

thereafter, the variable of choice for describing sound appears to be "signal amplitude" or "amplitude." Sound pressure and sound pressure level are avoided; the decibel scale is defined in terms of sound intensities. On page 49, we are told that the jerky motion of a bowed violin string is called a sawtooth because of its shape, and that "the air surrounding this motion moves in the same way, creating a sawtooth sound wave." On page 52, we are told, without qualification, that "it is the fundamental frequency that defines the pitch of the signal." Power is defined simply as work per unit time. In spite of these minor flaws, the first two introductory chapters provide a useful introduction to what is to come.

Chapter 4, which covers static properties of speech sounds, examines the acoustic features of individual phonemes. Consonants are classified by manner of articulation grouping (stops, fricatives, nasals, liquids and glides) and are richly illustrated with waveforms and spectrograms. In the case of vowels, frequencies of the first three formants are given, and they are appropriately placed in vowel formant space.

Chapters 5 through 8 consider phonetic variations of sounds in context: the way in which adjacent sounds merge into one another, how they affect one another and how they vary according to the context in which they occur. Chapter 5 discusses transitions between vowels and glides. Chapter 6 focuses on transitions between vowels and obstruent consonants. The topic of chapter 7 is transitions between vowels and sonorant consonants, while transitions between one consonant and another are discussed in chapter 8. The treatment is very thorough, and these chapters are arranged so that the reader can easily look up a particular topic of interest.

Chapter 9, on acoustic variability, is concerned with variations in American English speech that stem from factors other than the combination of sounds. These may be due, for example, to different speaking rates or to different degrees of stress of syllables in a word. Dialectal variations are carefully considered, both regional dialects and socially differentiated varieties (such as Black American English and Cajun English). Some characteristics of speakers of English as a second language are also considered.

This book is likely to appear on the shelves of most speech scientists and serious students of speech acoustics. It deserves to be read by a

larger audience, however, because it has much to teach us, beginners and experts alike, about the language we use every day. Best of all, it is written in a style that is easy to read and understand.

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A Nuclear Free World: Desirable? Feasible?

**Edited by Joseph Rotblat,
Jack Steinberger and
Bhalchandra Udgaonkar**
*Westview, Boulder, Colo.,
1993. 228 pp. \$49.95 hc
ISBN 0-8133-8718-3*

In the view of many defense analysts, the potential spread of nuclear weapons to a number of additional states now poses the major security threat to world peace, perhaps even greater than that of the superpower confrontation during the cold war. It is also widely believed that current approaches to stopping proliferation—from increased technology controls to more militaristic counter-proliferation programs—will at best only delay the inevitable.

The 26 experts from 11 nations who contributed to this important new book argue that the only effective solution to the nuclear threat is one that is not being seriously considered: the abolition of nuclear weapons. Throughout the nuclear era, similar proposals, beginning with the Baruch Plan in 1946, fell victim to the cold war. The authors suggest that it is now time to reconsider the prospect, and to this end they present thought-provoking papers that examine the desirability and feasibility of a world free of nuclear weapons.

The collapse of the East-West confrontation robs nuclear weapons of much of their previous justification, and many defense analysts (though not all) now agree with the authors that nuclear weapons should have no purpose beyond deterring the use of other nuclear weapons. And, as the book points out, this function too would disappear if there were satisfactory assurance that no state possessed nuclear weapons. But that, of course, is the rub.

The authors make a strong case that, if the nuclear powers were willing, new and innovative legal, technical and societal systems for control and verification could be devised and

established that would make it extremely difficult to hide or covertly produce nuclear weapons. The problem is that while the nuclear powers might see the advantages of such controls for the nonnuclear states, they may still be unwilling to truly risk a nuclear-weapon-free world, because (they would argue) no matter how severe the controls and how intrusive the inspections, there is no way to guarantee absolutely that other states are not covertly retaining or building nuclear weapons.

Two of the papers (one by Richard Garwin and another by Vitalii Goldanskii and Stanislav Rodionov) raise the possibility of a compromise that might meet the security needs of both the nuclear and nonnuclear states: the abolition of national nuclear arsenals, but with the retention of a United Nations nuclear deterrent force to guard against cheating by outlaw states. To me, the idea of reducing the nuclear threat by internationalizing nuclear weapons appears to be practical and politically realizable (although still a tough sell.) While it would not achieve complete abolition, internationalization, combined with a strong, universal control regime, could achieve the objectives of a world without nuclear arms by eliminating rivalries among the present nuclear powers and greatly reducing the possibility of further proliferation. Elsewhere in the book, however, other contributors reject this concept—even as a transition state—because it would "legitimize" nuclear weapons.

Whether or not one agrees with all its conclusions, this book performs a valuable service: It begins the important task of thinking through the specific requirements of a program to implement nuclear disarmament. While policymakers in both the East and West still seem stuck in the cold war paradigm when it comes to nuclear weapons, *A Nuclear Free World* moves beyond, initiating a much needed debate on how best to construct a more secure and peaceful world.

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The Kondo Problem of Heavy Fermions

A. C. Hewson
*Cambridge U. P., New York,
1993. 457 pp. \$89.95 hc
ISBN 0-521-36382-9*

Jun Kondo's discovery that magnetic scattering causes a logarithmic

growth in resistivity was made almost three decades ago; his findings disturbed the theoretical community and initiated an epic period of research that continues today. Regrettably, however, although a good part of our current research on highly correlated materials is founded on concepts and developments in the theory of local moments, until now there have been no appropriate texts in this field: The prospective student has been faced with the daunting task of navigating a labyrinthine trail of papers and references stretching back to the 1960s.

Alex Hewson's new book does much to alleviate this difficulty. In ten chapters it leads the reader systematically from the early development of models for magnetic ions, through a thorough treatment of the theory of the Kondo effect and mixed valence ions, to a final discussion of how these ideas impinge on current research in heavy-fermion and cuprate superconductors.

Hewson has carefully held to a domain where the theory is mature and uncontroversial. An agreeable feature of the book is the wealth of experimental figures and references that complement the theoretical development. Several detailed appendices take the reader through more involved calculations, such as the scaling theory of the overscreened Kondo model and avoid disturbing the flow of ideas in the main text. A weakness of this book is the absence of worked exercises. These would have been helpful in using the book in a graduate course and might be a useful feature of a future edition.

In his opening discussion of the early development of models for magnetic ions, Hewson begins with Friedel's concept of the virtual bound state resonance and builds to a discussion of both the Anderson and *s-d* ("Kondo") models. The second chapter is devoted to the resistance minimum in scattering off magnetic ions and Kondo's explanation of the phenomenon. Hewson carefully explains how Kondo's innocent-looking logarithmic corrections to the scattering rate confirmed Anderson's superexchange concept and initiated a renaissance of interest in the strong correlations driven by magnetic ions.

Chapters 3 through 6 take the reader through the perturbation theory of the Kondo effect, on to the concept of the renormalization group (where the analytic Anderson-Yuval and numerical Wilson approaches are covered in some detail), and ultimately show the reader how this leads to the concept of a strong cou-

pling expansion and the Fermi liquid fixed point.

The second part of the book describes developments that took place in the 1980s. Here Hewson describes two complementary developments: the exact Bethe *Ansatz* approach and the $1/N$ expansion that proved so important in early developments in heavy-fermion physics. Hewson ends these discussions with a chapter devoted to experiment, showing how beautifully the theory squares up with a wide range of experiments taken from transition metal and rare-earth systems.

The concluding chapter discusses the new developments in highly correlated materials, illustrating the way in which many of the concepts, taken from single-impurity physics, have influenced current understanding of heavy-fermion compounds. The book ends with a summary of some of the problems posed by cuprate superconductivity and the new ideas that have been proposed to explain them.

The Kondo Problem of Heavy Fermions is a concise introduction to the theory of local-moment physics. Hewson provides a thorough and reliable foundation for those interested in research in strongly correlated materials. I heartily recommend it.

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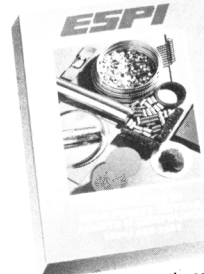
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