This is a true statement that may do damage. Without this startling beginning the paragraph on weightlessness gives a sensible picture of practical troubles. No "explanation" of weightlessness is offered there, but an earlier chapter says "Gravity has been cancelled out by the satellite's speed, so the satellite has no weight." (Physicists must cry aloud for a simple experiment: let the children throw two stones out together, with the same velocity. "Watch them move together, on the same orbit. Now imagine the big stone is a satellite and the small stone some object inside the satellite. Things inside—rocks, lumps of metal, balloons, scientists themselves—all just hover there, as seen by an observer inside. They seem to be weightless.")

Γ raises a different issue of editing. It is one of the Science Study Series that is part of the PSSC program, though the series has spread beyond that program in a most gratifying expansion. As such, this book, too, deserved, and seems to have missed, a careful review by an outside physicist to ensure accuracy and consistency with the PSSC program that it supplements. Such review would have saved some minor mistakes: for example, Poynting's "weighing of the Earth" experiment is attributed to Boys, who made a different and more famous measurement of "*G*." The explanation of tides contains a familiar mistake that would make the lunar tide 90 feet high on the Earth instead of a few feet. But, far more important, a reviewer would have urged the author to reduce the conflict between his occasional use of centrifugal force and the position of the PSSC text, which takes a stern view against it. Gamow starts with centripetal acceleration v^2/r for moon and planets and then switches to a centrifugal force that balances gravitational pull. We are all tempted to make such switches—all three books under review seem to make them—and here all would be well if a few words were added to explain the change of frame of reference. For a book that is part of the PSSC system, with all the care for consistent and reliable science teaching that that title implies, I plead for an editor to add the necessary bridge.

Where science books are sponsored by educational groups, I think advisory boards are not enough: a final revision by an independent scientist is a duty to young scientist readers.

Inglis and Burton Lectures

The Teaching of Science. Two essays. Joseph Schwab and Paul Brandwein. Harvard University Press, Cambridge, Mass., 1962. 152 pp. $3.25.

This small book contains two essays on science teaching in secondary and elementary schools, presented as the Inglis and Burton lectures, respectively, at Harvard University in 1961. The first, by Joseph Schwab of the University of Chicago, is entitled *The Teaching of Science as Enquiry*. The second, entitled *Elements in a Strategy for Teaching Science in the Elementary School*, is by Paul Brandwein of Harcourt, Brace and World.

Schwab makes a plea for teaching science in the spirit of enquiry rather than as rhetoric or a collection of dogma. He usefully defines both *stable* and *fluid* enquiry, the latter being fundamental to the invention and creation of new scientific knowledge while the former provides the fruits for technological development. The author points out three reasons for converting school science "from the dogmatic to the enquiring mode." The reasons are our need for scientists, the competences required for our political leaders, and our need for a public that is cognizant of the nature of scientific enquiry.

Specific suggestions for achieving such a curriculum are offered, including the following unusual boundary conditions: that the laboratory lead, at least in part, rather than lag the classroom; that the classroom concern itself with an exhibition of the course of enquiry rather than with a rhetoric of conclusions; that doubt be specifically injected; that appropriately selected, original papers be included to provide experiences in depth as well as familiarity with true enquiry; that we include "invitations to enquiry" by providing suitable problems.

Every enlightened science teacher will recognize many of Schwab's observations and suggestions as being similar to his own. However, this essay is an unusually perceptive and concise statement which clearly identifies the contrast between two types of enquiry and which convincingly delineates the steps that can be taken to orient the teaching of science toward science itself as a living intellectual adventure. Its pertinence goes far beyond the secondary school to both the undergraduate and graduate curriculum. The author emphasizes that only by positive changes throughout the years of formal scientific education can we revise a situation in which we find our fluid enquirers by identifying them as the men "who run the obstacle course of an indoctrinational curriculum and emerge at the other end not yet wholly indoctrinated."

The second essay, by Paul Brandwein, is concerned with the role of the science teacher at the elementary level. Brandwein dwells primarily on the importance of each child's creativity, on concept forming, and on "teaching rather than telling." He stresses the importance of understanding to what extent children of different ages and abilities can comprehend specific concepts. As in the previous essay, emphasis is on the individual child's intellectual growth through realistic scientific experiences. While this essay makes a contribution to the general problem, it does not strike as boldly at the heart of the matter as the other. As its title implies, however, it provides a strategy for teaching science at the elementary school level, a strategy based upon conceptualization and "a mix of learning in which enquiry plays its appropriate part."

LEONARD M. RIESER
Dartmouth College,
Hanover, New Hampshire

Needed: More Scholars

Great Chemists. Eduard Färber, Ed. Interscience, New York, 1961. xxvi + 1642 pp. Illus. $29.50.

This is a large and impressive work. In its more than 1600 pages it contains the biographies of over 100 scientists who have contributed to the evolution of chemistry. It ranges in time from the era of the chemical technologists in ancient Mesopotamia to 1937 when the subject of the last biography, Wallace Hume Carothers, died. It can be safely stated that there is no other volume quite like it. Its nearest competitor, Günther Bugge's *Das Buch der Grossen Chemiker*, does not range so widely either in number, time, or space; but it should be pointed out that the present volume does not entirely displace Bugge from its honorable position in the history of chemistry.