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Book Review

Introduction to Wave Scattering, Localization and Mesoscopic Phenomena. Second edition

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BOOK REVIEW

Introduction to Wave Scattering, Localization and Mesoscopic Phenomena. Second edition

PING SHENG
(Springer-Verlag Heidelberg 2006, 333 pp, $179.00 hardback, (ISBN 3 54029 155 5))

For any researcher working with waves in disordered media, it is crucial to have a solid reference to elementary principles with the details worked out in a complete and transparent way. This is very helpful for new students that join the group, and quite useful when preparing courses or presentations. The study of wave propagation in random media is characterized by a great deal of unavoidable technical, mathematical approaches, which in spite of their complexity do not even provide the rigorous answers. Mean field theories, diagrammatic expansions and diffusion approximations have been designed to capture the basic physics as accurately as possible, yet despite the many glorious experimental confirmations, they often leave enough room for lively debates at conferences and Summer Schools: everybody working on radiative transfer, Anderson localization or effective medium approaches knows that. Nevertheless, great principles have emerged from these calculations that have become solid guide lines to new studies.

The first edition of the book by Ping Sheng was released in 1995 by Academic Press. What I always liked about this book is that it provided *both* the global picture – the basic issues and concepts – *and* the technical calculation that is supposed to provide the approximate answer. What I did not like about the book was that it was so rapidly sold out. One of my students once came back excited from his holiday since he had finally been able to purchase his own copy in some foreign second-hand store! And between the lines of the book, the expert senses the struggle that was needed to find the right approach in a mess of unsolvable physics. How to do better than the independent-scatterer approximation in a successful effective medium theory? Is the familiar diffuse pole in wave transport robust when going beyond classical radiative transfer by incorporating superposition and interference? Does such anomalous diffusion have any relation to Anderson localization, and can we handle this by using just one parameter? Do resonances affect the transport velocity of classical waves much more than they do in electronic transport? What is the origin of non-Gaussian speckle, that seems to be long-range and that seems to govern conductance fluctuations entirely? These are typical issues discussed in Ping Sheng's book. All have been

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