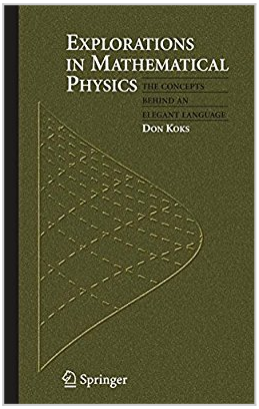

Explorations in Mathematical Physics: The Concepts Behind an Elegant Language

By Don Koks

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Have you ever wondered why the language of modern physics centres on geometry? Or how quantum operators and Dirac brackets work? What a convolution *really* is? What tensors are all about? Or what field theory and lagrangians are, and why gravity is described as curvature?

This book takes you on a tour of the main ideas forming the language of modern mathematical physics. Here you will meet novel approaches to concepts such as determinants and geometry, wave function evolution, statistics, signal processing, and three-dimensional rotations. You will see how the accelerated frames of special relativity tell us about gravity. On the journey, you will discover how tensor notation relates to vector calculus, how differential geometry is built on intuitive concepts, and how variational calculus leads to field theory. You will meet quantum measurement theory, along with Green functions and the art of complex integration, and finally general relativity and cosmology.

The book takes a fresh approach to tensor analysis built solely on the metric and vectors, with no need for one-forms. This gives a much more geometrical and intuitive insight into vector and tensor calculus, together with general relativity, than do traditional, more abstract methods.

Don Koks is a physicist at the Defence Science and Technology Organisation in Adelaide, Australia. His doctorate in quantum cosmology was obtained from the Department of Physics and Mathematical Physics at Adelaide University. Prior work at the University of Auckland specialised in applied accelerator physics, along with pure and applied mathematics.

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Editorial Review

Review

From the reviews:

"With enjoyable and sometimes surprising excursions along the way, the journey provides a fresh look at many familiar topics, as it takes us from basic linear mathematics to general relativity… look forward to having your geometric intuition nourished and expanded by the author's intelligent commentaries."

Eugen Merzbacher, University of North Carolina, Chapel Hill

"This truly is a book of explorations, covering many topics. The presentation is at its best in the fields of linear algebra and transformations, tensors, curvature and the geometrical insights. … The publisher suggests advanced undergraduate and graduate students and researchers as the readership. But … advanced undergraduates should be the natural audience. … I believe the book is an interesting supplement to standard texts for teaching mathematical methods in physics, as it will add alternative views that could serve as additional material." (S. Marcelja, Australian Journal of Physics, Vol. 44 (1), April/May, 2007)

"The book under review … offer a tour through the main ideas forming the language of modern mathematical physics. … In a book like this, it is a difficult task for the author to decide what is a good balance between the topics and their presentation, but in this case it has been achieved. … This book is intended for those physicists who would like to be exposed to clear motivation and careful explanation of the basics of the present-day apparatus of mathematical physics." (Ivailo M. Mladenov, Mathematical Reviews, Issue 2007 f)

From the Back Cover

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