

GEOMETRIC ALGEBRA FOR PHYSICISTS

Geometric algebra is a powerful mathematical language with applications across a range of subjects in physics and engineering. Written by two of the leading researchers in the field, this book is a complete guide to the current state of the subject.

Early chapters provide a self-contained development of geometric algebra and form the basis of an undergraduate lecture course. Topics covered include new techniques for handling rotations in arbitrary dimensions, and the links between rotations, bivectors and the structure of the Lie groups. Following chapters extend the concept of a complex analytic function theory to arbitrary dimensions. This has applications in quantum theory and electromagnetism. All four Maxwell equations are united into one single equation, and new techniques are discussed for its solution. Later chapters cover some advanced topics in physics, including non-Euclidean geometry, quantum entanglement and gauge theories. The final chapters describe the construction of a gauge theory of gravitation in Minkowski spacetime. Using the tools of geometric algebra, advanced applications such as black holes and cosmic strings are explored.

This book will be of interest to researchers working in the fields of geometry, relativity and quantum theory. It can also be used as a textbook for advanced undergraduate and graduate courses on the physical applications of geometric algebra.

CHRIS DORAN obtained his PhD from the University of Cambridge, having gained a distinction in Part III of his undergraduate degree. He was elected a Junior Research Fellow of Churchill College, Cambridge in 1993, was made a Lloyd's of London Fellow in 1996 and was the Schlumberger Interdisciplinary Research Fellow of Darwin College, Cambridge between 1997 and 2000. He is currently a Fellow of Sidney Sussex College, Cambridge and holds an EPSRC Advanced Fellowship. Dr Doran has published widely on aspects of mathematical physics and is currently researching applications of geometric algebra in engineering and computer science.

ANTHONY LASENBY is Professor of Astrophysics and Cosmology at the University of Cambridge, and is currently Head of the Astrophysics Group and the Mullard Radio Astronomy Observatory in the Cavendish Laboratory. He began his astronomical career with a PhD at Jodrell Bank, specialising in the Cosmic Microwave Background, which has been a major subject of his research ever since. After a brief period at the National Radio Astronomy Observatory in America, he moved from Manchester to Cambridge in 1984, and has been at the Cavendish since then. He is the author or coauthor of nearly 200 papers spanning a wide range of fields, from early universe cosmology to computer vision. His introduction to geometric algebra came in 1988, when he encountered the work of David Hestenes for the first time, and since then he has been developing geometric algebra techniques and employing them in his research in many areas.

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