

advanced graduates would benefit from it. *Dark Cosmos* is an entertaining, if uneven, tour through our newfound dark universe.

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Intermolecular Interactions

Physical Picture, Computational Methods and Model Potentials

Ilya G. Kaplan
Wiley, Hoboken, NJ, 2006.
\$180.00 (367 pp.).
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Understanding why solids and liquids exist in nature is at the heart of many theoretical and experimental studies in physics, chemistry, and biochemistry. In *Intermolecular Interactions: Physical Picture, Computational Methods and Model Potentials*, Ilya Kaplan begins by describing the main intermolecular forces: electrostatic, resonance, induction, dispersion, and exchange. But he goes further in his presentation. He also treats magnetic interactions and offers an extended description of relativistic retardation effects generally absent from other recent texts on the subject. He explains the concept of anapole moments (page 64), which are quite exotic and largely unknown, even to specialists, but are detectable in accurate experiments. His explanation is one of many nice features in the book.

Kaplan, a renowned specialist in the field at the National Autonomous University of Mexico, has written a very good and useful text, with new aspects and up-to-date references. The book's general structure is similar to Anthony Stone's *The Theory of Intermolecular Forces* (Clarendon Press/Oxford U. Press, 1996), which was, until now, the most recent reference book on the subject.

Chapter 2, despite its title, "Types of Intermolecular Interactions: Qualitative Picture," contains a detailed and clear description of electric moments, their interactions, and such force ingredients as valence repulsion, induction, and dispersion—including resonance interactions and the interactions between macroscopic bodies. Chapter 3 presents in detail the practical problems in calculations of intermolecular interactions. The author gives a systematic presentation of various multipole ex-

pansions, which are valid under various distinct conditions, and his analysis of their convergence is a strong point of the book.

In chapter 4, Kaplan carefully treats the nonadditivity of the intermolecular interactions. The second part of the chapter pertains to what is known as the symmetry-adapted perturbation theory, which is applicable for medium intermolecular distances, when the overlap of the electron clouds of both molecules can no longer be neglected. The fifth and final chapter presents a review of intermolecular potentials that serve to mimic the electronic energy, a potential energy function for the motion of the nuclei. For flexible molecules, the function has a large, sometimes astronomical, number of local minima. That important problem, largely ignored in past textbooks, is also discussed in the chapter, and Kaplan's book is the first I know of that covers it. No other source in the literature gives such a detailed description of the intermolecular potentials. Although the chapter is less interesting to me because of its very long list of model potentials, I nonetheless appreciate its near completeness.

The book's three appendixes are devoted to, respectively, fundamental physical constants and a conversion table of physical units; necessary mathematical apparatus such as vector and tensor calculus and group theory; and methods of quantum chemistry. Topics covered in the third appendix include the Hartree-Fock method; the density-functional method and others that take into account electronic correlations; and perturbation theory, including the Møller-Plesset theory, asymptotic expansions, and the Padé approximants. The appendixes will certainly be valuable to readers who use modern software packages for calculating electronic properties of molecules.

I read Kaplan's book with pleasure and curiosity and found only a few inconsistencies. For example, on page 2, R_0 is not the distance where the attractive and repulsive forces compensate. On page 191 Kaplan writes that the solution for the Morse potential is approximate; but, in fact, equation 5.23 is exact. Overall, *Intermolecular Interactions* is a competent and modern presentation of the current knowledge about intermolecular interactions, which are ubiquitous in the physical and life sciences. The book is worthy to be placed on the shelf of any researcher,

teacher, or graduate student working in those fields of science.

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The Star Wars Enigma

Behind the Scenes of the Cold War Race for Missile Defense

Nigel Hey
Potomac Books, Washington, DC,
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On 23 March 1983, President Ronald Reagan challenged US scientists to render "nuclear weapons impotent and obsolete" by developing full-scale ballistic missile defenses. The program became known as the Strategic Defense Initiative (SDI), and that speech spawned two passionate debates during and after the cold war. The first was whether the goal was achievable; the second, whether SDI caused the demise of the Soviet Union.

In *The Star Wars Enigma: Behind the Scenes of the Cold War Race for Missile Defense*, Nigel Hey wades into the middle of both debates. A science and technology writer and a retired senior administrator of Sandia National Laboratories, Hey attempts to answer those questions by interviewing key players on Reagan's national security team and in the R&D community, consulting the published literature, and talking with several influential Russian scientists. His answer to the first question: Very few people, including federal officials and scientists in the R&D community at the heart of the missile defense program, thought it was possible to achieve Reagan's vision. Hey answers the second question by concluding that SDI was not the only dagger that killed the Soviet beast, but it was important.

The book tells the political story of the creation of SDI and its role in ending the cold war. Hey gives no serious discussion of the science or technology of SDI. Therefore, the book will not help readers understand the fundamentals of missile defense or how lasers, for example, work in that context. Nor does it address some of the potentially serious consequences of missile defense,

