that the band theory of solids is not even introduced until the last chapter, about 100 pages later. The fact that semiconductors are not Fromhold's area of expertise is easily deduced from an earlier paragraph in the section on metal–insulator–metal structures which reads: "Typically the energy gap in an intrinsic semiconductor is of the order of a few multiples of the thermal energy ($k_B T \simeq 0.025$ eV) at $T = 300$ K), instead of having values exceeding an electron volt or so as is the case for good electrical insulators."

Fromhold is a well-respected, highly honored physicist. I wish that he had taken the time to write a good quantum mechanics text.

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Analysis, Manifolds and Physics. Revised Edition

Y. Choquet-Bruhat, C. DeWitt-Morette
Elsevier, New York, 1982. $29.50

No one familiar with present-day elementary-particle physics can fail to be aware of the striking shift of emphasis that has emerged over the last fifteen years. The empirical, and sometimes pessimistic, attitudes of the late 1960s have been replaced. Recent theoretical activity has been anchored in the significance and applicability of renormalized quantum field theory. Physicists are now using mathematical tools that have not been part of their conventional armory. This trend is nowhere more marked then in those areas of quantum field theory that concern classical solutions of the field equation. In particular, the study of solitons, monopoles, instantons, and indeed the entire structure of gauge theories, has drawn extensively on the methodology of differential geometry. Of course, general relativists have long employed such techniques, but it is only recently that they and particle physicists have communicated to any considerable degree. For many theoretical physicists, the need to come to terms with this new mathematics has entailed something of a culture shock.

It must be admitted that, for physicists, differential geometry is not the easiest subject to learn. Many of the otherwise excellent standard texts adopt an analytic approach that is geared to the interests of pure mathematicians and that frequently presupposes a prior degree of mathematical expertise that most physicists do not possess. Thus we must especially welcome this text by Yvonne Choquet-Bruhat and Cecile DeWitt-Morette. While it in no way sacrifices any degree of mathematical accuracy, it presents the crucial ideas within a framework that is specifically geared to the needs of theoretical physicists. In particular, the authors have managed to place within one coherent volume almost all of the topics that a student would need. Previously this material could only be found despersed in a number of different mathematical works. Thus we find not only the anticipated sections on manifolds and Riemannian geometry, but also extensive discussions of integration, submanifolds (especially useful for canonical studies of gravity), the theory of distributions and Sobolev spaces, an introduction to finite-dimensional manifolds and the Wiener measure that underpins so much of modern quantum theory, and, in this revised edition, a new and comprehensive account of fiber bundles.

It is a truism that mathematics can only be learned by practice. The authors, fortunately, have included substantial collection of carefully presented problems and exercises. The discussion in these sections is consistently oriented around physical applications and introduces many topics of specific interest to physicists. Thus, for example, there is a nice account of spinors (a notoriously difficult topic on which to obtain information at just the right level) and many illustrations of the use and significance of characteristic classes. (Throughout the book there is a steady but gentle introduction to the basic ideas of differential cohomology.)

The high quality of French mathematics, combined in this volume with the wide professional expertise of the authors in mathematical physics, has resulted in a work of great value. The price is low enough to place the book realistically within the reach of most graduate students. I can wholeheartedly recommend it to anyone who aspires to participate in the exciting developments in modern elementary-particle physics and relativity.

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Surface Studies with Lasers. Proc. International Conference, Mauterndorf, Austria, March 1983. F. R. Aussenegg, A. Leitner, M. E. Lippitsch, eds. 241 pp. Springer-Verlag, New York, 1983. $26.00

Quantum Electronics and Electro-Optics. Proc. Fifth National Quantum Electronics Conference, Hull, September 1981. P. L. Knight, ed. 451 pp. Wiley, New York, 1983. $54.95

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