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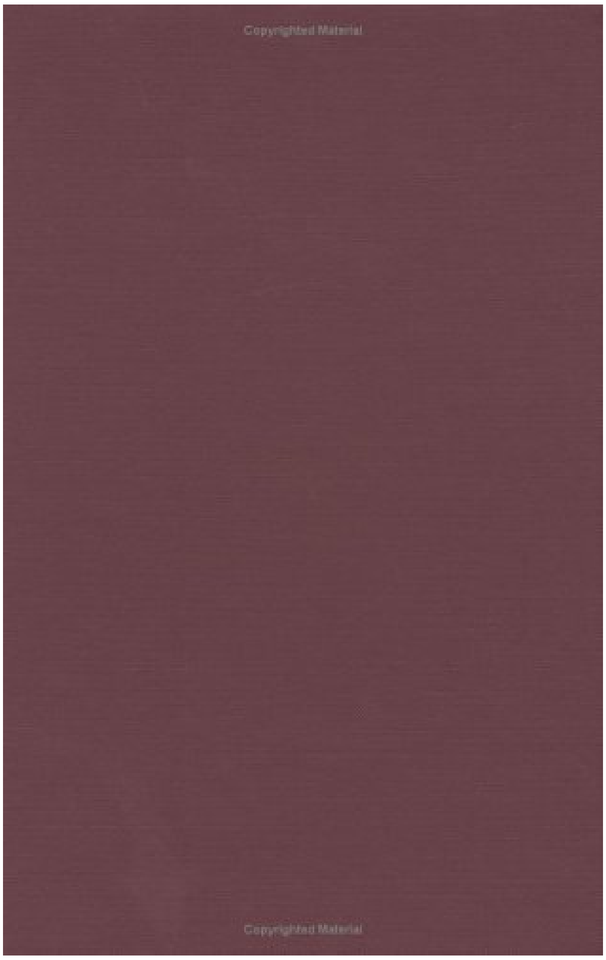

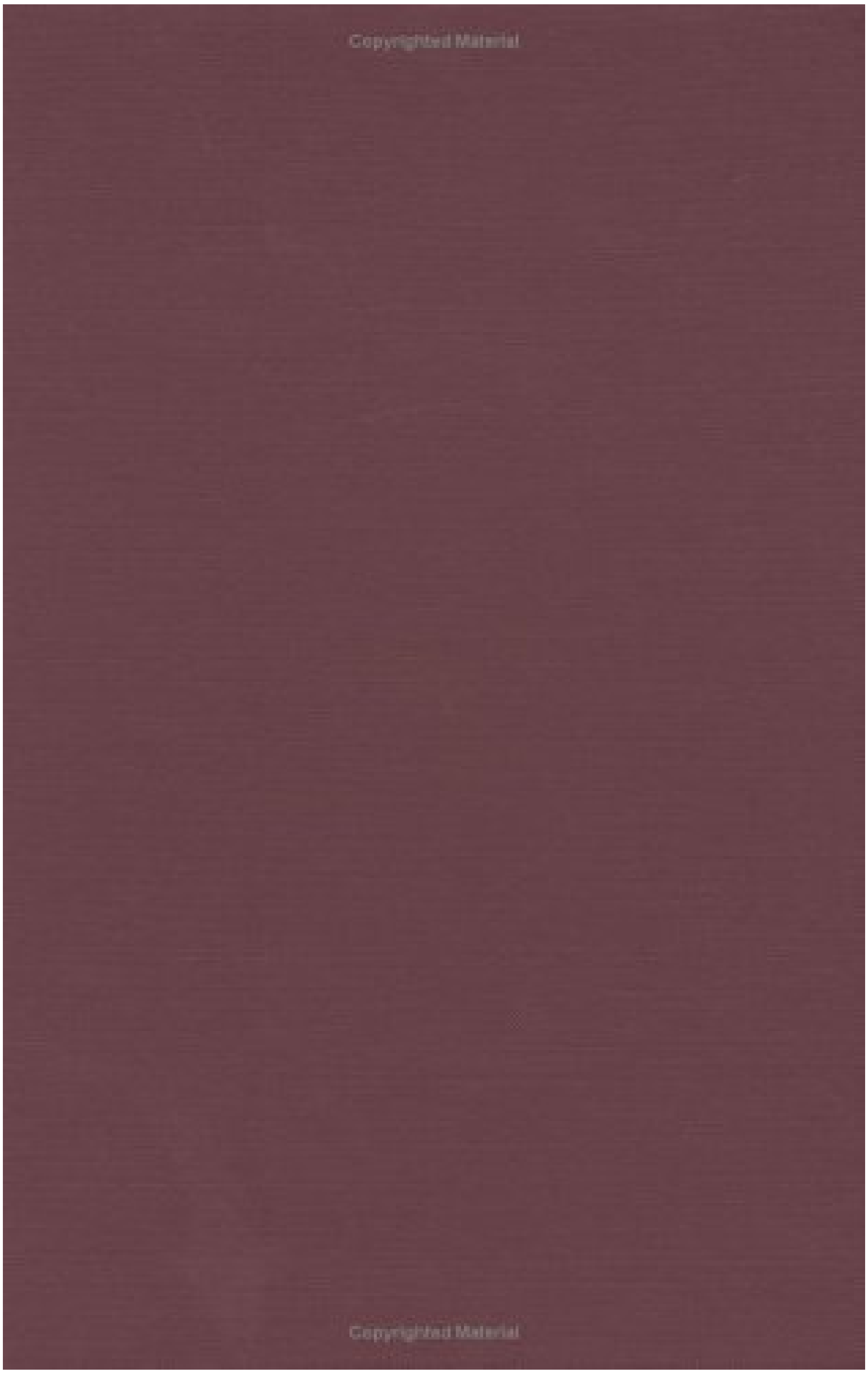
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'Our purpose in writing this book is to put material which we found stimulating and interesting as graduate students into form. It is intended for individual study and for use as a text for graduate level courses such as the one from which this material stems, given by Professor W. Ambrose at MIT in 1958-1959. Previously the material had been organized in roughly the same form by him and Professor I. M. Singer, and they in turn drew upon the work of Ehresmann, Chern, and E. Cartan. Our contributions have been primarily to fill out the material with details, asides and problems, and to alter notation slightly. We believe that this subject matter, besides being an interesting area for specialization, lends itself especially to a synthesis of several branches of mathematics, and thus should be studied by a wide spectrum of graduate students so as to break away from narrow specialization and see how their own fields are related and applied in other fields'.'We feel that at least part of this subject should be of interest not only to those working in geometry, but also to those in analysis, topology, algebra, and even probability and astronomy. In order that this book be meaningful, the reader's background should include real variable theory, linear algebra, and point set topology' - from the Preface. This volume is a reprint with few corrections of the original work published in 1964. Starting with the notion of differential manifolds, the first six chapters lay a foundation for the study of Riemannian manifolds through specializing the theory of connections on principle bundles and affine connections. The geometry of Riemannian manifolds is emphasized, as opposed to global analysis, so that the theorems of Hopf-Rinow, Hadamard-Cartan, and Cartan's local isometry theorem are included, but no elliptic operator theory.Isometric immersions are treated elegantly and from a global viewpoint. In the final chapter are the more complicated estimates on which much of the research in Riemannian geometry is based: the Morse index theorem, Synge's theorems on closed geodesics, Rauch's comparison theorem, and the original proof of the Bishop volume-comparison theorem (with Myer's Theorem as a corollary). The first edition of this book was the origin of a modern treatment of global Riemannian geometry, using the carefully conceived notation that has withstood the test of time. The primary source material for the book were the papers and course notes of brilliant geometers, including E. Cartan, C. Ehresmann, I. M. Singer, and W. Ambrose. It is tightly organized, uniformly very precise, and amazingly comprehensive for its length.

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29 of 30 people found the following review helpful.
Spectacular geometric insight into differential geometry
By Richard J. Petti
As a differential geometer for the past 30 years, I own 8 introductions to the field, and I have perused a half-dozen others. Bishop & Crittenden's "Geometry of Manifolds" is unparallelled for imparting a strong

geometric intuition about Lie derivatives and connections on fiber bundles, which is the key to understanding this field, plus general relativity, Einstein-Cartan theory, and gauge theories in physics. Bishop & Crittenden taught me to see pictures for the main constructions and theorems, though I admit I had to work hard to build my intuition. It is particularly strong in establishing a 1-1 correspondence between geometric images of horizontal planes in fiber bundles and the language of differential forms in fiber bundles. I first read the classic Chevalley's "Lie Groups" which is very strong on geometric intuition about manifolds and Lie groups. I also relied on Kobayashi & Numizu's "Foundations of Differential Geometry" I & II because ity has better algebraic and computational treatment in some areas, and it cover topics not in "Geometry of Manifolds."

If you are really serious about differential geometry, if you prefer to think in terms of geometric visualization when possible and use algebra afterwards, then this book is the greatest -- nothing I have seen comes close. If you prefer to think mainly with abstract algebra, then you might prefer Kobayashi and Nomizu.

Richard J. Petti

13 of 13 people found the following review helpful.
A Unique Classic
By A Reader
Differential geometry is one of the most highly developed subjects in all of mathematics. The literature is daunting, both in volume and complexity. The serious student will soon learn that there simply is no single "perfect book" on the subject from which one can learn everything one needs to know. This is doubly true for the student who wants to learn about both Riemannian manifolds and Semi-Riemannian geometry, the language of Einstein's theory of general relativity.

The book by Bishop and Crittenden, long out of print and difficult to find before this recent re-printing emerged, contains a wealth of important and fundamental insights that are simply not to be found in any other differential geometry text. I will describe only one example in detail; many other examples of a similar nature could be cited.

As one studies differential geometry, one quickly learns that there are uncountably many connexions on a typical manifold (M,g). However, most books quickly restrict their attention to the Levi-Civita connexion, the unique connexion that is (1) metrically compatible, and (2) has torsion zero.

While metric compatibility is fairly easy to understand, the notion of torsion zero is far more elusive. Do a quick internet search and you will find scores of hapless students who are begging for help in understanding the GEOMETRIC content of the torsion tensor. Students of general relativity quickly learn that the mathematical expression of Einstein's Equivalence Principle will not hold unless the connexion has zero torsion, and that is sufficient to motivate the condition in GR; however, this still does not explain the tensor's geometric content.

Bishop and Crittenden give a visual interpretation of torsion in terms of geodesic quadrilaterals (see page 97) that will appeal to anyone who is searching for geometric intuition. I have over 150 differential geometry books in my personal library, and Bishop and Crittenden is the only one to provide this intuitive, geometric understanding of the torsion tensor. Richard Bishop continued this trend in his later book, co-authored with Sam Goldberg, where he gives a similar geometric interpretation of the Lie bracket.

If you are a devoted student of geometry, then I suggest you add Bishop and Crittenden to your library, along with Spivak (5 volumes), Kobayashi and Nomizu (2 volumes), Chern, etc., etc. Each of these references contains unique insights not to be found in any of the others. You may only need to refer to this book a few times, but the insights gained will be well worth the meager purchase price.

8 of 9 people found the following review helpful.
excellent but not a first semester textbook
By Christina Sormani
I recommend this as a supplement for students who have already learned Riemannian Geometry or at least Differential Geometry elsewhere for 1-2 semesters. It is excellent for fibre bundles and viewing a metric as an SO(n) bundle over a manifold. It is also an excellent reference for Bishop's Volume Comparison Theorem which has since been adapted by Gromov in his book "Metric Structures for Riemannian and Non-Riemannian Spaces" and has led to a fundamental change in the study of manifolds with Ricci curvature bounds.

Prerequisite books I read as a grad student were Spivak's Differential Geometry and DoCarmo's "Riemannian Geometry".

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