ICM 1998, Berlin, Aug. 18–27

Abstracts of Plenary and Invited Lectures

Section:

5. Differential Geometry and Global Analysis

1991 MS Classification: 53, 55, 58
Joyce, Dominic, Lincoln College, Oxford, England
Compact Riemannian manifolds with exceptional holonomy

In the classification of Riemannian holonomy groups, the most mysterious cases are the *exceptional holonomy groups* G_2 in 7 dimensions, and $Spin(7)$ in 8 dimensions. We outline the construction of the first known examples of compact 7- and 8-manifolds with holonomy G_2 and $Spin(7)$.
In the case of G_2, we first choose a flat G_2-structure on the torus T^7, preserved by a finite group G of diffeomorphisms of T^7. Then T^7/G is an *orbifold*. Secondly, we resolve the singularities of T^7/G to get a compact 7-manifold M. Finally we use analysis, and an understanding of Calabi-Yau metrics, to construct a family of metrics with holonomy G_2 on M, which converge to the singular metric on T^7/G.