mal style wanders dangerously close to the fey, as in the occasional dialogues between the two authors and in the somewhat alarming title.

Notwithstanding its defects, the book capably fills a void between technical works and the few popularized materials science books. Many future polymer scientists will meet the intellectual love of their lives in its pages.

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The Theory of Intermolecular Forces

Anthony J. Stone
Oxford U. P., New York, 1996.
264 pp. $90.00 hc ($50.00 pb)
ISBN 0-19-855884-8 hc
(0-19-855883-X pb)

Intermolecular forces (or, equivalently, intermolecular interactions or intermolecular potentials) determine properties of the (nonmetallic) condensed phase, of atomic and molecular clusters and of biomolecular aggregates. Their importance was recognized by Richard Feynman who, in the introduction to his *Lectures on Physics*, included a description of intermolecular forces in his "single sentence [to be] passed on to the next generation of creatures" if our civilization were to be destroyed by some cataclysm. In the not-too-distant past, our ability to predict intermolecular potentials quantitatively was very limited; theoretical investigations of condensed matter, clusters and biomolecules had to rely on very simplified models of the interactions, often on the simplest possible one: the hard-sphere model. Anthony Stone's monograph, *The Theory of Intermolecular Forces*, covers the theoretical developments that changed this unsatisfactory situation.

The modern theory of intermolecular interactions was introduced soon after quantum mechanics was conceived. The fundamental 1930s work by Fritz London is discussed in most texts on quantum mechanics. In recent decades our knowledge of intermolecular potentials improved dramatically, due to the increased capabilities of computers and the development of powerful theoretical methods for solving the many-electron problem.

These newer developments have not been covered adequately in the existing monographs, and Stone's book fills this gap admirably. He does not review, however, the numerous papers appearing each year that are devoted to calculations on specific systems. A very thorough compilation of such results up to 1984 can be found in *Intermolecular Complexes* by Pavel Hobza and Rudolf Zahradnik (Elsevier, 1988).

I believe that Stone's book will be very popular in the upcoming years, as the first-principles approach to the condensed phase and molecular clusters, based on *ab initio* computed intermolecular potentials, becomes more widespread. Stone provides quite broad coverage of intermolecular interactions. The presentation is most extensive in description of the long-range perturbation approach, which has been the author's field of research. Here, Stone gives all the detailed formulas, including appendixes listing explicit forms of the angular functions appearing in this theory. This is the first such compilation available, and for this reason alone, *The Theory of Intermolecular Forces* will be a useful reference for anybody working in this field.

Stone discusses various aspects of the so-called distributed long-range expansions. For the interaction of larger molecules, the familiar single-center multipole expansion of intermolecular potential is so quickly divergent that it is of no use except for very large intermolecular separations. The solution to this problem, developed within the last decade or so (with major contributions from Stone and his coworkers), is to divide molecules into smaller fragments and introduce the multipole expansion between the fragments. Perhaps even too much space is devoted to electrostatic and induction (polarization) interactions in the multipole approximation, compared to that devoted to the short-range components of the interaction energy and the associated exchange symmetry adaptation problem. This may give a somewhat biased perspective of the field.

The book is very well written. The style is light and the reading enjoyable, and I noticed only a few minor errors. Further, although it is a part of the Oxford University Press Monographs on Chemistry series, the book is in fact closer to a textbook than to a typical monograph. This feature is a significant asset: For most if not all of the included subjects, Stone provides a very elementary introduction, often accompanied by simple examples. In places where full explanations would be too long, Stone always gives good references to the literature.

The combination of a didactic approach and full and deep coverage of the subject matter makes the book accessible to advanced undergraduates and, at the same time, very useful for seasoned researchers in the field.

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Theory of Interplanetary Flights

G. A. Gurzadyan
Gordon and Breach, Newark, N.J., 1996. 383 pp.
$120.00 hc ($44.00 pb)
ISBN 2-88449-074-4 hc
(2-919875-15-9 pb)

Theory of Interplanetary Flights by G. A. Gurzadyan takes the reader through the processes and applications of basic and advanced astrodynamics in a clear and concise manner. While emphasis is given to the commonly known and much-published fundamentals of perturbation theory, it is enlightening to read a fresh approach that presents many real-life and current examples. Topics addressed range from manned and unmanned spaceflight to astronomical aspects of binary star systems and comets, as well as stability and chaos in the Solar System.

The introductory chapter, on the historical aspects of astrodynamics, is informative and unique, as it presents the problem of the determination of orbits from the viewpoint of early astronomers, including their difficulties and the advances each made. The theoretical and operational experience of the author comes through clearly on each topic, as he takes the reader from a beginning set of equations and examples to the most stringent and complex methods.

In each subsequent chapter, Gurzadyan develops the equations as building blocks for the reader. The description and development of the formulas of Kepler, Newton, Lagrange and many others are commendable in that the author clearly describes the reasoning, limitations and logic behind each. The presentation of perturbation theory is well documented and easy to follow. Transitions of two-body formulation and the essence of perturbation functions to other chapters flow smoothly. I found the explanation of the N-body and restricted three-body problems and the related material clearly discussed and comprehensible.

Most equations are derived in an easy formulation and then uniquely applied in the subsequent text for a complete illustration of their use. I found the derivation and discussion of the Jacobi integral and null velocity very notable—the best that I have read. While the focus of the book is interplanetary transfer trajectories, the author provides material on multiplanetary flights, gravity assist and change of influence by planetary bodies. Treatment is also given to such advanced topics as solar sailing, low-

thrust propulsion and periodic orbits in the Earth–Moon system. Additionally, there is an appendix on the treatment of the canonical equations of celestial mechanics.

The text is structured for both reference and teaching. It places emphasis on the fundamentals of astrodynamics and perturbation theory, while effectively communicating the subject in a manner not found in other texts. Since the material in the book is comprehensive, the book can be used in the same domain as the second edition of *Fundamentals of Celestial Mechanics* by J. M. A. Danby, published by Willmann-Bell (1988). I will definitely use this book as a reference. There is a sprinkling of minor text errata that does not detract significantly; I trust that they will be eliminated in a subsequent printing. I encourage anyone interested in a clear understanding of the history and theory of astrodynamics to read this book.

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The Fusion Quest

T. Kenneth Fowler
The Johns Hopkins U. P., Baltimore, Md., 1997. 250 pp. $29.95 hc ISBN 0-8018-5456-3

Central to this graceful book are the images of farsighted Prometheus (thinker about the future) and his shortsighted brother, Epimetheus (thinker about the present), whose muddled failure to provide people with fur, claws or other natural endowments for survival moved Prometheus to compensate by stealing fire from heaven. In revenge, Zeus chained kindly Prometheus to a mountain to have his liver daily devoured by an eagle—an apt metaphor for the fusion community, which has coped with serious erosion of its budget in recent years.

Ken Fowler, the author of *The Fusion Quest*, is one of the Promethean heroes of the epic struggle to make controlled fusion a reality. He gives ample credit, with warm personal anecdotes, to many colleagues. He tells of the origins of the dream, from the 1929 paper by Robert d'E. Atkinson and Fritz G. Houtermans, who first pointed out that fusing light elements would release enormous amounts of energy, to the premature announcement by Argentine President Juan Peron that controlled fusion had been achieved in the laboratory, to the establishment in the US and elsewhere of national programs systematically to develop controlled fusion, first by magnetic confinement in stellarators, tokamaks,