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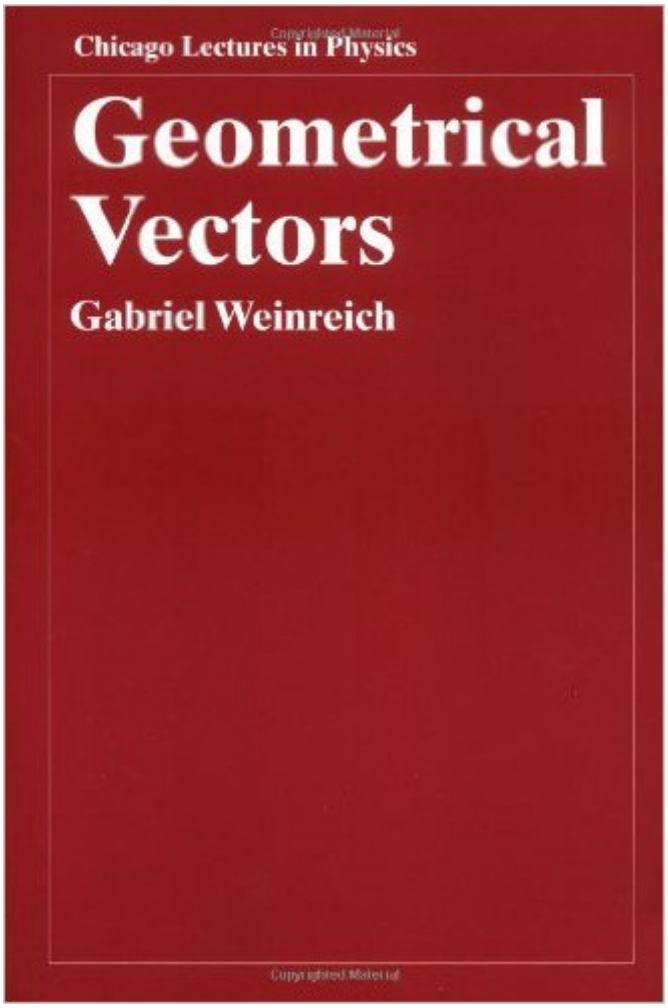
Geometrical Vectors (Chicago Lectures In Physics)



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Synopsis

Every advanced undergraduate and graduate student of physics must master the concepts of vectors and vector analysis. Yet most books cover this topic by merely repeating the introductory-level treatment based on a limited algebraic or analytic view of the subject.Geometrical Vectors introduces a more sophisticated approach, which not only brings together many loose ends of the traditional treatment, but also leads directly into the practical use of vectors in general curvilinear coordinates by carefully separating those relationships which are topologically invariant from those which are not. Based on the essentially geometric nature of the subject, this approach builds consistently on students' prior knowledge and geometrical intuition.Written in an informal and personal style, Geometrical Vectors provides a handy guide for any student of vector analysis. Clear, carefully constructed line drawings illustrate key points in the text, and problem sets as well as physical examples are provided.

Book Information

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Customer Reviews

The concept of a field got its first geometrical incarnation thanks to Michael Faraday's line drawings. Since, its treatment and interpretations have been progressively analytical as the sophistication of physical description has necessitated its abstraction. Gabriel Weinreich has convinced me through his wonderful little monograph that there is more than meets the eye if one cared to look and extend geometrical reasoning to those vector concepts that can be understood by our everyday intuition.The primary strength of his method, at least initially, lies in a description of vector

relationships in rubbery space. The raison d'etre is twofold, as the author points out quite early. One appeals to the pedagogical advantage of exploiting the capacity of our brain to extrapolate 3D data from what is essentially a 2D image on the retina (in conjunction with the stereoscopic nature of vision, of course), and hence lending itself to think in topologically invariant terms. The other leaves the forms of relationships invariant in this rubber space geometry, which potentially saves some nightmare calculations from their tedium.Weinreich hints, however, that this formulation might not represent `interesting' physical laws, but that there is a lot to be gained from this perspective. Like a well-told story, what exactly is gained emerges with an elegant lucidity only toward the end of the book, where he motivates the definition of the metric through topological reasoning. He does this by first demonstrating the problems faced when representing physical laws, like Maxwell's equations, using his invariant formulation, then introduces a coordinate representation that is necessitated by the need for this metric.

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