Clifford Algebras
Applications to Mathematics, Physics, and Engineering
Rafał Abłamowicz, Editor

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34

The invited papers in this volume provide a detailed examination of Clifford algebras and their significance to geometry, analysis, physics, and engineering. Divided into five parts, the book's first section is devoted to Clifford analysis; here, topics encompass the Morera problem, inverse scattering associated with the Schrödinger equation, discrete Stokes equations in the plane, a symmetric functional calculus, Poincaré series, differential operators in Lipschitz domains, Paley–Wiener theorems and Shannon sampling, Bergman projections, and quaternionic calculus for a class of boundary value problems.

A careful discussion of geometric applications of Clifford algebras follows, with papers on hyper-Hermitian manifolds, spin structures and Clifford bundles, differential forms on conformal manifolds, connection and torsion, Casimir elements and Bochner identities on Riemannian manifolds, Rarita–Schwinger operators, and the interface between noncommutative geometry and physics. In addition, attention is paid to the algebraic and Lie-theoretic applications of Clifford algebras—particularly their intersection with Hopf algebras, Lie algebras and representations, graded algebras, and associated mathematical structures. Symplectic Clifford algebras are also discussed.

Finally, Clifford algebras play a strong role in both physics and engineering. The physics section features an investigation of geometric algebras, chiral Dirac equations, spinors and Fermions, and applications of Clifford algebras in classical mechanics and general relativity. Twistor and octonionic methods, electromagnetism and gravity, elementary particle physics, noncommutative physics, Dirac's equation, quantum spheres, and the Standard Model are among topics considered at length. The section devoted to engineering applications includes papers on twist representations for cycloidal curves, a description of an image space using Cayley–Klein geometry, pose estimation, and implementations of Clifford algebra coprocessor design.

While the papers collected in this volume require that the reader possess a solid knowledge of appropriate background material, they lead to the most current research topics. With its wide range of topics, well-established contributors, and excellent references and index, this book will appeal to graduate students and researchers.

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Progress in Mathematical Physics

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