

tion is characterized by a heavy infusion of pre-1940 literature, which is both a virtue and a disappointment. Protozoology is a huge, growing, and complex field, and Part 1 provides the beginning student with a much-needed background. Many classic papers are cited in the chapter bibliographies (that is also true of Part 2). On the other hand, these feats are accomplished at the expense of newer knowledge (a drawback if the present work is to stand for another 12 years). A case in point is the discussion of mitochondria (p. 93). Certainly the present knowledge of mitochondrial function and the characteristic structure of protozoan mitochondria is not so new that it could not have been included. Likewise, the section on nutrition (p. 115) seems to ignore the advances of the 1950's in the growth of protozoa in defined media. As in previous editions, the value of some illustrations is limited by insufficient labeling (Figs. 1, 25b, 25c, 26, 32), and one may find references to authors' names but not to specific papers.

Many of the shortcomings of both parts are offset by the expanded chapter bibliographies and improved English usage (the book reads much better than previous editions). The production of a satisfactory text on either the general biology or the taxonomy of the Protozoa is very difficult. In general the author has again succeeded admirably in combining the two aspects in a single relatively inexpensive volume. It is indeed hard to imagine anyone who must deal continually with protozoa, either in the field or in the literature, without his worn copy of "Kudo." I see no reason why the fifth edition should not continue the tradition.

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## Scientists as Diplomats

The nuclear test-ban treaty of 1963 marked a turning point in the nuclear arms race. Study of the decade-long negotiations provides an opportunity to examine the whole web of world political change. Equally important, the negotiations were an important setting in which men of science acted as diplomats. Four conferences were conducted primarily by scientists—the Conference of Experts (1958), the two Technical Working Groups (1959), and the Seis-

mic Research Program Advisory Group (1960)—and at least one scientist was always assigned to the American negotiating team.

**Diplomats, Scientists, and Politicians: The United States and the Nuclear Test Ban Negotiations**, by Harold Karan Jacobson and Eric Stein (University of Michigan Press, Ann Arbor, 1966. 548 pp. \$8.50) tells the tale and is a useful addition to the literature on the impact of science and technology upon public affairs. The authors had access to the full minutes of formal sessions, and they here weave a chronological narrative which, though complicated, is always absorbing and lucid. An authors' analysis provides background, but in general the facts are allowed to speak for themselves, a method which tends to refute the tendentious and facile generalizations about scientists as "a new breed."

At one point in the technical talks, James B. Fisk responded to a Soviet remark by rejoining that "science is not the servant of political expediency" (p. 227). The perspective in this account proves exactly the opposite. The technical issues were very real, but they could not be separated from the facts of bargaining positions and assessments of national interests.

Throughout the negotiations, U.S. policymakers tried to make this separation. At each step, the scientists found themselves forced to act as political bargainers, frequently (as far as the U.S. was concerned) with inadequate political guidance. The role of "experts" was political from first to last. In effect, the technical men provided an alternate forum where the nuclear powers could resume their dialogue when other forums broke down. The U.S. resort to this forum was often an effort to evade the fact that American disarmament policy was divided and uncertain. Emphasis on the technical unknowns of detection served to gain time in the face of deep conflict in Washington over the whole role of nuclear weapons in diplomatic and military global strategy. It remained for a new president, John F. Kennedy, to wrestle the dilemma into a coherent military capability which, by 1963, permitted adoption of the unsupervised partial test-ban as part of a general stabilization of the nuclear arms race.

As an epilogue, the authors provide a perceptive, closely reasoned essay which limns the moral of the tale. The role of the scientists differed little from that of conventional diplomats; the talks

were always primarily political. Scientific expertise was essential but lacked any singular magic or authority. Effective decision-making requires that "policy makers . . . receive advice from several scientists rather than one" (p. 483), in order that personal and political values may be isolated. In this way responsible politicians reserve the right of decision and indeed are forced to face up to such judgments as should be neither delegated nor obscured.

If this book has a weakness, it lies in the explanation of key departures from policy during the negotiations. Because they stick closely to the formal sessions, the authors are often forced to speculate on the sources of policy change and fail to go beyond official rationalizations. The internal politics of decision-making are not yet completely on the record. But this does not detract from the value of their work in making the record more complete. Here are no startling revelations, no inside dope, few fresh insights into the behavior of nation-states. Instead, we find a solid account of America's adjustment to its role as superpower and nuclear giant trying to find its way through a variety of highly technical and highly political bargaining situations.

By 1960, nuclear testing had become a kind of shadow-war. While negotiators sat across the table from each other in Geneva, the thunder rumbled from the wings, each side testing, raising the background radiation of the planet, and daring the other to raise it still higher. Testing became in effect a demonstration of force to support other forms of diplomacy. The period of reprisal testing was happily ended by the treaty of 1963.

This account of the negotiations vividly demonstrates the contradictions of U.S. policy in what might be termed the classical period of the nuclear age. The inability of the West to develop a consistent diplomatic strategy and military capability prevented a unified negotiating posture. Added to all the other factors of world diplomacy, this prevented an earlier assessment of Soviet intentions, obscuring the changed nature of the Soviet threat in the late 1950's and the need to revise U.S. military strategy in the direction of non-nuclear forces. The authors' work provides another opportunity to continue the process of national introspection in a changing and challenging world.

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