emphasizes improved high-spatial-resolution satellite observations of the ocean and ultrafast and powerful supercomputing as supports and complements to experimental efforts. His several predictions include a new generation of ocean and wave forecast models and better understanding of complex nearshore dynamics and the coupling of microscale-wave-related processes with various air–sea exchanges.

The Science of Ocean Waves is a truly remarkable achievement. It has a great chance to become a standard text for students, scientists, weather and ocean forecasters, engineers, climate modelers, and anyone else whose curiosity or professional interests relate to ocean waves.

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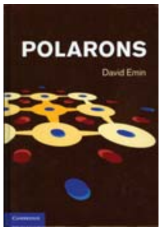
Polarons

David Emin
Cambridge U. Press, 2013. $110.00
(212 pp.). ISBN 978-0-521-51906-9

The polaron was proposed by Lev Landau in 1933 to describe an electron moving in a dielectric crystal whose atoms displace from equilibrium to screen the electron charge. Large polarons, whose radii are much larger than the lattice constant, are described by a Hamiltonian named after Herbert Fröhlich. Small polarons, whose radii are of the same order of magnitude as or even smaller than the lattice constant, were first studied in the late 1950s by Theodore Holstein, Jiro Yamashita, and Tatumi Kurosawa. Holstein introduced a simple model for short-range electron–phonon interactions that lead to the hopping motion of what would be identified as small polarons.



Polarons come in several varieties, including acoustic polarons, piezopolarons, and polarons in organic materials. Polaron-like states can even be found in Bose–Einstein condensates. Both the large- and small-polaron pictures are used for the interpretation of experiments on optical, thermal, and electromagnetic response in crystals.

With *Polarons*, David Emin aims to present a relatively simple, mostly empirical introduction to the relevant physics. The first section qualitatively describes the formation of several polaron states: large and small polarons, molecular polarons, and large and small bipolarons (bound polaron pairs). Its final subsection, on magnetic polarons, gives a nice explanation of colossal magnetoresistance in ferromagnetic semiconductors. The book's second section addresses manifestations of polarons in the physical properties of crystals. The third section treats extensions of the polaron concept, including the presently hypothetical bipolaron superconductivity.

Emin is at his best discussing small-polaron phenomena, a subject to which he has devoted most of his own research, some of it in collaboration with Holstein. But in treating large-polaron physics, the book is sometimes less accurate: In particular, chapter 9 has a flawed description of the theory of large-polaron optical absorption at strong coupling. The book fails to discuss recent optical experiments indicating that Fröhlich polarons—as well as small polarons—can act as charge carriers in strontium titanate. Emin omits some key methods and topics in polaron theory, including Richard Feynman's path-integral variational approach; Sin-itiro Tomonaga's translation-invariant description used by T. D. Lee, Francis Low, and David Pines; Nikolai Bogolyubov's field-theoretic treatment; and the diagrammatic quantum Monte Carlo method refined by Andrei Mishchenko and colleagues. Frederick Brown and coworkers' seminal experiments on Fröhlich polarons are also missing.

Polarons mainly addresses graduate students, but it can also be useful for advanced researchers, particularly experimentalists. I would recommend the book as a qualitative introduction to the physics of small polarons. As such, it nicely complements the existing literature.

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In Search of the True Universe

The Tools, Shaping, and Cost of Cosmological Thought

Martin Harwit
Cambridge U. Press, 2013. $50.00
(393 pp.). ISBN 978-1-107-04406-7

When I was 12, my father told me that one of the best things to do when going to sleep is to rehash the day. "Go over