Book Review

The Theories of Chemistry By Jan C. A. Boeyens (University of Pretoria, South Africa) Elsevier: Amsterdam. 2003. xiv + 556 pp. $190.00. ISBN 0-444-51491-0.

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Nonlinear Dynamics in Polymeric Systems. Edited by John A. Pojman (University of Southern Mississippi) and Qui Tran-Cong-Miyata (Kyoto Institute of Technology). American Chemical Society (Distributed by Oxford University Press): Washington, DC. 2004. xi + 352 pp. $145.00. ISBN: 0-8412-3850-2.

This book is based on presentations given at the *Nonlinear Dynamics in Polymeric Systems* symposium held in Boston, MA in August 2002. It brings together topics in the fields of polymer science and nonlinear dynamics in 24 chapters, which are organized under the following headings: Background, Gels, Frontal Polymerization, Interfacial Systems, Phase Separation, and Oscillatory Systems. An author and a subject index complete the book.

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This book is written for both graduate students and researchers who are interested in the mathematical and physical foundations of chemistry. The author reports cogently that much, if not most, of contemporary mathematics and physics has not greatly impacted modern chemical reasoning. To that end, the author explicitly says in the Introduction that the book "reviews a fair amount of forgotten results that point to new lines of enquiry." Words uncommon or unknown to most chemists abound: Bessel functions, Lie (continuous) groups, and quaternions from mathematics; Higgs field and particle, the Lorentz transformation, Noether's theorem, and solitons from physics. The author additionally asserts that "the chemist of this century will have to be familiar with the concepts that appear to be new, even alien, at present." He is right: all science evolves in terms of concepts, data, technology, and vocabulary. To this end, a collection of topics from mathematics and physics is extensively discussed with exquisite care, detail, and rigor. And indeed, while essentially all of these topics have been reviewed in other texts, it is useful to find them presented in one volume. Many of these topics originated from the research and pedagogy of physicists, mathematicians, and occasionally engineers, and thus may be less approachable to chemists.

Although the various discussions in this book may be educational, there is still little indication of how these concepts are applicable to contemporary chemistry. This will perhaps be more evident in a second volume or to the reader who can apply the theories discussed to his or her research or studies. In that regard, the book might have been more sensibly entitled "Theories for Chemistry". Regardless, this reviewer, on behalf of the theoretical chemistry community, found himself insulted by exhortations such as (i) "Despite a lot of posturing the electron of chemistry is still the electron of Lewis, ..." (ii) "Instead of a theory to elucidate the important unsolved problems of chemistry, theoretical chemistry has become synonymous with what is also known as *Quantum Chemistry* [author's italics]. The discipline has patently failed to have any impact on the progress of mainstream chemistry." (iii) "The EH [extended Hückel] method epitomizes a theory in crisis." (iv) "The failure of quantum theory to provide a convincing account of molecular shape is one of the important outstanding scientific problems at the end of the 20th century. ...[M]olecular mechanics ... represents the only successful technique for theoretical optimization of molecular trial structures." While the author presents some documentation for what he admits on occasion to be iconoclastic views, this reviewer emphatically disagrees with them.

The book is accompanied by occasional footnotes and a bibliography of 133 entries. In general, the former was highly useful. The latter was less useful because of its lack of current references: only one journal citation entry was dated after 1995 and it was from the author's own work published in 2000. There are very few references to the primary literature.

It is good to see continuity between the literature of research and pedagogy. However, there are examples of discontinuities among the definitions: for instance, Rydberg appears as atom, state, and unit, and Hartree appears along with the names of Fock and Slater, but never as a unit. This is surprising because most theoretical chemical articles, or at least computational quantum chemical studies, use Hartrees and not Rydbergs for total molecular energies.

Let me close with what is perhaps most painful about the book. If a goal of Boeyens in writing this monograph was to educate the student and beginning professor, as well as the more established researcher, educator, and practitioner, then the price of $190 appears excessive for this photoreproduced book. The publishers should offer a paperback version at a significantly reduced price if the author's goals are to be realized. Summarizing, this reviewer can hardly recommend this book as a "good buy".

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