

subjects in a logical fashion that is relatively free of overlap, because the authors represent diverse viewpoints. This diversity of viewpoint, rather than detracting from the book, is its greatest strength. Readers from other areas and interested students will find the volume excellent for learning about this intriguing field. Specialists will be familiar with much of the material, but there should be one or more chapters that present either new information or a different viewpoint.

The traditional concepts of vapor-phase growth are reviewed by W. B. Campbell. In each case Campbell discusses the extension of theory to practice. The third chapter, by R. S. Wagner on the vapor-liquid-solid (VLS) mechanism of growth, is written in a most interesting manner. Wagner reviews the many observations which led him with his colleague Ellis to hypothesize the VLS mechanism. He then describes numerous experiments which confirmed the VLS concept and revealed the reasons behind branching and kinking and other unusual growth features. Finally, he summarizes the 11 or 12 materials grown by the VLS technique, and notes that he is convinced that the principles can be applied to almost any material. Wagner, has so clearly outlined the basic principles in scientific terms that the successful application to almost any material will lie primarily in the originality of individual investigators.

The completeness of the chapter by Wagner is matched in Sutton's chapter on the principles and methods for fabricating whisker-reinforced composites. Each chapter is more than 60 pages long, and Sutton's shares the logic of Wagner's in emphasizing basic scientific principles underlying the methods. The manufacturer of whisker composites consists of several steps, which include whisker processing (coating and beneficiation), whisker alignment, incorporation in the matrix, and finally consolidation of the combination. If the process is to be useful there must be subsequent steps involving shaping the composite to the final form and then joining it to other structural components. The problems are unending, and yet the subject is presented in a clear and concise manner with scientific insight into potential solutions to each of the problems. Again, the author has made the fabrication of whisker composites more a science than an art.

All things considered, this volume contains much information about whiskers and the initial attempts to

use them. The book should be valuable in stimulating the development of these materials and in opening up new areas of application.

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Infinite Power Series

The Padé Approximant in Theoretical Physics. GEORGE A. BAKER, JR., and JOHN L. GAMMEL, Eds. Academic Press, New York, 1970. xiv, 382 pp., illus. \$17.50. Mathematics in Science and Engineering, vol. 71.

In a variety of physical and chemical problems, one obtains solutions in the form of infinite power series,

$$\sum_{n=0}^{\infty} a_n z^n.$$

Sometimes, the series will diverge for all z or for some z of interest or will converge slowly for some z of interest. In such cases, one is tempted to try a more devious method of "evaluating" the sum than straightforward summing. The Padé approximant is such a method—one tries to approximate the series with rational functions rather than polynomials. Explicitly, $f^{[N,M]}$ is the unique ratio of a polynomial of degree M to one of degree N with the property

$$f^{[N,M]}(z) - \sum_{n=0}^{N+M} a_n z^n = O(z^{N+M+1}).$$

The folklore is that the approximants as N and M both go to infinity (usually with $N-M$ fixed) converge very well. This is based on a host of numerical examples and a small number of theorems which are either variants of a remarkable theorem of Stieltjes (1894!) or very weak.

Because of the power of the Padé techniques and their wide applicability, there is a real need for a book that can serve as an introduction to the method. Unfortunately this collection of articles edited by Baker and Gammel, two of the most distinguished Padéists, does not meet the need. To the novice, the heart of the book is the lead article by Baker. Like his famous 1966 review (which is better for the novice than this book), it has readable discursive sections but muddled statements and proofs of theorems (I am still unable to unravel the statement of theorem 5 on page 8). One is also likely to be confused by the fact that four of the

articles are little related to the Padé method (chapters 3 and 7 are really on the moment problem; chapters 4 and 11 are on non-Padé summability methods). Finally one is disturbed by the lack of scope of the book: almost half the articles are on quantum scattering. Particularly missed is a discussion of the application to cooperative phenomena (one can picture a dandy article by Fisher or by the London group who have squeezed so much from perturbation series); the only mention of cooperative phenomena is by Baker, who limits his discussion to his own work.

If one does not evaluate the book as a pedagogic text, one must view it as a collection of research papers. On this score, it fares as do most such collections. It is spotty—there are some very good articles (the article by Langhoff and Karplus comes to mind) and several trivial ones (chapters 3 and 6 come to mind).

In summary, I am not much pleased with this book. But, alas, it is all we have. If a student wanted to delve further into the Padé method after reading Baker's review article, I would reluctantly send him to this volume.

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Books Received

Advances in Inorganic Chemistry and Radiochemistry. Vol. 13. H. J. Emeléus and A. G. Sharpe, Eds. Academic Press, New York, 1970. xiv, 584 pp., illus. \$26.50.

Advances in Steroid Biochemistry and Pharmacology. Vol. 2. M. H. Briggs, Ed. Academic Press, New York, 1970. x, 480 pp., illus. \$19.50.

Advances in Virus Research. Vol. 16. Kenneth M. Smith, Max A. Lauffer, and Frederik B. Bang, Eds. Academic Press, New York, 1970. x, 478 pp., illus. \$24.

Affirmation and Dissent. Columbia's Response to the Crisis of World War I. William Summerscales. Teachers College Press, New York, 1970. xiv, 160 pp. \$7.25.

Analysis of Feedback Systems. Jan C. Willems. M.I.T. Press, Cambridge, Mass., 1971. xviii, 188 pp., illus. \$15.

Analytical Calorimetry. Vol. 2. Proceedings of a symposium, Chicago, September 1970. Roger S. Porter and Julian F. Johnson, Eds. Plenum, New York, 1970. xvi, 460 pp., illus. \$19.50.

The Analytical Chemistry of Nitrogen and Its Compounds. C. A. Streuli and P. R. Averell, Eds. Wiley-Interscience, New York, 1971. Part 1, viii, 430 pp., illus; part 2, viii + pp. 431-764, illus.

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