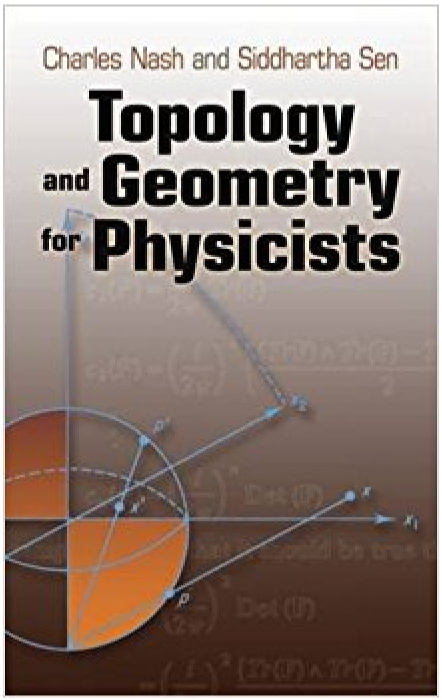
# Topology And Geometry For Physicists (Dover Books On Mathematics)



## Synopsis

Differential geometry and topology are essential tools for many theoretical physicists, particularly in the study of condensed matter physics, gravity, and particle physics. Written by physicists for physics students, this text introduces geometrical and topological methods in theoretical physics and applied mathematics. It assumes no detailed background in topology or geometry, and it emphasizes physical motivations, enabling students to apply the techniques to their physics formulas and research.Ã Â "Thoroughly recommended" byÃ Â The Physics Bulletin, this volume's physics applications range from condensed matter physics and statistical mechanics to elementary particle theory. Its main mathematical topics include differential forms, homotopy, homology, cohomology, fiber bundles, connection and covariant derivatives, and Morse theory.

## Book Information

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## Customer Reviews

"One of the most remarkable developments of the last decade in the penetration of topological concepts into theoretical physics. Homotopy groups and fibre bundles have become everyday working tools. Most of the textbooks on these subjects were written with pure mathematicians in mind, however, and are unnecessarily opaque to people with a less rigorous background. This concise introduction will make the subject much more accessible. With plenty of simple examples, it strikes just the right balance between unnecessary mathematical pedantry and arm-waving woolliness...it can be thoroughly recommended.--T.W.B. Kibble, PHYSICS BULLETIN --This text refers to an out of print or unavailable edition of this title.

This volume provides an easily comprehensible introduction to topological and geometrical methods in theoretical physics and applied mathematics. No detailed knowledge of topology or geometry is required in the reader, and advanced undergraduate or graduate physicists should have no difficulty in understanding the material.The style and approach of the book reflect the fact that the authors are themselves physicists, and have taken trouble to clarify difficult mathematical concepts and to emphasize their physical motivation. The applications range from condensed matter physics and statistical mechanics to elementary particle theory, while the main mathematical topics are differential forms, homotopy, homology, cohomology, fibre bundles, connection and covariant derivatives and Morse theory. --This text refers to an out of print or unavailable edition of this title.

I must say that this wonderful little book must be (and I recommend it as such) the first step for a physicist into the world of higher geometry (manifolds, differential forms, stokes theorem, curvature, etc), differential and algebraic topology where topics like Homotopy, Homology, Cohomology theories, the theory of Fiber bundles, characteristic classes and Morse theory appear. The authors are brilliant expositors and know their subject well, they oftenly give handiful insights into the subjects being treated and write so beautiful it makes think you are reading a Tolkien’s story!. I believe this book should be a classic, for example I found it cited on another good book about group theory for particle physics (Costa and Fogli, Symmetries and Group Theory in Particle Physics), it is also cited in Nakahara. The book ends with some more physics like Yang-Mills theories from a geometric perspective where concepts like instatons and monopoles are treated. After this title you will be in a better position to address more terse books like Nakahara which at times requires a bit more of mathematical maturity. If I have to resume I would say it has been beautifully and clearly written, all in all, simply brilliant!!

Good introduction, but with several typos and unclear sections.

The book presents several very interesting (and advanced) issues from topology and differential geometry with applications to (particle) physics. The book has been written for theoritical physicists which makes the book accessible to a large scientific public and not only for mathematician. The book is excellent. Many thanks.

very satisfied with everything.

The very modest description of this used book’s condition had me expecting less. It turned out to be in much better shape. The person, who sold the book, was definitely not trying to oversell it. I would buy another book from him any day.

While it is true that this text is absent problem-sets for students to hone their problem-solving skills,the book,never the less, remains a valuable stepping stone to other--more advanced--treatments.I first approached this text (in the 1980’s) after reading a brilliant article in Scientific American:Fiber Bundles and Quantum Theory (July 1981, Bernstein and Phillips). My interest in Fiber Bundles was piqued.I , then, searched for more information. Finding, as too advanced (though detailed):Gravitation, Gauge Theories and Differential Geometry(Physics Reports, Vol.66, No.6,1980, Eguchi,Gilkey, Hanson).Finding, as too brief: Yang’s brilliant article, Geometry and Physics (Gauge Theories, Einstein Symposium,1981, Pages 3-11).Imagine, then, happiness in perusing the topic in the text of Nash and Sen. Falling as it does between the two extremes--not too elementary and not too advanced, not too short and not too long. One hundred pages (Chapter Seven) devoted to the topic.In fact, I find the entire book rather refreshing. (And, if in need of Exercises, Nakahara’s 1999 textbook fits the bill).Here, I offer an overview of my impressions:(1) Chapter One, Basic Notions of Topology, is just that--basic notions. Any ’notion’ in this chapter can fill a book(for instance: First Concepts of Topology by Chin and Steenrod or Fixed Points, by Shashkin).(2) Chapter Two, Differential Geometry (Manifolds and Differential Forms). Again, these ’things’ occupy entire books.Nash and Sen will not replace those more detailed textbooks (say, Spivak or Flanders). But, this is a beginning.(3) Fundamental Group, Homology, Cohomology (Chapters Three to Six), almost ninety pages of basic material.The Proof of Poincare’s Lemma: one page in Nakahara (196). More leisurely in Nash and Sen (Pages 125-127).Compare and contrast. Nash and Sen, as such, adds much clarity to Nakahara’s exposition in other respects.(4) My favorite chapter, Seven, Fiber Bundles.(Compare Electromagnetism: Nakahara’s Page 354 to Nash & Sen’s Page 196).(5) Morse Theory, Chapter Eight. Again, introductory in character. A topic absent in both Nakahara and Eguchi.(6) The book closes with Yang-Mills Theories.And, a rather interesting discussion of quaternions, instantons and twistors.That material is not duplicated (in this manner) in any of the other references for which I have offered comparison.Thus, in retrospect, I have created an increasing tower of technicality in which to proceed:Read Bernstein’s article. Proceed to Yang’s Article. (Both are qualitative and beautiful).Study Nash and Sen concurrent with Nakahara (They complement each other wonderfully).Finally, study the Physics Reports article of Eguchi, Gilkey and

Hanson (the pinnacle).No single book will satisfy all needs.However, Nash and Sen does fill a much needed niche.

Rigorous is not an absolute category: something is rigorous or it is not ; it is a relative one: something is more or less rigorous than something else.When an author writes a book on mathematical methods for physicists, he may intend to convey to his audience a sound intuition about the subject ; something similar happens to Advanced Calculus, which is not the same as Introduction to Analysis.If you can understand what is going on helped by pictures, even intuitively, kudos! You already know a lot. Sophisticated mathematics is not a substitute for lack of physical insight.During decades methematicians mocked physicists because of delta Dirac function; now, distribuitions are a perfectly respectable branch of pure mathematics.



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