THE UNIVERSITY  OF HONG KONG

Institute of Mathematical Research
Department of Mathematics

COLLOQUIUM

G2 and the Rolling Ball

Professor John Baez
Department of Mathematics, UC Riverside
Centre for Quantum Technologies, Singapore

Date: May 17, 2012 (Thursday)
Time: 4:00 – 5:00pm
Venue: Room 210, Run Run Shaw Bldg., HKU

Abstract

Understanding the exceptional Lie groups as the symmetry groups of simpler objects is a longstanding challenge. Here we describe how the smallest exceptional Lie group, G2, shows up as symmetries of a simple physics problem: a ball rolling on a larger ball without slipping or twisting. G2 acts as symmetries of this problem, but only when we treat the smaller ball as a "spinor", which returns to its orientation not after a full turn but only after two full turns - and only when the larger ball is 3 times as big as the smaller one. We show how to understand this special ratio, describe the geometry of the rolling ball system in terms of imaginary split octonions, and show how geometric quantization applied to this system lets us recover the imaginary split octonions together with their cross product.

All are welcome