BOOKS

Dynamics of Polymeric Liquids: Vol. II Kinetic Theory, by R. Byron Bird, O. Hassager, R. C. Armstrong and C. F. Curtiss, 253 pages, $26.95, (Wiley, New York) 1977.

I have been convinced for about a decade that the main way we shall make usable progress in rheology is to combine the molecular viewpoint with that of continuum mechanics; neither separately has proved to be of much use to the engineer. A major obstacle to advancing this point of view has been the lack of books in this area; only the work of Lodge on concentrated solutions has so far been available. Dilute solutions, which form the main subject of this book, have not been much discussed from a non-chemist's viewpoint. Thus there is really no book known to me of comparable scope to the present one, and it fills a definite need. It is concerned with deriving the macroscopic rheological properties of dilute solutions of various mechanical objects in incompressible Newtonian fluids. The "objects" are made up of point spherical resistances, rigid rods, and springs, and, depending on one's conceptions of what molecules look like, one can convince oneself that one is dealing with models of real molecules. The book is very suitable to learn from; the steps in the arguments are laid out carefully. In fact, the amount of computations that must have been done by the authors in checking and correcting other work and in producing the many corollary exercises to the text is stupendous; when one adds to that the vast amount of original work included as well, one can appreciate that this book is highly novel; it has not been possible merely to copy the work of others. The first three chapters deal with bead/spring, bead/rod dumbbells and chain models respectively and are very well done; the fourth chapter is really a gem and shows how to compute rheological properties for very complex molecules; as an example applications to various protein molecules are given. The fifth chapter is a very general discussion which seeks to underpin the theory already used; I found it very hard going and it is certainly not elementary. The final chapter deals with network theories of the Lodge type and I feel it is rather too condensed to be really effective. One might complain that solutions of finite-sized spheres, ellipsoids, and so on, are ignored; I have already said that the last chapter is too condensed, sometimes back references to volume I are awkward, and certainly in this volume the question of the relation between real molecules and the models is not discussed fully. However, obviously one has to call a halt somewhere to the inclusions, and I believe this book will be mandatory reading for those who would like to embark on some research in this satisfying area; I confidently predict that it will attract new workers to this still relatively small field.

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Mathematical Methods in Chemical Engineering, 2nd Edition, V. G. Jenson and G. Jeffreys, Academic Press (London), $19.50. Publication date: December, 1977, 599 pages.

This edition is only trivially different from the first edition. Styles and tastes in education vary much more rapidly than is generally appreciated and nowhere is this more evident than in chemical engineering, which has changed in the last thirty years from a descriptive, empirical subject to one with a rational quantitative mathematical base. This distresses many old boys but it is a fact and no amount of distress is going to change it. Efforts to introduce mathematical notions into chemical engineering were the early books of Sherwood and Reed and Marshall and Pigford. Most of us were brought up on Sokolnikoff, Schelkunoff, Marganau and Murphy, and a host of others which now slip my mind. These all had a style that reflected J. E. Littlewood's simile (quoted in G. H. Hardy, *Pure Mathematics*) "of a missionary talking to the cannibals." They presented the bare bones of the subject without the structure or body necessary for understanding or, in fact, for anything other than everyday nuts and bolts problem solving. Current courses in applicable mathematics should be substantially different from this and the reason for this is twofold. Firstly, students by the time they are in the fourth year of a B.S. program, and, certainly by the time they are graduate students, are mathematically sophisticated by the standards of twenty-five years ago. Secondly, the subject of mathematics itself has changed drastically during that time. Many pure mathematicians are interested now in subjects whose realizations are very close to physical and chemical problems. Mathematics itself has a unity in functional analysis which it did not present earlier, and can be more interesting intellectually and in practice to engineers, and, further, with the right pedagogy, easier to understand since it need not be treated as a set of disjoint subjects. After all, a linear operator is a very general thing.

With this brief sermon complete it is apparent that my view is that applicable mathematics can be lectured on, written about, and discoursed on in a much more interesting, enlightening, and useful way than is presented in this book. Without going into detail this book follows the old nuts and bolts format and in addition is old-fashioned in its approach and subject matter. It treats too many subjects, some of which should have been omitted, and a great number which should have been brought up to date.

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