Book Reviews

Science and Liberal Education. Bentley Glass. Louisiana State University Press, Baton Rouge, 1960. x + 115 pp. $3.

These three essays, originally given as lectures before a lay audience, are a credit to the profession. Scientific principles are explained with simplicity and accuracy, and the importance of science in liberal education is well argued. References to many artists and scholars from "the other side" are wisely utilized. The historian Carl Becker figures prominently.

Bentley Glass insists that science must become the core of liberal education, but aptly reminds us that "The core of the apple is certainly not the whole apple—not even the most beautiful or delicious part of the apple. Yet the core gives the rest of the apple meaning—here lie the seeds without which, in a state of nature, there would be no more apple trees and no more apples" (page 63). That portion of the educational core that we call genetics is discussed at length. Radiation problems are admirably summarized.

Evolutionary and genetic theory are serious challenges to traditional ethics. The author points out how well-meaning tenderheartedness with respect to animals has frequently led to actions that are cruel because they are based on insufficient information—for example, when man removed such "cruel" predators as wolves and coyotes, he made it possible for their ungulate prey to multiply to the point where they can enjoy the delights of mass starvation. In the human species, medicine, attempting to save all life by correcting for individual "inborn errors of metabolism" without removing their genetic causes, raises the potentiality of increasing the total amount of suffering as harmful mutations are summed, generation after generation. Glass rightly asks if traditional medicine is not acting in such a way as "to damn the future for the selfish interest of the present?" (page 113). Yet, so difficult is it even for biologists to keep in mind the dilemma in choosing between present and future evil that even our geneticist, in speaking of the consequences of shifting from exogamy to endogamy, says that if we should revert to the earlier breeding pattern the result would be a "disastrous increase in the proportion of hereditarily afflicted persons" (page 44); he says this in spite of the fact that on the preceding page he had admitted that "inbreeding does not of itself change gene frequencies, but it brings the recessive genes out into the open and allows selection to be exercised upon them." Is this "disastrous"? I do not want to be cited as a proponent of cousin-marriage, but as scientists we must insist that *as concerns society* there is, perhaps, as much to be said for inbreeding as against it, since it results in paying off genetic debts early rather than late; only the individual parent benefits by exogamy, since he thereby shuffles off his genetic debt onto a later generation. Ethics is a difficult discipline.

Nevertheless, there are no important objections to be made to Glass's presentation, which contains much that deserves praise. His book well merits wide reading among the general public. It should be particularly effective in arousing the interest of high-school students in the social implications of science; it should help to bring together what C. P. Snow has called the "two cultures" of science and the other humanities.

GARRETT HARDIN
University of California, Santa Barbara

Political Man. The social bases of politics. Seymour Martin Lipset. Doubleday, New York, 1960. 432 pp. $4.95.

This book is a collection of Lipset's essays, selected by the author to illustrate "the contribution the sociologist can make to the understanding of democratic political systems." It is an interesting demonstration.

The successive chapters present a series of major hypotheses, of which the following examples may indicate the intellectual problem of the book. (i) Democracy requires institutions which support conflict and disagreement as well as those which sustain legitimacy and consensus; (ii) the social situation of the working class predisposes the class to the development of authoritarian attitudes and to a preference for extremist and doctrinaire political movements; (iii) recent fascist movements have represented an extremism based on the political center and the middle class, rather than on the right or left; (iv) in every modern democracy political parties basically represent a "democratic translation of the class struggle."

The method by which Lipset undertakes to establish the validity of these propositions is that of comparative analysis. He has assembled a formidable array of evidence regarding voting and other political behavior, using election statistics, sample survey data, and other records from a dozen different Western democracies. The many regularities he finds in these cross-national comparisons are impressive. His positive style of statement may occasionally imply a clearer order in his evidence than someone else might find, but this is, perhaps, inevitable in an attempt to organize a range of events as broad as he deals with.

Lipset is explicitly committed to the premise that democracy is not merely the means through which different groups "seek the good society; it is the good society itself in operation." He feels that in the West the fundamental political problems have been solved, that the ideological class struggle which formerly divided intellectuals into right and left has lost its driving force. The argument now is over adjustments within a rather narrow range of alternatives. He ends his books with an expression of hope that his attempt to outline the conditions of the democratic order may help "men develop it where it does not now exist," specifically in Africa and Asia.

It is easy to share Lipset's concern that, in this country's attempt to foster the growth of democratic political forms in the so-called underdeveloped nations, those individuals who make our national policies should have some understanding of society and of democracy. There is some question, however, about how well we can understand political man in these countries

from our observation of his behavior in the West. It is obvious that different systems of ownership, employment, mobility, status, and authority will require some adaptation of the concepts which Lipset has found useful in this book. This does not in the least invalidate his concern for the development of a sociology of politics; it merely projects it onto a broader stage.

ANGUS CAMPBELL
Survey Research Center,
University of Michigan

The Transits of Venus. A study of eighteenth-century science. Harry Woolf. Princeton University Press, Princeton, N.J., 1959. xiii + 258 pp. Illus. $6.

Now that our age is designated as that of the Sputnik almost as often as it is designated that of the atom, it is interesting to reflect that astronomy, and not physics, has customarily been the trail-blazer of science for some 3000 or 4000 years. For less than a century of that time, physics has seemed to be the leading part of the research front, and astronomy has been relegated to subservience.

In earlier times, the roles were very different. Ptolemaic astronomical theory arose long before any comparably advanced mathematical formulations in the rest of physics. In the later Middle Ages and Renaissance, it was again astronomy that yielded the greatest and most shaking advances. A more equal balance was attained during the age of Galileo and Newton, but within a century of the death of Newton, the new science of electricity had shifted the scientific focus toward what is now known as physics.

This 18th century saw, however, two important astronomical events—the transits of Venus—that had considerable effect upon the organization and the content of the whole of science. It is most interesting that the transits happened when they did by virtue of the *force majeure* of slow astronomical motion rather than by any historical persuasion. The transits of Venus occur at intervals of about eight years, separated by gaps of 105½ and 121½ years, when no such phenomenon can be observed. In the 17th century they happened in 1631 and 1639. The former, but a generation after the development of the telescope, was not seen by anyone. The latter was observed only by Horrox, but no useful measurements were made. The next pair of transits, in 1761 and 1769, became the object of an endeavor similar in nature to the recent International Geophysical Year.

The importance of these transits was that they provided a means for measuring the size of the planetary system —one of the fundamental constants of the observed world. A yardstick for the universe is difficult to obtain. Before high-precision instruments were available, it was not possible, except through the transits of Venus, to obtain any but very approximate results. The transits of Mercury were not very useful, since that planet is too near the sun for much parallax to be observed against the solar backdrop. No other planet will suffice; no other method was possible in the 18th century. Astronomers had to sit patiently and wait for the great events of 1761 and 1769. Wait they did, and when the time came, the astronomers were strung out over the war-torn globe in accessible and almost inaccessible places.

The story of this international essay in science is a most exciting one, and has been admirably told by Harry Woolf. His treatment is monographic and authoritative. Among several entertaining stories is that of Pingré, who made observations on the island of Rodrigue. He improvised turtle oil for cleaning his corroded instruments, and finished by commenting on the excellence of turtle liver as a gastronomical delicacy. Although the historical discussions are so capably written, one might wish that more space had been devoted to the hard core of astronomical theory. Figure 2, which attempts to illustrate the geometry of a transit, appears to be drawn in two planes at once; the letter g should be a q, and this correction should also be made in the text. Furthermore, the letters e and w in the diagram are seemingly irrelevant and unused. The use of Bode's law is misleading in its context, since only Kepler's third law was needed, and indeed used, to obtain the relative distances of Venus and the Earth. There is no theoretical comment on the way in which the early astronomers were forced to abandon the possibility of using the transits of Mercury, and there is little appreciation of the huge difficulties involved in the mathematical technique needed to trace the predicted observabilities of the Venus transits at various points on the Earth. Thus, although the book could have contained more discussion of science from the inside, Woolf has done such a monumental job of editing, collecting, and commenting from the historical outside, upon the original sources related to this episode of science that he shall forever have our thanks and our heartfelt praise for his labors.

DEREK J. DESOLLA PRICE
Department of History of Science
and Medicine, Yale University

Crystal Chemistry of Simple Compounds of Uranium, Thorium, Plutonium, and Neptunium. E. S. Makarov. Translated from Russian by E. B. Uvarov. Consultants Bureau, New York; Chapman and Hall, London, 1959. iii + 145 pp. Illus. $5.25.

This book has the two-fold purpose of presenting, in a systematic collection, the results of the many studies of the crystal structure of the chemically simple compounds of uranium, thorium, plutonium, and neptunium, and of developing and correlating the crystal chemistry of these compounds. A brief introduction stating the purpose of the book is followed by chapter 2 (21 pages) in which an attempt is made to present a short discussion of some of the main principles of crystal chemistry. Presumably this chapter is included to make the book more nearly self-contained. It would have been better had the author chosen, instead, to refer his readers to the standard texts on crystal chemistry, since his treatment is very naïve, and in part, completely erroneous. The following statement is one example of this: "In crystals with ionic bonding the valence electrons are completely localized in the atomic orbits of the anions and therefore the negative charge (electron density) is distributed periodically, roughly speaking, at lattice points." This is "roughly speaking" indeed! Many other misleading or completely wrong statements occur in this chapter, including the common mistake of calling the CsCl-type structure body-centered, and, as always, confusing the lattice with the structure.

In chapter 3 (16 pages) data on the crystal structure of the several polymorphic varieties of the elements are collected, and in chapter 4 (72 pages) similar data are given for a large number of simple compounds, including