

The 8th Daniël Kan Memorial Lectures

‘Lectures on Exceptional phenomena in geometry and topology’

John Jones (Warwick)

Utrecht, 26-27 September 2024

Thursday 26 September

15.30 **Tea**

16.00-17.00 **John Jones** – Exceptional phenomena in geometry and topology
Koningsberger Building, Lecture Hall Pangea, first floor

17.30 **Drinks:** *in Library, Hans Freudenthal Building*

Friday 27 September

11.00-12.00 **John Jones** – Exceptional phenomena in geometry and topology II
Koningsberger Building, Lecture Hall Pangea, first floor

12:30 **Lunch** *in Library, Hans Freudenthal Building*

15.15-16.15 **John Jones** – Exceptional phenomena in geometry and topology III
Koningsberger Building, Lecture Hall Atlas, first floor

Koningsberger building:
Budapestlaan 4ab, 3584 CD Utrecht

Hans Freudenthal Building and Library:
Budapestlaan 6, 3584 CD Utrecht | The library is on the 7th floor; turn left when leaving the elevator.

Please see abstract on the next page

Exceptional Phenomena in Geometry and Topology

Abstract:

The exceptional phenomena in the title of these lectures refers to those smooth manifolds which, in some way or other, are connected to the exceptional Lie groups G_2, F_4, E_6, E_7, E_8 . In Cartan's list of symmetric spaces there are 12 examples of symmetric spaces for the exceptional Lie groups. The classical symmetric spaces are very well understood through the work of Borel, Bott, Hirzebruch, and Samelson. In comparison the exceptional symmetric spaces are not at all well understood. The aim of this project is to get a much better understanding of the exceptional symmetric spaces. The main examples used in the lectures will be the four Rosenfeld projective planes, FII, EIII, EVI, EVIII, in Cartan's list. They are symmetric spaces for F_4, E_6, E_7, E_8 of dimensions 16, 32, 64, 128 respectively.

There are two main lines in the approach. The first is to use K-theory and representation theory as the primary source of topological invariants. This takes full advantage of the very powerful methods, both conceptual and computational, of representation theory. The second is to use ideas from the theory of compact Lie groups acting on manifolds. In its simplest form this gives a very useful filtration of these symmetric spaces. There are also much more sophisticated outputs.

The first lecture will be used to set the context and introduce the exceptional symmetric spaces. It will also give some idea of how these methods work and the results they give. Roughly speaking, the second lecture will focus on the use of K-theory and representation theory, and the third will focus on the ideas coming from the theory of transformation groups.