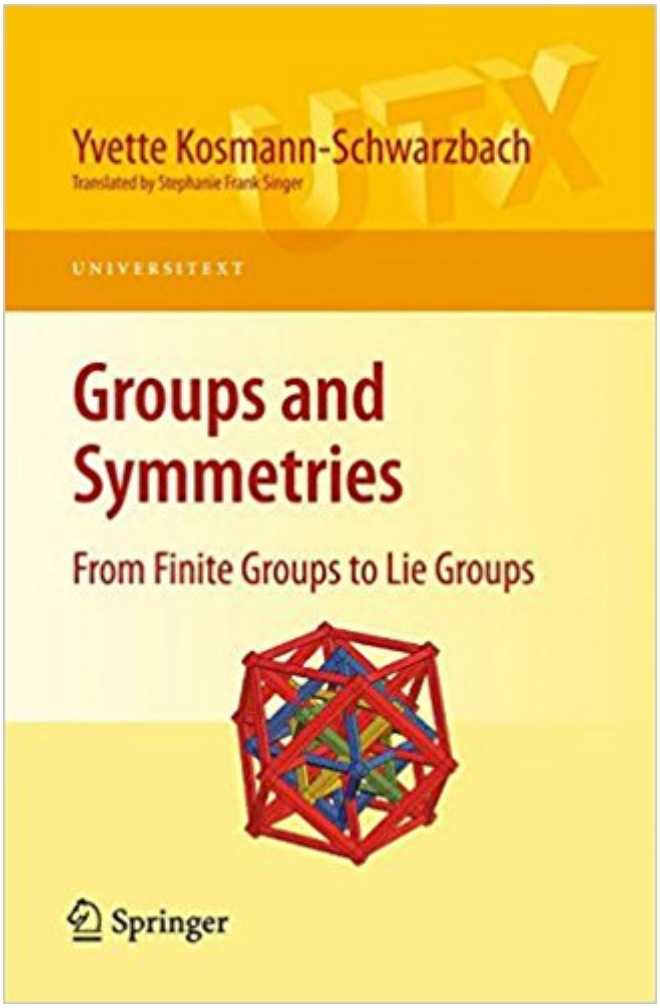
# Groups And Symmetries: From Finite Groups To Lie Groups (Universitext)



## Synopsis

- Combines material from many areas of mathematics, including algebra, geometry, and analysis, so students see connections between these areas - Applies material to physics so students appreciate the applications of abstract mathematics - Assumes only linear algebra and calculus, making an advanced subject accessible to undergraduates - Includes 142 exercises, many with hints or complete solutions, so text may be used in the classroom or for self study

## Book Information

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## Customer Reviews

From the reviews:â œGroups and Symmetries is a short, concise book â | that provides an introduction to the subject of Lie Groups, Lie Algebras, their representations, and their uses in theoretical particle physics. â | Anyone interested in understanding the connection between quarks and representation theory is an expeditious fashion should read this book. â | at the end of each chapter, Groups and Symmetries has a helpful reference section that provides readers with historical comments and additional references to the topics covered.â • (Thomas R. Hagedorn, The Mathematical Association of America, April, 2010)â œThis book by Kosmann-Schwarzbach (Ã‰cole Polytechnique, France) also starts with the basics but rapidly moves on to enrich group theory with notions from topology, analysis, and (multi) linear algebra. Surely one finds many monographs on Lie groups for students on the way to specializing. â | Summing Up: Recommended. Upper-division undergraduates, graduate students, and professionals.â • (D. V.

Feldman, Choice, Vol. 47 (11), July, 2010)â œThis book gives a gentle introduction to the theory of group representations and its applications in quantum mechanics. â | This book is well written and is well suited for a course aimed at advanced undergraduates and early graduate students.â • (Aloysius Helminck, Mathematical Reviews, Issue 2011 g)â œThe author gives a very clear and comprehensible introduction to the representation theory of groups focussing in particular on Lie groups. â | A series of nine problems and solutions completes this well thought-out and well organized book, which can be recommended already to advanced undergraduates.â • (G. Kowol, Monatshefte fÃ  r Mathematik, Vol. 164 (2), October, 2011)

Unlike many other texts, this book deals with the theory of representations of finite groups, compact groups, linear Lie groups and their Lie algebras, concisely and in one volume. Key Topics: â ¢ Brisk review of the basic definitions of group theory, with examples â ¢ Representation theory of finite groups: character theory â ¢ Representations of compact groups using the Haar measure â ¢ Lie algebras and linear Lie groups â ¢ Detailed study of SO(3) and SU(2), and their representations â ¢ Spherical harmonics â ¢ Representations of SU(3), roots and weights, with quark theory as a consequence of the mathematical properties of this symmetry group This book is illustrated with portraits and a few historical remarks.Â  With only linear algebra and calculus as prerequisites, Groups and Symmetries: From Finite Groups to Lie Groups is accessible to advanced undergraduates in mathematics and physics, and will still be of interest to beginning graduate students. Exercises for each chapter and a collection of problems with complete solutions make this an ideal text for the classroom and for independent study.

be forewarned that this very concise book is not an easy read, except for someone with a very solid background in abstract and advanced linear algebra. It deserves 5 stars for the lucidity of the mathematical presentation, but I deducted 1 star as a heads up because despite its claim to be aimed at advanced undergraduates / beginning graduates in math *or* physics, I think the book would be tough going for many readers who fit that description. As a math-degree-less autodidact, I found the book very challenging in places. To be fair, I found Chapter 2, Representations of Finite Groups, the most difficult chapter, and this no doubt colored my perception of the book as a whole. So if you can power through that chapter, you might well find the rest fairly smooth sailing.One major plus is that there are a large number of problems and complete solutions (pp 129 - 183).For me, the most outstanding feature -- and the reason I read the book - is that it explains in very clear, mathematically rigorous terms the basic group-theoretic math behind the standard model of

elementary particle physics. If you make it through to the end, then you'll come to understand in a mere 100 pages, what, mathematically speaking, the Eightfold Way and quarks really are! This is quite an accomplishment. I have not found any other introductory book that does this except Frankel'sÂ The Geometry of Physics: An Introduction, Second Edition, which, although a superb book for self-study, is a very long read. There are also a number of well-written books aimed at physicists like Sternberg'sÂ Group Theory and PhysicsÂ or Ramond'sÂ Group Theory: A Physicist's SurveyÂ that deal with the topic in some detail and are well worth studying, but no introductory book on the standard model I've consulted, e.g., Griffiths'Â Introduction to Elementary Particles, even attempts to address the issue. (If you know of one that does, please leave me a comment informing me.)In sum, this is a very clear but ultra-concise exposition of the essential mathematics needed to understand mathematically what those diagrams of representations of groups you see in physics books on the standard model really mean. But if you're not 100% comfortable with very condensed mathematical presentations, this book is probably not the right first book._____P.S. If you'd like a succinct but clear introduction to the more basic mathematics used in this text or e.g. in Robinson's exceptionally well written but more informalÂ Symmetry and the Standard Model: Mathematics and Particle Physics, check out Tapp'sÂ Matrix Groups for Undergraduates (Student Mathematical Library,)Â or Stillwell'sÂ Naive Lie Theory (Undergraduate Texts in Mathematics).

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