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For applications in the U.V. such as Cerenkov counting, the 9813QB with a quartz (fused silica) window is available. S-20 variants for laser detection and similar applications can be obtained with Pyrex or quartz window (9816B and 9816QB). In addition, there are 10 and 12 dynode versions in both the bialkali and S-20 cathodes. All types can be furnished capped with the standard B-20 base, or with the low loss B19A teflon socket.

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implanted layers (L. Csepregi, J. W. Mayer and T. W. Sigmon, *Phys. Lett.* **A54** 157, 1975). These are some of the prettiest demonstrations of ion implantation and channeling techniques, now leading to an understanding of the crystal-amorphous interface.

The authors are quite cognizant of the fact that they have omitted the burgeoning subject of implantation into materials other than semiconductors. Ion implantation has been successfully employed to modify the properties of superconductors, optical materials, catalysts and surfaces that are subject to wear or corrosion. Any property of matter that is surface-sensitive is fair game for implantation. Although the technological importance of implantation in these areas has not been established, there is no doubt that some of the science is taking shape. For example, ion implantation is a highly non-equilibrium process, and in the past year connections have been established between metastable alloys produced by ion implantation and those formed by the more conventional rapid quenching techniques such as splat-cooling.

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Space and Time in the Modern Universe

P. C. W. DAVIES
232 pp. Cambridge U. P., New York, 1977.
\$13.95 clothbound, \$5.95 paperbound

As is stated on the cover, this book will appeal to undergraduates both in and out of the physical sciences, as well as to scientists and philosophers who would like to review some modern developments on such topics as time reversal and quantum ideas associated with black holes.

At first sight one might ask, "Who needs another elementary account of space and time, especially with a preface that explains powers of ten?" However, P. C. W. Davies, who is a lecturer in applied mathematics at King's College, London, demonstrates in the first few pages that he is a professional. His knowledge of modern physics together with the clarity of his writing produce an excellent non-mathematical book of the sort one might use for popular-type (but serious) courses in "The Nature of Time" and similar topics. (At New Paltz, for example, we have such a freshman course, which has been quite popular for four years now.)

Very briefly, the first two chapters deal with the absolute space and time of Newton and how these two apparently different entities were seen, in special relativity, to be part of a higher entity. In chapter 3 Davies asks why some things—

such as atoms—seem to persist in their motions, clock-like, whereas people die and cars rust. He considers time asymmetry (compare the harmonic motion of a simple pendulum, for instance, with the irreversible behavior of a lighted match) and goes on to a non-mathematical discussion of the Boltzmann H Theorem.

Davies then examines space and time from the point of view of a freely falling observer (chapter 4), along with the principle of equivalence and the distortion of space-time by gravity. While discussion of such material normally makes no contribution to the average physicist's knowledge, the account is commendably well written, especially for people who (thus far) have only vague ideas about such material. Davies includes space-time in collapse, and of course he goes on to the "old-hat" subject of black holes and the Schwarzschild radius. But there is an excellent section on quantum ideas in general relativity and on Stephen Hawking's work on thermodynamics, on singularities, and on the quantization of the gravitational field.

The last three chapters of the book look in a challenging way at stability and instability in the universe, the three basic Friedmann cosmological models and Mankind's existence. There are very interesting short discussions of the Wheeler-Feynman absorber theory and of order and disorder in the universe, with examples drawn from Thomas Gold's ideas on recontracting Friedmann universes and John Wheeler's speculations on a gradual changeover in direction of time-asymmetric processes.

In the cosmology chapter's section on non-standard cosmologies, I do have a minor complaint: There was no mention of the Gödel rotating models. I would also object that this book on time makes no mention of "chronons."

The last sections of the book include sensible discussions of exobiology ("to date no subject matter...!"), why the universe is "big," religion, and mind and perception in the universe. Altogether, a very interesting book.

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The Structure of the Universe

J. NARLIKAR
264 pp. Oxford U.P., New York, 1977.
\$12.00 clothbound, \$4.50 paperbound

In the past few years there has been a tremendous explosion of interest in the subject of cosmology; the origin, evolution and nature of the universe in which we live. This explosion has been stimulated by observational discoveries ranging from quasars, pulsars and x-ray sources to the universal background radiation. Closely

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