Book Reviews

Education and Freedom. H. G. Rickover. Dutton, New York, 1959. 256 pp. $3.50.

Conant says that there's nothing wrong with the American high schools that a few changes will not correct [*The American High School Today* (McGraw-Hill, New York, 1959); reviewed in *Science* **129**, 382 (1959)]. Rickover wants a brand new deal. He believes that the high-school curriculum is watered down; too many high-school teachers are not qualified for their jobs; much time is being wasted; excellence in teaching is yielding to mediocrity; badly needed human talent is being lost; our schools are inferior to those of the Russians (who abandoned John Dewey to copy the European system); we need demonstration schools (European model) to revolutionize our educational system by setting up bench marks of excellence—bench marks that will lead to national standards for the certification of teachers and to a series of comprehensive examinations for measuring the achievements of high-school seniors before they are graduated.

Conant identifies the comprehensive high school as a uniquely American contribution in the Anglo-Saxon tradition. Thus, he elicits in this country a flood of warmth and receptivity. Rickover, on the other hand, paints a harsh picture of the villain in the piece—a revered American philosopher who so misled American educators and administrators as to give rise to a new species called "educationists." These must first be destroyed if our country is to survive. In easy stages, Rickover's advocacy of Russian (European) education assumes a non-American look which soon becomes un-American in its projected image. As Max Lerner says, "If Rickover were clearer about education *for* freedom, he would be much more savage than he is about the Russian educational system."

Conant and Rickover are seeking many similar goals, but in ways that are contrastingly different. Some of Conant's recommendations call for educational upheavals as radical as any which Rickover is advocating. One example is the proposal to reduce the number of secondary schools so that all of them can have at least 100 students in the senior class. In my humble opinion this may take a century of effort, if it can be done at all. Furthermore, we need 400 or 500 in the senior class to do the job for the academically talented that needs doing, unless we are ready to spend at least twice as much money for education as we are presently willing to spend. Rickover would give his blessing to any device which would make classes more homogeneous with respect to ability but would probably be impatient with, and suspicious of the efficacy of, the "comprehensive" features of the high school.

I regret Rickover's passionate impatience because I prefer his overhaul job to a mere tinkering with the educational system. If we are impressed by the seriousness of the world picture Rickover paints, then we must admit that we are at war in a struggle for the survival of all that is dear to us. No half measures will do. I wish Rickover had not seen fit to attack Dewey when he was really attacking Dewey's interpreters. I wish he had not glamorized the European educational system to an extent not necessary to make his essential points. In doing so, he precipitates arguments from the opposition that are as *ad hominem* as his own. While Rickover's interest in education may have originated in dissatisfaction with the education of the men he sought for work on the *Nautilus,* one must admit that his understanding of the history of education is superb. Certainly, he has traced with force and clarity the debt we owe to the best in Greek and Roman culture.

Weighing all in the balance, I must side with Rickover. The time has come when we can no longer afford to paralyze action in educational reform. Talent *is* being wasted. We *are* falling behind the Russians. Our high schools need *more* devotion to excellence. Equal educational opportunity is *not* the same as equal educational exposure. Heterogeneous classes *do* tend toward mediocrity. The sights *must* be raised for all our students—bright, average, and slow. Not all scholars are good teachers, but good teachers must first be scholars. The action of good mind upon good mind in classrooms *does* promote learning in ways never dreamed of it. It is *not* undemocratic to organize schools with classes that are more nearly homogeneous in interest and ability. Special schools, where it is feasible to establish them, *are* most potent instruments for excellence in teaching and in learning. The essence of democracy *must* be to let each child become all that he is capable of being.

Whether Conant's gradualism or Rickover's revolution prevails depends in the last analysis upon the progress of the cold war. The hotter it gets, the sooner we will move in the direction toward which Rickover leads.

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Foundations of Modern Physical Science. Gerald Holton and Duane H. D. Roller. Duane Roller, Ed. Addison-Wesley, Reading, Mass., 1958. xvi + 782 pp. Illus. $8.50.

Physics. Henry Semat and Robert Katz. Rinehart, New York, 1958. viii + 927 pp. Illus. $9.

Physics for Engineers and Scientists. Richard G. Fowler and Donald I. Meyer. Allyn and Bacon, Boston, Mass., 1958. xiii + 546 pp. Illus. $8.

Principles of Modern Physics. A. P. French. Wiley, New York; Chapman and Hall, London, 1958. ix + 355 pp. Illus. $6.75.

Introduction to Modern Physics. C. H. Blanchard, C. R. Burnett, R. C. Stoner, R. L. Weber. Prentice-Hall, Englewood Cliffs, N.J., 1958. xi + 414 pp. Illus. $10.

The first three books listed above deal with elementary physics—that is, first-year college physics; the last two are for more advanced students. Each book has a different outlook and general method, and the existence of these differences is an indication of the different reasons for teaching and studying physics in college today.

The Foundations of Modern Physical Science, by Holton and Roller, is intended, according to the authors, "mainly for courses of two types: (a) the one-year general physics course for science majors (including premedical students) outside physics and engineering, and (b) the course for majors in the humanities and social studies, including the physical science course for liberal arts students and the integrated or general education course." The approach to the study of physical science is the same as in Holton's well-known

textbook, *Introduction to Concepts and Theories of Physical Science,* but in the present book the mathematical and conceptual material are developed more extensively, and there is more material on physical optics, electricity and magnetism, and nuclear physics. The newer book does not replace the older one but provides a differently weighted treatment. As in the older book, there is great emphasis on the basic concepts and theories, on their historical development, and on the relationship between theory and experiment. The nature of scientific thought and discovery is carefully explained and elucidated, and the material is organized according to the historical and philosophical development of physical science.

There are nine parts: "The study of motion"; "The study of forces"; "The study of planetary systems"; "On structure and method in physical science"; "The conservation principles"; "Origins of atomic theory in physics and chemistry"; "Theories of fields in electricity and magnetism"; "The quantum physics of light and matter"; and "The nucleus."

The book is excellently organized and written, and I found it a pleasure to read. It could be read with profit by physics specialists, who too often learn little about the philosophical aspects of science while they are mastering the techniques, and it could well be used to supplement the more specialized texts used in courses for physics and engineering majors. At the same time, the technical exposition is very well done; there are many good examples and problems, and students should learn a good deal of basic physics from the book.

Physics, by Semat and Katz, is intended for students of science and engineering; according to the authors, "it aims to develop both an understanding of the important concepts of physics and some analytical skill in the solutions of problems. The mathematical level . . . is such that it may be used by students who are taking a course in calculus concurrently." Thus, calculus and vector analysis are used throughout. The subject matter is divided into six parts—"Mechanics," "Heat," "Wave motion and sound," "Electricity and magnetism," "Optics," and "Atomics and nucleonics."

In view of the fact that Semat is one of the authors it is not surprising that the book is an excellent one. The exposition is clear; the coverage is complete and thorough; the figures and diagrams are plentiful and helpful; and there are many good problems and modern examples. As one who works in the field of Nuclear Engineering, I found the treatment of units especially appealing. In the sections on mechanics, heat, and sound, the British engineering system and the centimeter-gram-second and meter-kilogram-second metric systems are used; in the section on electricity and magnetism, the rationalized meter-kilogram-second system is the main one used, but the unrationalized Gaussian system is also developed because of its wide use. There are very helpful tables of equations and conversion factors for the various units used in electricity and magnetism. The treatment of atomic and nuclear physics is particularly good for those students who will not go on to a separate course in these subjects.

Physics for Engineers and Scientists, by Fowler and Meyer, was written, according to the authors, in response to "the present-day pressure by colleges of engineering for reducing the purely engineering content of general physics as it is commonly taught and increasing the attention given to modern physics." Instead of following the traditional division of physics into mechanics, heat, wave motion and sound, and so forth—as, for example, in the book by Semat and Katz—the authors attempt a more unified treatment, in which atomic and molecular concepts are introduced, as is electricity, much earlier than in most physics textbooks. Vectors and calculus notation are used throughout, but formal calculus manipulations are presented in such a way that they may be omitted by students who have insufficient mathematics. The result is a book which has less detail and is less thorough than that by Semat and Katz (it is shorter by about 400 pages) but which is more homogeneous in its treatment. The figures are excellent, and there are many helpful examples and problems.

I do not have enough experience in the teaching of elementary physics to compare the effectiveness of this treatment with that of the traditional kind of presentation, but the treatment is certainly an interesting one, and one which should appeal to many teachers and students.

The books by French and by Blanchard *et al.* are two more attempts to meet the increasing need on the part of scientists and engineers for a mastery of the concepts and methods of modern physics. French's *Principles of Modern Physics* traces the development of the concepts and theories of modern physics; the author has tried "in the space available to trace the progress of some of our more important physical concepts with the help of a minimum of detailed information." The chapter headings indicate the scope of the book: "The atomic theory of matter," "Light and the electro-magnetic field," "The atomicity of electric charge," "Thermal radiation and the quantum theory," "Quanta and atoms," "Relativity," "Wave mechanics," "Some applications of quantum mechanics," and "The nucleus."

The author has succeeded very well in his aims and has produced a clear, logical, and consistent account of the basic ideas of modern physics. The interrelation between theory and experiment is clearly brought out, and enough examples are given to show how the concepts are used. The style is laconic, and there is no danger that the student will miss the forest for the trees; with some collateral reading (and there is an adequate bibliography for each chapter), French's book will provide science students with a sound introduction to modern physics.

Introduction to Modern Physics, by Blanchard, Burnett, Stoner, and Weber, stems from a required course in atomic and nuclear physics in the engineering curricula at Pennsylvania State University. The direction and speed of technical development in the modern world make a course of this type essential for engineering students, and this book should be a good text for such a course. The scope is somewhat broader than that of French's book, and more applications are included. In addition to the subject matter covered by French, there are chapters on "Molecules and solids," "Ranges absorption and detection," "Nuclear reactions," "Applications of nuclear physics," and "High-energy research." The treatment is less deep and less critical than that of French, but the greater breadth should serve to provide a satisfactory background in modern physics for future engineers. The book is clearly written and has a good supply of examples, problems, and references.

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Mental Subnormality. Biological, psychological, and cultural factors. Richard L. Masland, Seymour B. Sarason, and Thomas Gladwin. Basic Books. New York, 1958. 442 pp. $6.75.

In the last two decades, with the decrease in incidence and urgency of the acute infectious disorders, the enormous toll exacted by the chronic disorders has been bared. Of these, the large group of conditions included under the rubric of mental subnormality (depending upon definition, 3 to 14 percent of the population are included in this group), is by far the most costly to society and the individual affected. The problems of research, prevention, and care are apparently so overwhelming that the entire area has been and is badly neglected. However, the increasing concern of governmental and private agencies, as well