Polonium and Its Lower Homologues

K. W. Bagnall, the author of the small but excellent book **The Chemistry of Selenium, Tellurium and Polonium** (Elsevier, New York, 1966. 208 pp., illus. $13), is well known for his research in the field of polonium chemistry. This research stimulated his interest in the lower homologues, selenium and tellurium, and thus qualifies him as an authority on all three elements.

The book is divided into seven chapters, each followed by a carefully selected set of references. The first chapter deals with the discovery and occurrence, the isotopes, and the uses, health hazards, and handling problems of the three elements. Chapter 2 covers their separation, purification, and determination, in a concise and interesting manner. The modifications of the elementary substances, the hydrides, selenides, tellurides, carbonyl compounds, and nitrides are discussed in chapter 3, and chapter 4 deals with the oxides, oxo-acids, sulfides, and sulfur-oxo-acids of selenium, tellurium, and polonium and with the seleno- and telluro-polythionates. The fifth chapter is concerned with interesting aspects of the chemistry of the fluorides, chlorides, bromides, iodides, and pseudohalides. Chapter 6 gives a discussion of the nitrates, sulfates, chromates, phosphates, and other salts formed with oxo-acids. The last chapter gives an introduction to the better-known classes of organo-compounds of the three elements; these include the alkyl and aryl compounds and their halogen derivatives, chalconium salts, organo-oxides, organo-acids, organo-selenocyanates, and some heterocyclic compounds.

I was pleased to see the structural aspects of the elements and their compounds well covered, with the inclusion of many diagrams of molecular structures and tables of crystallographic data. Unfortunately the space group symbols are carelessly set up in quite a number of cases, and this may cause trouble to some readers.

Errors, other than typographic ones, appear to be few. Among those which might be pointed out to beginners are the inclusion of compounds of the type Se_2X_2 among bipositive compounds on page 90, the listing of both selenium and bromine among the decomposition products of $SeBr_4$ at 70° on page 118, and the statement "Optically active selenonium and telluronium compounds in which four different groups or atoms are bonded to the central selenium or tellurium atom are well known . . ." on page 171. However, on pages 168–69 it is correctly stated that selenonium and telluronium salts are "stable ionic compounds," and an ionic formulation for phenylmethylselenetine bromide given on page 169 shows only three bonds to selenium.

I recommend this book highly to those who seek an introduction to the chemistry of these interesting but somewhat neglected elements. The wealth of references supplied should prove useful even to those who are already somewhat familiar with the field.

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Optical Phenomena in the Atmosphere

Observation of the twilight sky not only gives the observer the pleasure of a beautiful and variable natural phenomenon but also provides him with a powerful method for studying the structure of the earth's atmosphere. In **Twilight: A Study in Atmospheric Optics** [Translated from the Russian edition (Moscow, 1963) by Richard B. Rodman. Plenum, New York, 1966. 368 pp., illus. $20] Georgii Vladimirovich Rozenberg has covered the entire range of twilight, and some daytime, sky phenomena in terms of mathematical models of the atmosphere. The book is, however, hard to read for a person who is interested in a single topic, for symbols are used freely in the text and it is sometimes hard to find where a given symbol is defined.

We would expect the volume to become rather controversial, since it exhibits a curious bias. For example, it discounts the evidence for an aerosol scattering layer at 20 kilometers, rejecting the work of Bigg and others. The very strong criticism of Hulbert's researches is to be deplored. On page 252 the author characterizes much of Hulbert's work on the twilight sky as having "ruinously affected further progress," yet his conclusions a few paragraphs later hardly justify this denunciation. Perhaps the author is showing evidence of Soviet conformance to authoritarianism. As young researchers in the 1950's, we were greatly stimulated by our contacts with Hulbert, and we certainly did not feel that his or any other person's conclusions were a proscription on our research activities, as the author seems to imply was the case. On the other hand, Rozenberg may only be setting the scene for his concluding remarks that "it has been the author's aim to rehabilitate the twilight method of sounding the upper atmosphere."

The work is certainly a valuable addition to the systematic study of twilight phenomena as long as one realizes that it may not be as authoritative as its author feels it to be. As a matter of fact, a controversial book may provide more stimulation to new research than one that succeeds in neatly tying up the solutions to all current problems.

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Mathematics

Robert R. Phelps's **Lectures on Choquet's Theorem** (Van Nostrand, Princeton, N.J., 1966. 136 pp., illus. Paper, $2.50) renders more accessible recent work by Gustave Choquet and by various other mathematicians following in his footsteps. The prerequisites are some rudimentary acquaintance with convexity and with functional analysis (Riesz representation, Hahn-Banach theorem, Krein-Milman theorem, and necessary background to these in measure theory and topology).

A good deal of the material consists of applications of particular interest to readers in quite different fields. These include such topics as completely monotone functions, weak convergence, function algebras, ergodicity, and Markov processes. The last two sections deal also with order relations for measures, a topic of interest in statistics, and give suggestions for further reading. Treatment of all these matters is not actually needed, except for illustration, but it helps to give a much richer understanding of the main ideas of the text.