

Book Review

Rotations, Quaternions, and Double Groups. Simon L. Altman. Oxford University Press, 1986. xiv + 317 pp. \$49.

This is a feisty, iconoclastic introduction to the rotation group and its representations. The double group of the title is a group that doubly covers a group of rotations.

The historical remarks are particularly lively. We learn that the quaternions were probably named after the mystical tetractys of the Pythagoreans; that Hamiltonian neither discovered nor correctly understood the quaternions; that Olinde Rodrigues did both in print 3 years before Hamilton's celebrated evening stroll across the Quaternion Bridge; and that Gauss discovered quaternions 20 years before Rodrigues, but did not trouble to publish them.

What Rodrigues understood and Hamilton did not is that the unit imaginary quaternions cannot be identified with vectors, as some still say today, but must be associated with rotations through π , even though their squares are not 1, but -1 . Rodriguez understood that the unit quaternions form a group, and for them he developed much of the theory of Lie groups before Lie.

The unifying tool of the work is the use of quaternions or Euler-Rodriguez parameters, instead of (say) Euler angles, as rotation parameters. In the author's words. "the main purpose of this book is to present a consistent description of this geometric and quaternionic treatment of rotations, so far badly neglected. Because it was my purpose to plug this important gap, and because I hope to reach an audience, such as molecular and solid-state theorists and crystallographers, primarily interested in point groups, and which may not be familiar with Lie-group theory, I have avoided the use of the latter." There are enough exercises for a textbook, with solutions, and the work will be useful and pleasurable reading for anyone who uses rotations.