

SPECIAL MATHEMATICAL PHYSICS MINI-SYMPOSIUM

"Ray Representations of Groups"

Dr. Ed Brown, *Rensselaer Polytechnic Institute*

It is often stated that the set of symmetry operators that leave a Hamiltonian invariant forms a group. This statement implies that the product of any two such operators is included in the set. The statement is true in classical physics, but should be modified for quantum systems. In quantum theory one can assign an arbitrary phase to a wave function without affecting the outcome of any measurement. Because of this it is possible that the product of two symmetry operators differs from another one by a phase factor. If a unique operator is chosen to correspond to any physical transformation, it may not be possible to eliminate the phases. In such cases the conventional group property is lost. We will illustrate this statement by the transformation properties of Pauli spinors. It will then be shown how ray representation theory applies to the problem of a Bloch electron (a charged particle in a periodic lattice) in a magnetic field.

"Lie Groups and Lie Algebras in Physics"

Dr. Goong Chen, *Texas A&M University*

The speaker will give a sketchy overview of the basics of the theory of Lie groups and Lie algebras intended for their applications in particle physics.

"Lie groups, Lie algebras, and their representations in Quantum Physics: There's more to the exponential than meets the i"

Mr. Philip Vetter, *Baylor University*

It was argued in 1927 that group theory should be dropped from the Princeton mathematics curriculum as it had no application. Within a few years Hermann Weyl and Eugene Wigner demonstrated the value of group theory in modern physics.

The talk introduces to the closely related topics of Lie groups, Lie algebras, and their representations, showing their deep connections with quantum physics. If time permits, the talk will conclude with an introduction to supersymmetry algebras.

Monday, May 13, 2013
IQSE 578, 2:00 p.m.
Mitchell Physics Building

Institute for Quantum Science and Engineering
Texas A&M University

(Coffee and Cookies to be served at 1:45 p.m.)