and cosmology. Indeed Frampton's discussion in this section is rather superficial.

My most serious disappointment with both books concerns their overall approach to quantum field theory. They take the traditional course of discussing renormalization and renormalizability of a gauge theory as if the Lagrangian describing the theory were an accurate description at arbitrarily short distances. Twenty-five years ago, this would have been a reasonable attitude. Even 15 years ago, the modern view of the subject was understood completely only by a few pioneers like Kenneth Wilson. But today, all working particle theorists realize that any specific quantum field theory, and almost certainly quantum field theory itself, is only a provisional, approximate description of the world, useful in a limited range of energy or distance. Pokorski and Frampton understand this very well, and discuss it in passing: Pokorski in his chapter on effective chiral Lagrangians, and Frampton in his treatment of effective gauge theories. But neither adopts the effective-field-theory language consistently from the start.

This is a mistake, in my view. Unfortunately, although most working particle theorists have a nuts-and-bolts understanding of effective-field theories, the old-fashioned view still dominates texts, and survives as well in many archaic, inappropriate words for ideas whose significance has changed in the modern view (such as "triviality" and "Landau ghost"). If we are to educate students properly, so that they learn the lesson of effective-field theories in their coursework rather than having to relearn field theory when they actually use it, we need texts that adopt the modern view from the beginning.

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Differential Geometry, Gauge Theories and Gravity

M. Göckeler and T. Schücker
Cambridge U. P., New York, 1987. 230 pp. $49.50 hc
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The past decade has witnessed a dramatic rise in the mathematical sophistication of mainstream elementary-particle theory. With the discoveries in the mid-1970s of monopole and instanton solutions in non-Abelian gauge theories, there entered into physics a number of concepts and tools from differential geometry and topology, such as fiber bundles and homotopy theory. The study of fermion fields in the backgrounds of such topologically nontrivial solutions led to the appreciation by physicists of characteristic classes and index theorems. This, in turn, fueled the renaissance of the theory of chiral anomalies in the early 1980s. The string theory revolution (brought on in part by a study of anomalies that was made possible by this renaissance) has brought into physics results from Riemann surfaces and even number theory.

Having said this, I must add that I, along with many other physicists, share a distrust of very abstract mathematics, and prefer to avoid it unless it proves to be absolutely necessary for the understanding of a physical problem. This reluctance to learn "new" mathematics is partially due simply to the inaccessibility of much of the mathematics literature to those with only a physicist's training.

This book by Meinulf Göckeler and Thomas Schücker is a recent effort to address this problem, at least in the area of differential geometry. The authors recast in mathematically more abstract and general settings certain results from tensor calculus and gauge theory that are familiar to physicists. In this way, the authors hope to familiarize the reader with new mathematical notions while at the same time indicating their physical relevance. Specifically, the book begins with an exposition of differential forms, which have become an established part of the particle theory vocabulary. After an interlude on gauge theories and Einstein–Cartan theory, the text proceeds with discussions of manifolds and Lie groups, thereby building up to fiber bundles and classical topological solutions. The two final chapters are on anomalies.

This effort to present mathematics effectively to physicists is largely successful. The presentation is in general quite careful and concise; many proofs are not supplied, but neither are they missed. This is not to say that the book can be read like a novel—the chapter on fiber bundles in particular is not easy. Unfortunately, the authors stray from their thorough and pedagogical approach in the last two chapters, which are rather sketchy. This is somewhat surprising in view of the fact that the chapter's subject—anomalies—is one on which Schücker has worked. Also, the handling of references is sometimes puzzling. For instance, in the brief discussion of lattice gauge theory (Göckeler's specialty), there is no mention of Kenneth Wilson; and the discussion of the so-called positive-energy theorem does not mention Edward Witten's proof.

The mathematics prerequisites for reading this text consist of linear algebra, tensor calculus and some acquaintance with Lie groups. The physics prerequisites are familarity with classical Yang–Mills theory and with relativity—say, at the level of Steven Weinberg's *Gravitation and Cosmology* (Wiley, New York, 1972)—except for the chapters on anomalies, which assume knowledge of quantum field theory. Thus the text should be accessible to graduate students in elementary-particle theory. At the end of each chapter there is a set of problems. Although many involve verifying results stated in the text, the reader may find these exercises useful study aids.

A number of excellent reviews for physicists on differential geometry and related topics have already been available for some time. Compared with the well-known review article "Gravitation, Gauge Theories and Differential Geometry" by Tohru Eguchi, Peter Gilkey and Andrew Hanson (Phys. Rep. **66**, 213, 1980), Göckeler and Schücker's text is somewhat slower paced and treats certain topics in more detail. However, their text has a much smaller scope, as it does not discuss index theorems or characteristic classes, except for a section on Chern classes. Other recent related texts include *Geometrical Methods of Mathematical Physics* by Bernard Schutz (Cambridge U. P., Cambridge, UK, 1980) and *Topology and Geometry for Physicists* by Charles Nash and Siddhartha Sen (Academic, London, 1983). Göckeler and Schücker's text does not fill an urgent need. Nevertheless, it should serve usefully as both a study guide and a reference.

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Kelvin's Baltimore Lectures and Modern Theoretical Physics: Historical and Philosophical Perspectives

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In the fall of 1884, William Thomson, professor of natural philosophy at the University of Glasgow, who became Baron Kelvin in 1892, delivered a set