ture (addition of lights) and subtractive mixture (due to absorption, as in filters) was not immediately recognized. It caused confusion until Helmholtz showed that neither technique of mixing could give supporting evidence to the other.

Sherman portrays Maxwell as the overriding genius who unified the field: He clearly understood the difference between the two types of color mixing (and concentrated on the simpler, additive case). He developed his light box and spinning disk of colored papers and used them to determine quantitative laws of color mixture. Further, he employed these devices to test color deficients, and he showed that they needed but two colors to match any other color. Finally he employed his basic results to demonstrate the feasibility of color photography.

Sherman is at his best when he reads between the lines of primary reference material (of which he includes an extensive list). He focuses on crucial experiments and concepts and paints a convincing picture of the motivations of the scientists involved. One shortcoming, though, is that he does not treat the other major scientific theory of color of the time, Hering's opponent-colors theory. Most modern theories of color vision reconcile and incorporate *both* the basic theories, and we can only regret that Sherman didn't extend his treatment to include Hering's idea. Nonetheless, in *Colour Vision* historians of science, the color community, and lay readers will find deep insights into the process of science and the history of color theory, especially those concerning an often unrecognized but vitally important aspect of the work of Maxwell.

Maxwell's pioneering work laid the foundations of modern colorimetry, the science of color measurment. The distinguished colorimetrist David MacAdam describes the current state of affairs in *Color Measurement: Theme and Variations*, a collection of fundamentals and selected topics confined to the physical aspects of color. (There is little or no discussion of color deficiency, color contrast or theories of color vision, for example.) The book's "theme" (Chapter 1–3 and parts of 4 and 5), consisting of a revision and abridgment of the *Handbook of Colorimetry* (1936), treats basic concepts such as lightness, purity, chromaticity coordinates, spectral reflectance curves and complementary colors; techniques such as color matching, spectrophotometry and spectroradiometry; and physical laws such as those of Planck, Beer and Bouguer. The lucid discussion of the CIE chromaticity diagram here is particularly helpful, since the powerful tool is used extensively throughout the rest of the book—the "variations."

MacAdam goes on to describe color properties of light, such as color temperature and the color rendering index, including the conventions for determining the color temperature of an arbitrary (for example, nonthermal) spectrum. He clearly differentiates between additive mixture and absorptive or subtractive mixture and shows how the chromaticity diagram can be used to predict precisely the result of an additive mixture based on the appearance of the component lights while it cannot be used to predict absorptive mixtures—spectral transmittance curves of the component colors are needed for that.

He deals more thoroughly with topics of his own research interests. This is a mixed blessing. In explaining the determination of a tristimulus value (which involves the sum over wavelength of the product of a source intensity and a particular response function), he lists table after numerical table appropriate for different illuminants and statistical assumptions. Most of this is reference material and can be skipped on first reading. Similarly, his discussion of nonlinear transformations of the chromaticity diagram is somewhat specialized. The familiar three-dimensional color systems of Friedrich Ostwald and A. H. Munsell receive only cursory treatment (a color plate would have helped the uninitiated), whereas MacAdam does a great service in explaining the recent Optical Society uniform-color scale, which he helped devise. This scale is simple, at least in theory: The three-dimensional Euclidean separation between colors corresponds to their judged similarity or difference. All four of the book's color plates are devoted to illustrating this scale, which should find wider use as a result of the treatment here.

Color Measurement contains modern terms, conventions and data useful to physicists and physical chemists concerned with color measurement, photography and lighting. Educators teaching popular courses on light and color will find both books excellent background reading.

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The research interests of David G. Stork (University of Maryland) include mathematical modeling of visual processing. He is writing an elementary text for nonscientists on light and color.

Electromagnetic Fields and Relativistic Particles

E. J. Konopinski

629 pp. McGraw-Hill, New York, 1981. $29.95

For many decades, classical electromagnetism has been a part of every physics student's curriculum in graduate school. The main features of the subject are well established; textbooks differ mainly in organization, details and the selection of applied topics. Emil Konopinski, a physicist at Indiana University, has written a book with a distinctive approach to this subject.

The main body of the text is organized in the standard way. A review of Maxwell's equations and their physical significance is followed by three chapters on static fields and a fifth chapter on the motion of nonrelativistic particles in static fields. Often a simplified argument is followed by a more complete one, with some topics being discussed more than once. For example, when Konopinski calculates the energy required to bring together two static-current loops, he first omits Faraday induction, but then introduces it to show how the additional work done in maintaining the current changes the sign of the interaction energy. A student will probably remember this point and be helped.

The novel feature of the book is that a quarter of it appears in seven supplementary chapters. Included are background mathematics (vector calculus and cylindrical harmonics), as well as everything on polarizable, permeable and finite-conductivity matter. The advantage of the arrangement is that the main text maintains the simplicity that holds when the discussion is restricted to discrete point charges and continuous charge-current distributions creating and responding to electromagnetic fields. This is probably a help to students learning field theory for the first time. (Think of the murky status of the stress-energy tensor in matter.) On the other hand, readers may be tempted to shortchange essential parts of the subject, and some topics that belong together (such as wave guides and attenuation in wave guides) are separated.

The remaining chapters describe time-dependent electromagnetism. In Chapter 6 there is a discussion of potentials and the storage and transport of energy, momentum and angular momentum. This is followed by chapters on plane waves, vector spherical waves and on radiation. The last four chapters treat special relativity, the covariant formulation, the Lagrangian formulation and radiation reaction.

Several topics are notable because they are present: the classical Zeeman effect, for example. Others are notable in their absence: There is no collection in one place of useful vector identities, integral theorems, and operators in curvilinear coordinates. The omission of Čerenkov radiation is unfortunate, especially because students building Čerenkov detectors may find the topic to be the main practical application of their course work. Green's functions are de-emphasized.

One dubious point concerns the vector potential: $q\mathbf{A}/c$ is interpreted as part of the field momentum when a static particle is present in a static electromagnetic field. This interpretation is supposed to give a physical meaning to the vector potential, and since much is made of the point, a reviewer's scepticism is perhaps relevant. In the first place, only the Coulomb gauge vector potential is related to the field momentum. Secondly, when the particle moves, $q\Delta\mathbf{A}/c$ cannot be mapped along its trajectory by finding the impulse delivered to the particle, as Eq. (5.6) shows. This is in sharp contrast to $q\Delta\phi$, which is gauge invariant and can be mapped by finding the energy delivered to the particle. The scalar potential is physical because there is an operational procedure to measure it with a test particle.

This quibble aside, Konopinski has written a valuable book, with an organization well worth trying in the classroom.

JOHN B. BRONZAN
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The Uranium People

L. M. Libby
351 pp. Crane, Russak, New York, 1979. $15.95

Reading *The Uranium People* is a little like going to the home of an aging lady to see interesting slides from her youth. Some of the slides are out of order, some are difficult to focus, for some she has forgotten exactly the where or the when. The general effect, though, is not unpleasant even while it may be occasionally confused.

Leona Marshall Libby, author of *The Uranium People*, is not, however, your run-of-the-mill aging lady. Libby became a professional scientist when women were not encouraged to enter the field (in fact, James Franck actively discouraged her). She was a member of the Chicago group that succeeded in making the historic first chain reaction. She has been a colleague and friend of almost everybody associated with the US effort to make atomic and hydrogen bombs. Her book is a collection of personality profiles and anecdotes. Here are Enrico Fermi, Edward Teller, Arthur Compton, Luis Alvarez, Edward Condon, among others. Such recollections are precious when a Who's Who of what has been euphemistically called the Defense Effort is fast becoming a Who Was Who.

Particularly valuable are Libby's memories of the Fermis. She worked with Enrico Fermi on the pile in Chicago, visited with him at Hanford and Los Alamos. Fermi was ever gallant with the ladies, and Libby was not only smart, she was good-looking as well. Enrico and Laura Fermi were extraordinarily hospitable to young people. It meant a great deal to junior colleagues to go to a party at the Fermis, and there were a lot of parties. Libby's stories about Enrico Fermi, almost a god to the physicists around him, stress his pragmatism and his humor. A remarkable teacher, he had some remarkable pupils and was, in large part, responsible for the heyday of physics at the University of Chicago immediately after World War II. Social scientists, analyzing that elusive quality, "creativity," could glean much from this book.

There is not an unkind word in the book except possibly for Klaus Fuchs, who gave information to the Soviets. Libby likes her entire cast of characters, even if in life they didn't much like one another. She likes Robert Oppenheimer; she likes Edward Teller. She likes nuclear bomb research. It is, however, somewhat surprising that her editor didn't correct her many small factual errors. It was Marlene Dietrich, not Greta Garbo, whose legs and singing were enviable; alcoholic beverages were not rationed during World War II, just hard to get; Los Alamos wives could always go on shopping trips to Santa Fe, although not much farther. But it is a sobering thought about the passage of time that perhaps no editor nowadays is old enough to remember such trivia.

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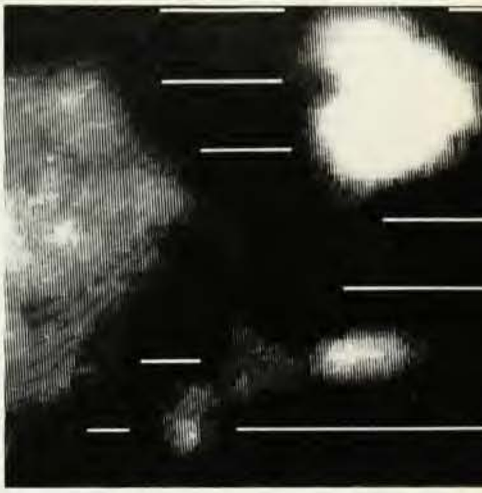
Physics in Nuclear Medicine

J. A. Sorenson, M. E. Phelps
419 pp. Grune & Stratton, New York, 1980. $39.50.

Physics in Nuclear Medicine provides an entirely adequate textbook for nonphysicist workers in this rapidly growing and important field, an excellent beginning text for radiological physicists and a useful collection of basic concepts for all. The book should be of particular value in the growing number of academic programs aimed at training medical and physical personnel in radiology and nuclear medicine.

The first three chapters treat elementary atomic and nuclear physics: atomic physics to the Born atom, and nuclear physics in simple descriptive form. Modes of radioactive decay are particularly well presented for a book of this type. The authors present copious details on exponential decay and on multiexponential decay and curve stripping. The examples are particularly useful in this area. To cite one case, I would guess that most workers would have to doodle for a few minutes to come up with the carrier-free specific activities of I^{131} and Tc^{99m}.



A scan of heart, liver and pancreas taken by a positron emission tomograph, an apparatus with which *Physics and Nuclear Medicine* is concerned. The brightness indicates the amount of N^{13} presence—originally administered as N^{13} L-glutamate—in an organ. (Photograph courtesy Memorial Sloan-Kettering Cancer Center.)

Chapters 4, 5 and 6 are clear presentations of radiation detection, electronic instrumentation and counting statistics. Classical detectors are well covered while solid-state detectors receive brief mention. The important topic of counting statistics is well presented. The authors devote adequate detail to production of radionuclides but treat the interaction of radiation with matter superficially. The remainder of the book contains a potpourri of topics, including radiation dosimetry, pulse-height spectrometry, counting systems, radiation safety, and health physics. Radiation dosimetry is well presented as is material on the gamma camera. However, the general coverage of imaging systems is not entirely satisfactory. In particular, the material on emission tomography is disappointing, particularly considering the prominent role of one of the authors in this field. However, a thorough presentation might well take another volume.

Altogether, the book is carefully prepared and well organized. It is a pleasure to read.

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The Tunnel Effect in Chemistry

R. P. Bell
222 pp. Chapman and Hall, London, 1980. $39.95

Convincing evidence for the presence of quantum mechanical tunneling was for many years a kind of "Loch Ness mon-