Friday, November 17, 2006
3:40-4:30 PM Nicholson 109

Higher Gauge Theory

John Baez

Department of Mathematics, University of California, Riverside

Gauge theory describes the parallel transport of point particles using the formalism of connections on bundles. In both string theory and loop quantum gravity, point particles are replaced by 1-dimensional extended objects: paths or loops in space. This suggests that we seek some sort of "higher gauge theory" that describes parallel transport as we move a path through space, tracing out a surface. To find the right mathematical language for this, we must "categorify" concepts from topology and geometry, replacing smooth manifolds by smooth categories, Lie groups by Lie 2-groups, bundles by 2-bundles, and so on. Some interesting examples of these concepts show up in the mathematics of topological quantum field theory, string theory and 11-dimensional supergravity.