BOOK REVIEWS

Selection of books for review is based on the editors' opinions regarding possible reader interest and on the availability of the book to the editors. Occasional selections may include books on topics somewhat peripheral to the subject matter ordinarily considered acceptable.

High-Energy Electromagnetic Processes in Condensed Media

Author	M. L. Ter-Mikaelian
Publisher	John Wiley & Sons, Inc. (1972)
Pages	457
Price	$27.50
Reviewer	R. H. Ritchie

High-Energy Electromagnetic Processes in Condensed Media is a high quality, specialized research monograph devoted to the exposition of processes by which electromagnetic radiation is emitted when fast charged particles interact with matter. Chapter 1 deals with bremsstrahlung and pair production on an isolated atom, while Chap. 2 covers coherent bremsstrahlung generation in single crystals. The next chapter is concerned with several aspects of particle-medium interaction upon electromagnetic yield; these include the effect of polarization of the medium and multiple scattering on bremsstrahlung yield, radiative corrections for Coulomb scattering of electrons on a screened Coulomb field, and the effect of medium absorption on radiation processes in an amorphous medium. Chapter 4 presents a thorough discussion of transition radiation—that radiation emitted when a fast charged particle approaches surfaces separating media having different dielectric permittivities or magnetic permeabilities. The last chapter, which is about twice as long as any other in the book, is devoted to the radiation emitted when fast charged particles pass through heterogeneous media.

This monograph is probably destined to become a classic review of the subject. It is thorough, clear, complete (as of *circa* 1967), and shows the hand of a real expert in the theory of the processes discussed. Although primarily concerned with theory, adequate discussions of relevant experiments are given. Emphasis is given to the high energy region, i.e., photon energies $\gg mc^2$, but emission at all energies is considered.

Much of the material included is brought together for the first time in a form easily accessible to the Western scientist. The coverage of material is extensive and well-balanced. Discussion typically begins with a lucid delineation of the main physical ideas involved in the topic to be covered. This is followed by a detailed exposition of the mathematical apparatus used. Routine details leading to the final results are omitted but the latter are presented in entirety. Limiting cases of physical interest are considered, followed by discussion of important, relevant experiments. Careful consideration of limitations to the results is given.

In the main, the mathematical approach used is that termed by the author the "quasi-photon" method. In Western literature this is usually referred to as the Weizsäcker-Williams method. It consists of replacing a fast charged particle by an equivalent set of coherent plane "source" electromagnetic waves and then computing the response of the medium to this set. It thus is approximately equivalent to the first Born approximation used in the quantum description but does not include the wave properties of the fast charged particle; nor does it account for its recoil in the photon emission process. Nevertheless, the method is quite powerful, as witness the range of problems solved in the book, and usually lends itself well to the formation of useful intuitive ideas.

A few minor faults may be pointed out. On p. 12, the statistical Thomas-Fermi atom model is used to characterize screening of a nuclear Coulomb field by atomic electrons but is introduced without any explanation or reference to the literature; also on p. 12 in Fig. 2, a velocity vector $\boldsymbol{v}$ and its negative $-\boldsymbol{v}$ are denoted by the same symbol. Some usages which may lead to a bit of confusion are that by the author of the term "flat waves" instead of plane waves, and "gliding angle" of incidence rather than grazing angle. Curiously, the author consistently misspells the name of the physicist E. J. Williams, as well as those of other Western workers. By contrast, the name of the Russian experimenter, F. R. Harutuman, is spelled in three different ways at various points in the text. The Preface implies that the coverage of material extends to 1969 and indicates that brief review of newer material is given in addenda. However, the scattering of surface waves on heterogeneities which is mentioned in connection with the experiments of H. Boersch and co-workers [*Z. Physik*, **187**, 97 (1965)] has experienced vigorous development in both experimental and theoretical aspects beginning in 1967, but is not mentioned.

It is unfortunate that the term "resonance radiation" is applied by the author to that radiation which arises when a uniformly moving fast charged particle passes through a medium whose dielectric or magnetic properties vary periodically in space. The same term is applied, beginning in the early days of atomic physics, to describe the radiation at a given wavelength emitted by an atom which has absorbed light of the same wavelength from an external source.

Despite the minor defects mentioned above, this monograph represents a valuable addition to the literature. The typography and binding are attractive and appear quite durable. It should be in the library of all serious workers in this field.

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Scattering Theory: The Quantum Theory on Nonrelativistic Collisions

Author	John R. Taylor
Publisher	John Wiley & Sons, Inc. (1972)
Pages	477
Price	$14.95
Reviewer	Marcel Coz

The scope of *Scattering Theory: The Quantum Theory on Nonrelativistic Collisions* is defined in the Preface: the book is intended for the student who wants a thorough grounding in scattering theory and has taken a one-year graduate course in quantum mechanics. The book is therefore a textbook and any judgment on its value depends on this basic fact.

As the author points out, the book results from a course he has already taught; it was quite easy for me to verify this assertion. Prof. Taylor, a careful teacher, is not afraid of pedestrian methods (see, for instance, p. 50). From time to time one finds in his text traces of the verbal style a professor uses in front of his classroom; one reads "celebrated formula" (p. 4), "celebrated connection" (p. 60), "we apply the famous trick" (p. 14).

Mr. Taylor is convinced that a rigorous treatment of the scattering problem is important and that emphasis must be given to the time-dependent formulation. I must acknowledge that he succeeds in transmitting his conviction. The sections on the scattering operator and S-matrix are excellent and justify Prof. Taylor's decision to emphasize the time-dependent formulation. Mr. Taylor is obviously familiar with the mathematical treatment of the scattering problem as it has been proposed by Jauch and his followers; I express my surprise not to see the name of Jauch[1] mentioned in a book his work has made possible. A second part deserves special compliments; it concerns the study of the analytical properties of the S-matrix.

Within the framework of a one-year course a choice must be made among the material. Nothing is therefore said on Fredholm's methods and the condition of their validity, nothing on the inverse problem, nothing on the few-body problem.

Reading the almost 500-p. volume, I have noted some inaccuracies, but not very many. To give an example of their importance, on p. 115 one finds the identity

$$(u \cdot \sigma)\,(v \cdot \sigma) = uv + i\,(u \times v)\sigma$$

Clearly this equation requires the existence of commutation relations between u, v, σ; this requirement is not mentioned. However in this case the formula is applied correctly.

I would call attention to two interesting references. With respect to p. 82, Jauch[2] has proved the existence of a Hamiltonian under the conditions of causality, homogeneity, and continuity; with reference to p. 266, M. C. Barthelemy[3] has considered the analyticity of the solutions for the Dirac equation. I would be surprised if she has not looked at the Jost solutions.

To conclude, in spite of its omissions this is a good textbook and I have enjoyed reading it. (Although I did not go over the problems at the end of each chapter, a glance convinced me of their relevance.)

REFERENCES

1. J. M. JAUCH, *Helv. Phys. Act.*, **31**, 127 (1958); **31**, 666 (1958).

2. J. M. JAUCH in *Dispersion Relations*, G. R. SCREATON, Ed., p. 203, Oliver and Boyd, Edinburgh (1961).

3. M. C. BARTHELEMY, *Ann. Inst. Henri Poincare*, **6**, 365 (1967), **7**, 115 (1967); *C. R. Ac. Sc., Paris*, **268**, 521 (1969).

Marcel Coz [Docteur-es-Sciences (State degree), Paris, 1960] was "charge de recherches" at Faculte des Sciences of the Paris University. He obtained a NATO fellowship at MIT in 1964 and came to the United States in 1966. He is currently associate professor of physics at the University of Kentucky. His field of interest is theoretical nuclear physics.

Microscopic Theory of the Nucleus

Authors	Judah M. Eisenberg and Walter Greiner
Publisher	American Elsevier Publishing Co., Inc.
Pages	519
Price	$33.50
Reviewer	Richard K. Osborn

The microscopic theory of the nucleus consists of the attempt to derive the details of the structure of many-nucleon nuclei from an assumed two-nucleon interaction. This is obviously an important task, although at the present time a somewhat frustrating one since the nucleon-nucleon interaction is not