the other to do the same in all instances, military as well as civil. In short, by isolating the control of peaceful uses of atomic energy from the control of atomic energy for military purposes, attempts at the former goal have been rendered relatively sterile and futile. The strong motivations which exist for accepting military controls have been rendered irrelevant to the civil situation. This leaves no strong motive of national interest operating in favor of international control of the Atoms-for-Peace program.

Yet the Commission in its report says, "We strongly urge the United States to make the International Atomic Energy Agency the focal point and major instrumentality of its activity in support in the development of the peaceful uses of atomic energy in other countries. In specific terms, the United States should give priority to the Agency rather than to bilateral or regional arrangements." I can see little force in the arguments educed for such a policy; this policy would lead every agreement with our friends into a maelstrom of quibbling in an agency where representatives of the Soviet Union and the neutralist countries also sit. It is hard to see why we should invite all the difficulties entailed in taking action under such unfavorable circumstances when there are opportunities for easy cooperation opened up by the effective unity within the Western alliance and similar groupings. The argument in favor of channeling activities through the IAEA amounts essentially to a demand that we set an example for the Soviet Union because it might then, also voluntarily, use the IAEA for the operation of the Soviet atomic cooperative programs. Example setting is, unfortunately, flimsy strategy in international affairs.

In closing, let me emphasize that the alternatives are not restricted to setting an example by actions that are contrary to national interest on one hand or by engaging in a suicidal, nuclear balance-of-power game on the other. Nuclear energy clearly requires international control. We will have to accept the imposition of such controls upon us as a price for imposing them upon others. The interest that nations have in survival is likely to produce whatever world-wide agreements are, in fact, reached. It is not at all clear that quarantining certain subordinate, though still important, areas of international relations from infection with the great issues of war, peace, and power conflict is possible, or even, if possible, likely to be constructive.

Nor is it clear that piecemeal reductions of tensions improves the chances for peace. It is not clear that piecemeal restrictions on atomic capabilities or even atomic weaponry, for example, reduce the likelihood of atomic catastrophe. It is most probable that such functions are nonlinear, nonmonotonic, and discontinuous, and if that is so, one cannot assume that a small sacrifice designed to promote a little progress toward international control of peaceful atomic energy activities will, at the same time, be a step toward preventing an atomic holocaust. The case must be established, if at all, by close reasoning about the particulars of the international bargaining situation.

While these issues are not faced in the present volume, the historical record is clearly and accurately stated. Scientists concerned with defense and atomic energy matters will find this case study both instructive and informative.

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Bigger's Handbook of Bacteriology. For students and practitioners of medicine. Seventh edition by F. S. Stewart. Williams and Wilkins, Baltimore, Md., ed. 7, 1959. x + 611 pp. Illus. + plates. $8.

Since the last edition of this excellent *Handbook* (1949), the many advances made in several of the fields of bacteriology have necessitated revision of much of the original text. New sections have been added on virology and chemotherapy, as well as new chapters on disinfection, antigens and antibodies, hypersensitivity, bacterial classification, and streptococci and coliform bacteria.

A great deal of technical material included in the earlier editions, which was of value to the laboratory technician, has been deleted. The chapters on pathogenic fungi and protozoa have been omitted, because it was felt that these specialized subjects required specialized treatment.

While the text has been increased by approximately 100 pages, the *Handbook* was held to Bigger's objective (expressed in the preface to the first edition)—to present "all the more important facts relating to bacteria as far as they affect man" in a small volume.

While this text is primarily intended for students of medicine, it appears to offer a wealth of material for the student nurse.

The illustrations and plates are excellent.

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Immunity and Virus Infection. A symposium. Victor A. Najjar, Ed. Wiley, New York; Chapman and Hall, London, 1959. viii + 262 pp. Illus. $10.50.

This book contains 20 papers presented in May 1958 at Vanderbilt University during a symposium planned by the department of microbiology as a tribute to the interests of a distinguished guest, Sir MacFarlane Burnet. Besides being devoted to the disciplines of immunology and virology, the volume has no formal organization, and it includes a variety of topics. It begins with a brilliant and provocative discussion of the clonal selection theory of antibody production by Burnet. Antibody production and the related problems of immunological tolerance and allergy are discussed by several participants. The other immunological topics included are separation and purification of antibodies, properdin, rheumatoid γ-globulins of high molecular weight, and genesis of fever in infection. The section on virology (also introduced by Burnet) begins with a highly speculative paper on trends in virus research. Luria, in the same vein, attempts a new definition of viruses, based on recent findings in genetics. Three papers deal respectively with the purification of viruses, the role of phage in the toxigenicity of *Corynebacterium diphtheriae,* and virus infection by "naked" ribonucleic acid. The three final papers are devoted to the problems associated with vaccination against poliomyelitis with inactivated or live attenuated virus, and to the effect of vaccination on the epidemiology of the infection.

The method of presentation varies considerably, too. A few authors discuss specific problems, but most summarize and discuss recent developments, while some thoroughly review old as well as new lines of investigation and provide

extensive bibliographies. The book contains an ample number of good illustrations and an adequate index.

In this age when scientific information multiplies so rapidly (a fact fully reflected in this book), one may justifiably ask whether the publication of a symposium of this type serves as a good method for rapid and wide communication to students and scientists. Because of the tenuous organization of the subject matter, the answer is not an unequivocal yes, but the papers are excellent and the book provides invaluable information on a number of current topics.

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Free Radicals. An introduction. A. F. Trotman-Dickenson. Methuen, London; Wiley, New York, 1959. 142 pp. $2.50.

When I reviewed Trotman-Dickenson's book *Gas Kinetics* [*Science*, **123**, 639 (1956)], I praised it because it gave "a useful summary of working equations . . . a critical review and tabular summaries of experimental results . . . a detailed description and evaluation of several recently developed experimental methods." *Gas Kinetics* is a useful monograph on a technical corner of the field of chemical reactions; the present book, *Free Radicals*, is a highly personal exposition in the broad area of physical and organic chemistry where, in either gaseous or liquid systems, one encounters free radicals. The treatment is so personal that I need to heed *"de gustibus non disputandum est,"* and any statements I make are necessarily a comparison of my tastes with those of the author.

The book consists of three short introductory chapters (24 pages) on the general aspects, history, production, and properties of free radicals; a long chapter (94 pages) on the reactions of monoradicals; a short chapter (13 pages) on biradicals; a very short list (37 references) of books and review articles; and a short subject index. A bibliography is not given, although a few names and dates and a few references are given at various points in the book.

Because it is a personal account of the broad field, this book has the same purpose and follows the same pattern as Semenov's *Some Problems in Chemical Kinetics* (translated by M. Boudart; Princeton University Press, 1958); yet the treatments differ as much as the personalities of the authors. Of the two books, Semenov's is more original. Surprisingly enough, in the list of references given in Trotman-Dickenson's book, (Chapter 6), no mention is made of Semenov's.

In *Gas Kinetics*, the exposition of theories of reaction rates was very weak. This weakness is carried over into the present book, and many specific examples could be pointed out. One example occurs in the discussion of the rate of radical recombinations (pages 38–39) where we are told ". . . the rate constants . . . approach the collision rate . . . and are two or three orders of magnitude above the value predicted by transition state theory." Using transition state theory, E. Gorin predicted the rate constant for recombination of methyl radicals to be 1.5×10^{13} cm^3/mole-sec [*J. Chem. Phys.* **7**, 643 (1939)]; the observed value is 2.2×10^{13} cm^3/mole-sec [A. Shepp, *J. Chem. Phys.* **24**, 639 (1956)]. For recombination of trifluoromethyl radicals, transition state theory predicts 1.7×10^{13}; the observed rate is 2.3×10^{13} [P. Ayscough, *J. Chem. Phys.* **24**, 944 (1956)]. Obviously Trotman-Dickenson has not taken the pains to follow the literature or to understand the methods of activated complex theory. Of course, he is not the only one who has erred in this respect. The physical chemists' education usually includes too little mathematics and theoretical physics for understanding the main current of theoretical developments. Too often chemists, frustrated because they do not understand a theory, misapply the theory and then proclaim its "failure."

The unique advantage of this book is the author's conscious attempt to unify and cover two or three fields which are usually treated separately. Who might profitably read this book? Certainly not novices in chemical kinetics (one should disregard the subtitle, "an introduction"). However, the portions based on gas phase photochemistry could profitably be read by solution kineticists; and gas phase kineticists could well review the items on the chemistry of reactions in solution. The role of this book, then, is to widen the horizon of narrow specialists in chemical reaction kinetics.

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Fallacies in Mathematics. E. A. Maxwell. Cambridge University Press, New York, 1959. 95 pp. $2.95.

Almost everyone who has studied high-school mathematics has been confronted with proofs that $0 = 1$ and that every triangle is isosceles. This book is concerned with these and many more fallacies, defined by the author as proofs which lead by guile and plausible reasoning to a wrong conclusion. Some of the fallacies are of a trivial nature; others lead to a deeper understanding of the mathematics involved. Examples of both kinds are given, but much more emphasis is placed on the nontrivial fallacies, most of which come from the domain of geometry.

Maxwell first gives a number of fallacious proofs from some discipline of mathematics such as geometry, algebra, differentiation, or integration, and asks the reader to discover the fallacious step in the argument. Then he provides a commentary on each fallacy; this may consist of a few words or a long discussion. Several of the discussions on the geometrical fallacies presuppose a sound knowledge of geometry, which an English college freshman may already have but which an American student acquires only if he takes college geometry.

The book ends with a series of howlers which are almost the opposite of fallacies; here we find solutions of problems by incorrect methods that lead to correct results. These howlers were taken from real life and provide a certain amount of amusement. However, much more enjoyment as well as enlightenment is provided by trying to detect the fallacies, or at least by reading the solutions given by the author of this lovely little work.

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The Thirteen Steps to the Atom. Charles-Noël Martin. Franklin Watts, New York 1959 (translation of *Horizons de France*, 1958). 256 pp. Illus. + plates. $4.95.

The thirteen steps of the title are the thirteen successive divisions by ten from 1 centimeter to 1^{-13} centimeter. The best part of the book is a collection of 118 superb photographs of such small objects as snowflakes, through such very