

Department of Mathematics and Statistics Colloquium

# From multi-dimensional cross products to special holonomies

Job Candidate

**Abstract:** The talk is supposed to be an overview of special or exceptional holonomy geometries, with some recent results and development. If the word "holonomy" doesn't sound familiar, then this exposition is perfect for you.

We will start from a simple question: how can one generalize the (well-known) cross product? It turns out that this has an unexpected answer, and a strong connection with the classification of division algebras (the reals, the complex, the quaternions and the octonions). Moreover, the so-called holonomy group of a manifold appears as some sort of an invariant in relation to these algebras. In particular, there are two holonomy groups called  $G_2$  and  $\text{Spin}(7)$  which can only occur in dimension 7 and 8. They are called "special" or "exceptional" holonomy geometries and they are very much connected with string theory.

In the end, we will present some recent results related to the study of the  $\text{Spin}(7)$  manifolds, which are the least explored of all the holonomies.

The talk should be accessible to undergraduate students that had some linear algebra and multivariable calculus. But even if you are taking those classes right now, you are more than welcome to come.

**Friday, January 31st at 3:45 in Roop 103**  
**refreshments at 3:30**