

Milne was born in 1850 in Liverpool. Whether tramping through Ireland in his early youth (he existed by playing the piano at wayside inns) or later canoeing along the rivers and canals of southern England, he displayed a wandering spirit that was to dominate his life. His studies at King's College, London, were centered on mechanics and geology, and he immediately put his knowledge of these subjects to work during an expedition to Iceland. After this expedition he studied mining at London and did extensive fieldwork in western Europe. Milne's first job as a consultant at the age of 22 was to assess the mineral resources of Newfoundland, and during the course of this work he became interested in icebergs and the mechanical aspects of ice abrasion on rock. After a short while back in England, his restlessness was eased by an invitation to join, as a geologist, an expedition to the Middle East in search of Mount Sinai. This exploration promoted Milne's growing reputation as a competent geologist who, like many Victorians, was prepared to travel for the sake of science.

In 1874 came the offer that was to be crucial for seismology—an appointment as professor of geology and mining at the Imperial College of Engineering in Tokyo. When traveling to Japan, Milne typically elected to go overland through Russia and Siberia to Vladivostok, from where he could make the short sea connection to Japan. The journey was a feat of endurance in those days, taking seven months, including a Siberian winter. Milne wrote copiously of all his travels and left a vivid record of his observations, including some pointed advice for would-be travelers ("a strong constitution is needed").

Milne's appointment in Japan was part of a program to use foreign specialists to train Japanese nationals in Japan's quest for parity with Western industrialized nations. Milne was to stay in Japan for 20 years, during which time he fostered the new science of seismology and became its world authority. His first obligations were to mining exploration, but his work in this field is not well known outside Japan because his reports to the government were largely confidential. Nevertheless his "Miners Handbook" proved invaluable to several generations of Japanese mining engineers, largely because the mining industry in Japan when Milne arrived in 1875 was in a primitive condition. In addition, during the early years of his appointment, he made geological observations and detailed sketches of more than 50 volcanoes that he climbed. That his scientific achievements continued to be recognized in Europe is shown by his election as fellow of the Royal Society in 1887.

On Milne's first night in Japan he experienced his first earthquake. The phenomenon intrigued him and the rest of his British staff (Ewing, Gray, Ayrton, and Perry). They felt that the key to understanding earthquakes was an instrument that could adequately record the nature of the seismic energy, not just the fact that an earthquake had taken place (seismoscopes had existed for 1700 years). Here was a challenge that could not be ignored. ("We had earthquakes for breakfast, dinner, tea, and supper.") One of Milne's Japanese colleagues later remarked that "he threatens to exhaust all that there is for workers in seismology to investigate." When not occupied with his official duties, Milne would sit for hours writing copious notes and compiling lengthy reports. According to the authors of this biography, his writings on seismology exceeded 2 million words: he was responsible for two-thirds of the contents of the publications of the Seismological Society of Japan during his stay in that country. His own enthusiasm and drive were obviously the stimulus to the group at the Imperial College, Tokyo.

Milne's contribution to seismology was due to his having the acumen to identify the necessary crucial experiments on earthquake motion. His early instrumental work was dominated by experiments on pendulums, because he strongly believed that simplicity in design was a key factor. He also experimented with microphones in recording earth tremors—thus anticipating by 50 years the standard use of geophones in seismic surveys—and investigated simulated ground motion in the laboratory, using concrete balls weighing about 2000 pounds, as well as explosive charges.

Realizing that the study of individual earthquakes would require the services of many people, Milne proposed that a society be formed of specialists who could pool their knowledge. Thus, in 1880, the Seismological Society of Japan was formed. In the society's opening address, Milne described the first seismograph network, in which 15 Gray-Milne pendulum instruments were to be deployed in Japan. As the work of the Seismological Society of Japan was superseded by that of the National Earthquake Investigation Committee in 1892, Milne became more and more involved in recording teleseismic earthquakes. This required an extremely sensitive seismograph. Stimulated by Zöllner's design for pendulums to detect the lunar disturbance of gravity, Milne constructed in 1893 the well-known horizontal-pendulum seismograph that bears his name.

Whether because of a fire in his home that destroyed many of his writings as well as much of his reference library, or because he felt out of the mainstream of Western science, or because he sensed the growing reaction against foreigners because of a resurgence of Japanese nationalism, Milne decided to return to England in 1895. He wanted to set up his new seismograph at a permanent observatory and finally chose Shide Hill House on the Isle of Wight.

Milne had repeatedly called for international cooperation in recording earthquakes. He realized that unless seismographs were of a standard design the