Lobelia inflata in which thirty minor alkaloids were detected (*Ann.*, **608**, 88 (1957)). New alkaloids, sedinine and sedinone, have been isolated from *Sedum acre* (*Ber.*, **91**, 2803 (1958); **92**, 1001 (1959)). The absolute configuration of sedamine has been deduced (*Ann.*, **626**, 134 (1959)). It is difficult to reconcile recent work on ricinine biogenesis (*J. Chem. Soc.*, 2921 (1959)) with earlier studies. The absolute configuration of conhydrine and its pseudo isomer has attracted much attention (*Tetrahedron*, **6**, 103 (1959), and ref. cited therein). The biosynthesis of the hemlock alkaloids has been investigated (*Z. naturforsch.*, **13b**, 691 (1958); *Biochem. J.*, **64**, 259 (1956); **73**, 556 (1959)). New precursors of the pyrrolidine and piperidine rings of nicotine and anabasine have been discovered (THIS JOURNAL, **80**, 2162, 4393 (1958); *J. Biol. Chem.*, **233**, 939 (1958)) and work is progressing on the origin of the pyridine ring (*Chemistry & Industry*, 1270 (1957), 1477 (1958); *Science*, **129**, 1485 (1959); *J. Biol. Chem.*, **235**, 800 (1960)) although the final story is not yet told. Smokers should read *Chem. Revs.*, **59**, 885 (1959), and feel humble when they learn of the large number of compounds with which they pollute our air. New alkaloids which contain the pyridine ring are anibine (THIS JOURNAL, **79**, 4507 (1957); **80**, 2263 (1958); *Monatsh.*, **89**, 391 (1958)), α-picoline (*Nature*, **181**, 636 (1958)), actinidine (*Bull. Chem. Soc.* (*Japan*), **32**, 315, 1155 (1959)), muscopyridine (THIS JOURNAL, **79**, 5558 (1957)), and homostachydrine (*Can. J. Chem.*, **36**, 339 (1958)).

Chapter 5. The tropane alkaloids, by G. Fodor: Since the author is one of the most active workers in this field he has been able to present an up to date account of these alkaloids. Details of the synthesis of scopolamine (*J. Chem. Soc.*, 3461 (1959)) and tropinone (*ibid.*, 2433 (1959)) have now been published. The absolute configuration of tropic acid (*Tetrahedron Letters*, No. 7, 16 (1959) and its biogenesis (THIS JOURNAL, **82**, 612 (1960)) have been elucidated. Structure LXXVIb for dioscorine has been confirmed (*ibid.*, **80**, 6146 (1958); *J. Chem. Soc.*, 615 (1959)). New tropane alkaloids have been isolated (*ibid.*, 1406 (1959), *Naturwissenschaften*, **46**, 492 (1959)). N.m.r. has been used to investigate the configuration of the N-methyl group of the tropane bases (THIS JOURNAL, **81**, 5456 (1959)). The conversion of scopinium bromide to *m*-hydroxybenzaldehyde has been investigated (*ibid.*, **81**, 5800 (1959)).

Chapter 6. The Strychnos alkaloids, by J. B. Hendrickson: This is a lucid and entertaining account of the recent chemistry of strychnine, vomicine and their derivatives, culminating in Woodward's brilliant synthesis. Since this chapter was written there has been much clarification of the alkaloids of the S. American *Strychnos* species. There is insufficient space here to list all the significant references; however, the dedicated reader can start with part 41 of a series of papers by Karrer's group (*Helv. Chim. Acta*, **43**, 141 (1960)) and trace his way back through this fascinating story. Key references to other workers in this field are *J. Chem. Soc.*, 736 (1960), and THIS JOURNAL, **81**, 2256 (1959). A recent review has also appeared (*Prog. Chem. Nat. Prod.*, **17**, 183 (1959)). It is extremely interesting to note that caracurine VII is identical with the Wieland–Gumlich aldehyde (formula CCXXIII, p. 188). The structure of gelsemine finally has been established (*Tetrahedron Letters*, No. 4, 1, 6 (1959)).

Chapter 7. The morphine alkaloids, by G. Stork: Recent work on the stereochemistry and synthesis of morphine, codeine and thebaine has been admirably described and the excellent structural formulas make it easy to understand the many rearrangements and displacements which occur with these alkaloids. Pseudomorphine has been shown to be 2,2'-bimorphine (*J. Chem. Soc.*, 2574 (1959)). Robinson's biogenetic scheme for morphine has been confirmed by the use of tracers (THIS JOURNAL, **81**, 3948 (1959); *Chemistry & Industry*, 364, 977 (1958); *Z. naturforschung*, **14b**, 52 (1959)).

Chapter 8. Colchicine and related compounds, by W. C. Wildman: Many of the perplexing reactions of colchicine have now been clarified and several minor alkaloids have been isolated and their structures determined. The structures of the lumicolchicines are remarkable and an analogous photochemical transformation has been realized with a γ-tropolone (THIS JOURNAL, **80**, 6685 (1958)). The total synthesis of colchicine has been achieved (*ibid.*, **81**, 6341 (1959); *Angew. Chem.* **71**, 637 (1959)). Recent results obtained by the reviewer (unpublished) have shown that Belleau's hypothesis for the biogenesis of colchicine is untenable.

Chapter 9. Alkaloids of the amaryllidaceae, by W. C. Wildman: This is the longest chapter of the book (124 pp.) and its length is indicative of the intense activity in this field. In six years more than 55 new alkaloids have been isolated from this family and the structures of many of them have been elucidated by the author. As a result, a very authoritative chapter has been written containing material obtained by personal communication with other workers in this area. Structures have since been deduced for amaryllidine, parkamine (*Ber.*, **92**, 2578 (1959)), criwelline (*Chemistry & Industry*, 1415 (1959)), powellamine (*Naturwissenschaften*, **46**, 475 (1959)), montanine and coccinine (Abstracts of the 136th Meeting of the Amer. Chem. Soc., Sept., 1959, p. 48-P). The stereochemistry of lycorenine, lycorine and related compounds has been elucidated (*J. Chem. Soc.*, 3736 (1959)).

The subject index is inadequate, taking up only seven pages. Furthermore many of the entries such as β-picoline, puberulic acid and *Nicotiana* serve no useful purpose. On the other hand, important entries have been omitted. There is considerable discussion of the biogenesis of hyoscyamine in chapters 1 and 5, but the reader will find no clue to this in the index. I was amazed to discover the single page reference to morphine—a page apparently picked at random.

In spite of these deficiences this is a book which all chemists working with natural products will wish to possess. The structural formulas are consistently well drawn throughout the book which is remarkably free of typographical errors (one was detected!—ajmaline (p. 210) lacks a methyl group). My order for Volume VII of "The Alkaloids" is already placed with the publishers.

DEPARTMENT OF CHEMISTRY
UNIVERSITY OF MINNESOTA
MINNEAPOLIS 14, MINN.

EDWARD LEETE

Statistische Theorie der Materie. Band I. **Allgemeine Grundlagen und Anwendungen auf Gase.** By Dr. KLAUS SCHÄFER, ord. Professor für physikalische Chemie an der Universitat Heidelberg. Vanderhoeck und Ruprecht, Postfach 77 (20b) Gottingen, Germany. 1960. xi + 282 pp. 16 × 23.5 cm. Price, DM. 38.00.

The Preface to this book explains that it originates in a course of lectures. It is obviously intended as a textbook for physical chemistry students at what we would call a moderately advanced level, seniors or first year graduate students. In addition to this usefulness, however, it contains a large number of equations and tables that are a handy reference for the advanced worker.

Since the main interest in America is likely to be the latter, only some short comments about the nature of the book as a text are called for in this review. Opinions about the ideal method of teaching statistical mechanics to students are a little like opinions about religion. Every specialist in the field has his own ideas, and there is little scientific basis for judgment on the values.

This book presents a comprehensive outline of the methods of obtaining the thermodynamic functions of gases from the "atomistic" structure of the molecules. It does so without reference to the more general (Gibbs) treatment of systems of interacting molecules, which is necessary in the treatment of liquids and solids. However, it does not limit itself to perfect gases without interaction between molecules. There is a chapter (chapter IV), on the treatment of temperature-dependent quantum states, which can only occur with interacting molecules. A section of this chapter treats ionic solutes in a solution. Similarly the last chapter includes two sections on virial coefficients which again imply interaction.

This reviewer would prefer, in a textbook, or a course, to defer these subjects until after the more general treatment of statistical mechanics had been presented. In addition this reviewer would choose to present the Boltzmann with the Bose–Einstein and Fermi–Dirac systems, rather than to isolate the Boltzmann "statistics" as the initial subject of introduction.

Quite obviously, since the treatment of this volume is limited to gases, that is to an approximation in which the molecules are treated as independent except in so far as they are influenced by the average field of their surrounding neighbors, the full beauty of the development of statistical mechanics is not included. The development given is not one that would appeal to an axiomatic mathematician. The fuller treatment is promised, by implication at least, in the second volume.

With these critical comments, which are obviously matters of taste rather than of substance, there is little that one can say except to praise. The book is clearly written in concise and logical language. The physical, as well as the mathematical, reasoning is well presented. The typography is pleasing.

One of the noteworthy characteristics of the book which will make it of great usefulness to many is the wealth of detailed approximation developments. These are given for such cases as the partition functions for anharmonic oscillators, as well as for the contributions to all the thermodynamic functions, U, F, C, S, etc. Similar equations are given for polyatomic molecules, including the "interaction anharmonicity" of different degrees of vibrational freedom, as well as for rotation at high temperatures and its interaction with vibrational degrees of freedom, and for "hindered" rotation. A very minor criticism of detail is that, without explanation, the German Gothic ℭoſ, 𝔖in is used for the hyperbolic functions usually written cosh, sinh in America. However even the most unwary user is not apt to use trigonometric functions, and a check of the meaning is very easy from the equations.

Particularly the fourth chapter, on temperature-dependent quantum states, which this reviewer might have preferred to see deferred for pedagogical reasons to the second volume, is an extremely useful chapter. It is a very welcome treatment of a rather confusing subject, done with clarity and skill.

Finally it should be mentioned that there is an excellent appendix of tables.

ENRICO FERMI INSTITUTE FOR NUCLEAR STUDIES
UNIVERSITY OF CHICAGO JOSEPH E. MAYER
CHICAGO 37, ILL.

The Physical Chemistry of Metallic Solutions and Intermetallic Compounds. Proceedings of a Symposium held at the National Physical Laboratory on 4th, 5th, and 6th June, 1958. Symposium No. 9. Volumes I and II. National Physical Laboratory. Her Majesty's Stationery Office, York House, Kingsway, London, W.C. 2, England. 1959. xli + 649 pp. 17 × 23.5 cm. Price, £1. 17s. 6d.

These two volumes comprise the papers and edited discussion presented at the Symposium which was held at the National Physical Laboratory on June 4, 5 and 6, 1958. The general topics discussed were: 1. Experimental Methods, 2. Metallic solutions, 3. Intermetallic Compounds, 4. Phase Transformations, 5. "Practical Applications" Thermodynamics and Phase Diagrams, 6. "Practical Applications" Gas–Metal and Slag–Metal Reactions, 7. "Practical Applications" Non-Stoichiometry in Metallic Compounds.

Many of the scientists in the world who are concerned with the general subject of this Conference attended and contributed papers which summarized their particular field of interest or which presented results of recent research. Because of the scope of the Conference it was necessary to limit, to some degree, the length of the papers and also the time for presentation. The discussions reflect the severe curtailment of the presentations, and free exchange of viewpoint was somewhat difficult to obtain due to this pressure.

In spite of the limitation on length, the papers reviewing the various sub-divisions of the subjects, as listed above, are of considerable value to people who would like to know more about the particular experimental methods and research results which are not immediately in their area of interest. These papers also provide excellent sources of references. The research papers cover a number of experimental methods and the results therefrom. Included are calorimetry, the structure and thermodynamic properties of metallic solutions, bonding in intermetallic compounds, and the properties of some metallic phases such as viscosities and densities.

In contrast to the large amount of information presented what might be called the theoretical aspect of this topic, sections dealing with practical applications include relatively few contributions. As was noted in the discussion, this is very disappointing. It would appear that it is easier to measure a property or the behavior of a substance or a system than it is to apply this understanding to the interpretation of the behavior of a material or to the analyses of complex systems such as are encountered in engineering work. If the publication of this volume serves no other end than to point up the fact that there is much to be done in the area of application of our understanding, and that this application requires perhaps even more ingenuity than does the generation of the actual basic information, the publication will have served a purpose.

DEPARTMENT OF METALLURGY
MASSACHUSETTS INSTITUTE OF
TECHNOLOGY JOHN F. ELLIOTT
CAMBRIDGE, MASSACHUSETTS

Nouveau Traité de Chimie Minérale. Tome XVIII. **Complexes du Fer, du Cobalt et du Nickel.** Edited by PAUL PASCAL, Membre de l'Institut, Professeur honoraire á la Sorbonne, Masson et Cie., 120, Boulevard Saint-Germain, Paris 6, France. 1959. xxxix + 944 pp. 17.5 × 25.5 cm. Price, Broché, 9.500 fr.; cartonné toile, 10.700 fr.

The bulk of this volume deals with the coördination complexes of iron, cobalt and nickel. Each element is treated in a different manner.

The chapter on iron (383 pages) by Clement Duval conforms to the general format of the series. The chemistry of iron in two of its oxidation states (+2 and +3) is described insofar as it is covered by the compounds formed with the halogens and with the oxy-anions of the elements of periodic groups III to VII. With the exception of the halogen compounds, binary compounds are treated in another volume. The presentation is for the most part uncritical. Compounds are listed: a brief statement of the method of preparation and properties is given. Sometimes the formula is written as a complex such as $Na_8[Fe_2(P_2O_7)_3]$ and in other cases in Berzelian style $3Na_2S_2O_3 \cdot FeS_2O_3 \cdot 8H_2O$. A vast amount of useful information is presented, and there are almost three thousand references.

The iron carbonyls and nitrosyls are competently discussed in a separate section by A. Michel. Only one reference is made to cyclopentadienyl compounds which presumably are described in another volume. About 120 references cover this topic up to 1958.

In contrast to the treatment given the iron compounds, the chapter on cobalt by Paul Job deals exclusively with the coördination complexes of cobalt(III). It is fortunately so organized that the inadequate index is not necessary. Cationic complexes are arranged in order of decreasing coördination with nitrogen and with regard to magnitude of the charge. Anionic complexes are in order of increasing charge. Polynuclear complexes are accorded a similar treatment, but in addition the nature of the bridging group is taken into consideration. The carbonyl and nitrosyl complexes are succinctly described by J. Amiel in 21 pages with 95 references. In the chapter on cobalt the references are placed at the end of each section, and the convenience of this system is realized when it is abandoned by Raymonde Duval in his chapter on the complexes of nickel (149 pages). All of the 966 references are given at the end. The organization in this case is based on the oxidation state of nickel from zero to four. A substantial section deals with the so-called inner complexes which nickel forms with two molecules of many bidentate organic ligands.

The advantages of a topical treatment of descriptive chemistry over the systematic organization based on the periodic table are revealed by comparing the chapters on the complexes of cobalt and nickel with the chapter on iron salts and complexes. The latter, however, provides a place to record the existence of many compounds which have not been certainly classified. This useful function is perhaps the main reason that treatises such as this are by no means outmoded.

DEPARTMENT OF CHEMISTRY
UNIVERSITY OF CONNECTICUT
STORRS, CONNECTICUT ROLAND WARD