Sakharov's original approach to a new theory of gravitation is described by Stephen Adler: "The Einstein action is not a fundamental action at all, but rather is an induced effect [due to, in Sakharov's words], 'the metrical elasticity of space' resulting from quantum fluctuations of the matter fields." Adler and others in the West have recently been striving to build, from such ideas, a renormalizable field theory of gravitational phenomena in which the gravitational and unification scales are related to one another.

To summarize, the book is an impressive testament to the scientific creativity of one of the major theoretical physicists of our time.

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Radiological Imaging: The Theory of Image Formation, Detection, and Processing

H. H. Barrett, W. Swindell
Academic, New York, 1981. 2 Vols. $55.00

Diagnostic radiological physics has grown in the last decade from a field based on photographic film to one including sophisticated images generated by analog and digital computers. Unfortunately, the literature describing the new technologies has been sparse and hidden in engineering libraries. Several new books attempt to fill this gap. Perhaps the best of these is the pair of volumes reviewed here.

In *Radiological Imaging*, Harrison Barrett and William Swindell attempt to fill two needs: to "prepare the student to do research in radiological imaging" and "to teach general image science within a radiographic context." Any attempt at fulfilling both these purposes is fraught with dangers. This text, however, is an excellent attempt. Used as a companion to the more standard medical and radiological physics texts, which are woefully inadequate on modern imaging theory, it can bridge the gap between physics graduate training programs and engineering programs and be a major contribution to both.

The first volume introduces the clinical setting for imaging problems and then, in individual chapters, analyzes linear-system theory, random processes, their applications to radiographic imaging and finally to detectors. What is lacking in basic dosimetry and mathematical function theory is discussed in four excellent appendices that should be understood before beginning study of the text.

Weaknesses in the text include the lack of problems for practice, brief statements about the "comparable quality" of analog and digital computed-tomography images (which is very

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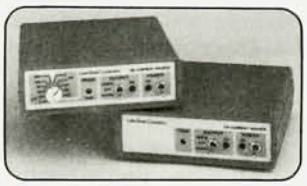

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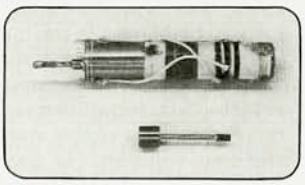

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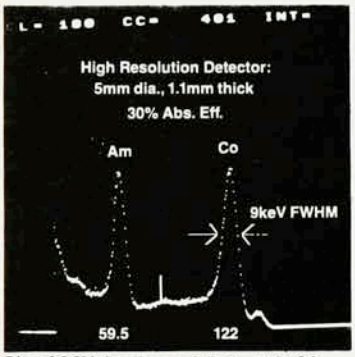

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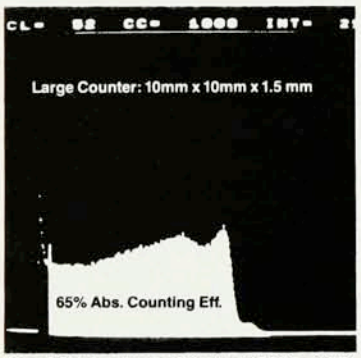

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questionable), a few minor inconsistencies in definition (for example, film speeds given in two different sets of units in adjacent chapter sections), and the use of kidney imaging instead of heart imaging in the discussion of gated studies (in the context of motion artifacts). Cardiac studies, a major portion of clinical nuclear medicine imaging, are totally ignored in this volume, even though the authors are apparently very familiar with nuclear-medicine equipment (their explanations of this equipment are exceptionally clear). Finally, examples of clinical CAT scans to illustrate the discussions of computed tomography would have been a welcome addition.

These minor deficiencies are totally outweighed by the text's excellent coverage of many important theoretical and practical topics, its clarity in exposition and example, and its personable style. The authors' approach is shown, for example, in their discussion of collimators: "Our goal in this section is therefore not to use the mathematics to understand the pinhole camera, but rather the reverse—to use the pinhole camera to demystify the mathematics."

The second volume of the set dealing with computed tomography, coded apertures, 3-D techniques, noise and scattered radiation is the more difficult of the two volumes. It goes into more mathematical detail than the first (and includes a fine section on holography and its relation to multiplex imaging and coded apertures), but retains its clear pedagogical approach. The authors continually compare calculation and imaging techniques with earlier discussions, thereby reinforcing understanding. This approach is followed throughout.

This set of books should be a valuable tool for physicists already working in medical areas and for any physics or engineering student considering a medically oriented career. Moreover, because the explanations of imaging techniques, random processes and autocorrelation are superior to those contained in most undergraduate engineering texts, these books can also aid the beginning engineering student.

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new books

Atomic, Molecular and Chemical Physics

Electron–Atom and Electron–Molecule Collisions. Proceedings of a Workshop, Bielefield, May 1980. J. Hinze, ed. 354 pp. Plenum, New York, 1983. $49.50

Intramolecular Dynamics. Proceedings of the Fifteenth Jerusalem Symposium on Quantum Chemistry and Biochemistry, March 1982. J. Jortner, B. Pullman, eds. Reidel (US dist. Kluwer, Boston), 1982. $74.00

Landolt-Bornstein Numerical Data and Functional Relationships in Science and Technology. New Series. Group II. Atomic and Molecular Physics. Vol. 14. Supplement to Vols. II/4 and II/6. Molecular Constants Mostly from Microwave, Molecular Beam, and Electron Resonance Spectroscopy. Subvol. a. J. Demaison, A. Dubrille, W. Hüttner, E. Tiemann. 788 pp. Springer, New York, 1982. $520.00

Proceedings of the International Symposium on Quantum Chemistry, Theory of Condensed Matter, and Propagator Methods in the Quantum Theory of Matter. Flager Beach, Florida, March 1982. (International Journal of Quantum Chemistry) P. W. Löwdin, Y. Öhrn. eds. 674 pp. Wiley, New York, 1982. $89.95

Advances in Atomic and Molecular Physics. Vol. 18. D. Bates, B. Bederson, eds. Academic, New York, 1982. $64.00. *compendium*

Particles, Nuclei and High-Energy Physics

Introduction to High Energy Physics. Second Edition. D. H. Perkins. 437 pp. Addison-Wesley, Reading, Mass., 1982. $24.50. *second-level text*

Neutron Sources for Basic Physics and Applications. S. Cierjacks, ed. 349 pp. Pergamon, New York, 1983. $65.00

Landolt-Bornstein Numerical Data and Functional Relationships in Science and Technology. New Series. Group I. Nuclear and Particle Physics. Vol. 9. Elastic and Charge Exchange Scattering of Elementary Particles. Supplement to Vol. 1/7 and Extension to High Energies. Subvol. b. Pion Nucleon Scattering. Part 2. Methods and Results of Phenomenological Analyses. G. Hohler. 601 pp. Springer, New York, 1983. $384.00

Introduction to the Quark Model of Elementary Particles. Vol. 1. Quantum Numbers, Gauge Theories and Hadron Spectroscopy. D. Flamm, F. Schöberl. 372 pp. Gordon & Breach, New York, 1982. $73.50. *text*

Dynamics of Nuclear Collective Motion. High Spin States and Transitional Nuclei. Proceedings 1982 International Symposium Mt Fuji. K. Ogawa, K. Tanabe, eds. 538 pp. Institute for Nuclear Study, Tokyo, Japan, 1982. *no price stated*

Proceedings of the First International Conference on Nonpotential Interactions and Their Lie-Admissible Treatment. University of Orléans, January 1982. J. Fronteau, R. Mignani, H. C. Myung, eds. Four Vols. 1947 pp. Hadronic Press, Nonantum, Mass., 1982. $50.00 each vol.

Optics and Acoustics

Advances in Infrared and Raman Spectroscopy. R. J. H. Clark, R. E. Hester, eds. 384 pp. Wiley, New York, 1982. $112.00. *compendium*