

mathematical activity of a kind that fosters habits leading to independent creative work."

The lectures deal with such topics as algorithms and automatic computing machines, configuration theorems, Fibonacci numbers, hyperbolic functions, geometrical proof, linear programming, and theory of games. Some provide elementary introductions to significant topics of these subjects, while others provide expositions of a greater depth than that usually found in standard textbooks. The booklets contain sequences of problems and their solutions, and for the most part each one is self contained.

The series is intended to reach a variety of readers in the United States, including secondary school students in the upper grades; teachers of mathematics and science in secondary schools, colleges, and universities; and students who are preparing to teach mathematics. Attempting to prepare reading material for such a varied audience is an extremely difficult task, and providing translations from Russian works would appear to be an even more difficult assignment. For the most part, *Topics in Mathematics* appears to have successfully accomplished these goals.

To secondary school students who have been exposed to the new curriculums in mathematics, the mathematical language may seem somewhat different or "old fashioned." Such usages as "unknowns" of an equation, function as a rule rather than a set of ordered pairs, and "equality" of sides of a triangle rather than "congruence" of sides are examples. But these are not serious detractors from the value of the booklets.

It is impossible to present mathematical material at a constant slope of difficulty, but at times in these lectures the ascent of difficulty seems unduly rapid, especially for secondary school students. For example, early in the lecture entitled *Areas and Logarithms* nearly a page is devoted to detailed instructions for locating a point on the Cartesian plane corresponding to a pair of coordinates, and only a page later a rather complicated outline of a method involving a passage to a limit to determine the area of a curvilinear trapezoid is presented. At other times the reader is asked to give proofs of theorems, when it is not entirely clear precisely what is available for his use.

In most of the volumes the topics

are motivated extremely well by appealing to concrete problems before generalizations are attempted. For example, N. N. Vorobyov begins his discussion of Fibonacci numbers by presenting this interesting problem: "A pair of rabbits is placed in a walled enclosure to find out how many offspring this pair will produce in the course of a year if each pair of rabbits gives birth to a new pair each month starting with the second month of its life." In the next section, Vorobyov presents a general discussion of recursive sequences in which it is shown that the solution to the rabbit problem involves a recursive sequence.

I strongly recommend that *Topics in Mathematics* be added to secondary school and college mathematics libraries not only for their excellent mathematical content but for their cultural value as well. These booklets along with the volumes of the New Mathematical Library of the School Mathematics Study Group provide reading material on an interesting variety of topics by prominent mathematicians at an extremely reasonable cost.

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## Standard Techniques

**Handbook of Microwave Measurements.** vols. 1-3. Max Sucher and Jerome Fox, Eds. Polytechnic Press, Brooklyn, N.Y., ed. 3, 1963 [order from Interscience (Wiley), New York]. 1216 pp. Illus. Set, \$40.

As the title indicates, this three-volume work is intended largely as an instruction manual in microwave measurement techniques, in which principal emphasis is placed on methods of measurement and less emphasis on theoretical concepts. Presumably it will provide a sufficient description of most standard methods of measurement for an engineer or technician who is relatively uninformed in the field, but it will also provide a useful compendium of formulas and tables to serve as a handbook for those who are more sophisticated in the field. It does not aim to be a comprehensive text on microwave theory and therefore can hardly be faulted for any lack in this area. However, the value of such a handbook is enhanced if it provides more

than a minimum amount of theoretical background, and in this respect the present edition represents a major improvement over the previous one. This is true of the entire book, but as an example, we might note chapter 4, on microwave linear networks. (This is not the title of the chapter, which is unnecessarily unwieldy.) This chapter treats its subject much more comprehensively than the second edition. Matrix notation has been incorporated, all the usual network representations are considered, and there is a more complete coverage of topics. Deschamps' work is included (his work was not considered in the second edition, even though his results had been published several years previously). Similar comments could be made about other chapters.

This more comprehensive coverage and more sophisticated treatment make the third edition of considerably greater interest to those of us who do not wish to learn the material from the handbook but who do wish to have a fairly complete reference volume.

There are certain omissions, for example, nothing on the measurement of periodic circuits, and very little on cavity perturbation techniques, which for certain applications are of great importance. The choice of topics, of course, is largely a result of the authors' own experience, particularly for more specialized techniques, and it is not likely that anyone would try to learn such specialized techniques from a handbook. For the more standard measurements, it is a satisfactory reference source.

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## Organic Chemistry

**Oxidation Mechanisms.** Ross Stewart. Benjamin, New York, 1964. xi + 179 pp. \$7.50.

Among the more common reactions in organic chemistry are those that involve oxidation and reduction, but despite their importance, very little work on the mechanistic pathways had been done prior to 1945. The publication of Westheimer's investigations on the chromic acid oxidation of isopropyl alcohol (in 1949) and the publication, at about the same time, of work on

other oxidation reactions by Criegee, Waters, and others has spurred an increased activity in this field in recent years. A few reviews that deal with a single aspect of the field have appeared, but until this year no comprehensive coverage of most common oxidation reactions had been published.

Ross Stewart is well qualified to write a monograph on oxidation reactions, because he has worked in this field for a number of years and has published a number of important papers dealing with permanganate and chromic acid oxidation. On reading his book, one is impressed with the insight that he has brought to the many unresolved problems and by his clear discussion of the present state of each reaction treated.

Stewart begins with a general discussion of the mechanisms by which oxidation may occur and the methods by which the reactions may be studied and then considers the versatile oxidants, chromic acid and permanganate, in considerable detail. The second half of the book is concerned with other transition metal oxidants, glycol cleaving reagents, nonmetal oxides and acids, and peroxy compounds. A final chapter is devoted to mechanisms of some biologically important oxidation reactions.

The material treated should prove valuable to most organic chemists regardless of whether their primary interest is in synthesis or in mechanisms of reaction. Although the volume is largely devoted to the mechanisms of reactions, a large body of information that should be useful in devising synthetic schemes is included. This small, inexpensive, and very useful book will be a valuable addition to any chemist's library.

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## Classification of Aurora

**International Auroral Atlas.** Published for the International Union of Geodesy and Geophysics by Edinburgh University Press, 1963 (order from Aldine, Chicago, Ill.). 18 pp. Plates. \$8.75.

Description of a phenomenon as transient and as variable as the aurora is much easier if it can be done with the help of an accepted scheme of

classification. Responsibility for providing such a scheme has been accepted by the International Association of Geomagnetism and Aeronomy, part of the International Union of Geodesy and Geophysics. The first atlas and classification were produced by a committee under Carl Störmer about 30 years ago and have been in use since that time. The atlas has been out of print for many years, and the association decided that, instead of reprinting the atlas, the question of a revision should be considered. The present atlas is the result of the deliberations of a committee chaired by James Paton.

It is clear that the revision of an accepted classification system should be undertaken with caution, because, when a few years have elapsed, the understanding of a large body of literature may be hampered. In this case, if the two systems are simply compared, there is no doubt that the new is superior; confusion due to the changeover will certainly exist but should not be serious, for the most important terms of the old system have been taken over with nearly the same meanings. These can be qualified by the addition of as many as five symbols, some of them with subscripts. In my opinion, this full panoply of qualifiers will practically never be used by most observers, but they do no harm and are always available if needed. Here is an example from the text: a rayed band is called RB in both the old and the new systems. For a more detailed description, the symbol RB3c would be used, giving the intensity and the color. The intensity scale is essentially the same as the old International Brightness Coefficients, increasing by one unit for each factor of ten in the physical intensity. The complete symbol would be  $a_s R_s B_3 c$ , in which  $a_s$  specifies a certain kind of activity, with rays moving rapidly along the form, and  $f$  tells us that the form is fragmentary. The subscript on  $R_s$  refers to a very long ray, at least several hundred kilometers high.

A useful innovation is the form called *veil* (V), a rather extensive, uniform luminosity which frequently covers a large fraction of the sky. Unwary observers have often reported that no aurora was present when in actual fact a bright veil was covering the whole sky. *Patch* (P) replaces the old diffuse surface; this may lead to some confusion, because in the old system P meant "pulsating," now replaced by the qualifier *pulsing* ( $p_1-p_2$ ).

The main body of the atlas is a collection of excellent photographs that illustrate the classification. There are 32 in black and white and 4 in color; the latter are outstanding in that they show truer colors than any others I have seen. Because all-sky photographs may distort some forms and make classification difficult, a collection of these is given also. To give an idea of the rapid motions in an auroral display, a sequence of 1-minute exposures covering 24 minutes is included. Study of all these pictures will give one as good an impression of an auroral display as can be had without being on the spot.

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## Chemical Kinetics

**Catalysis and Inhibition of Chemical Reactions.** P. G. Ashmore. Butterworth, Washington, D.C., 1963. xii + 375 pp. Illus. \$14.95.

Almost everyone who works in chemistry comes into regular contact with problems relating to the mechanisms of processes influenced by catalysts and inhibitors. For this reason it is particularly valuable to have an up-to-date review of the status of this subject. The field of catalysis and inhibition is a very wide one which embraces surface reactions, gas reactions, and enzyme-catalyzed processes. Despite this there are many general principles that relate to all of these topics, and a unified treatment of these principles, with applications to the various branches of kinetics, is therefore very welcome.

Ashmore, an original and careful research worker in chemical kinetics, is admirably qualified for the difficult task he has undertaken. The result of his labors is an authoritative, scholarly, and lucid review of the field of catalysis and inhibition. He places the subject sharply in perspective as an important branch of kinetics and brings out the fundamental principles very clearly. The subject is developed in a logical fashion, with an introductory chapter in which catalysis is carefully defined and the general mechanisms of catalytic action discussed. The next three chapters are on homogeneous catalysis; the first and largest deals with acid and base catalyzed reactions, and