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Distinguished Lecture Series

MATHEMATICS COLLOQUIUM
of DM–Ciências ULisboa

Spring 2025 Daniel da Silva Lecture

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(Nicolaas Kuiper
Honorary Professor at IHÉS)

Revisiting the Scalar Curvature

Abstract:

The scalar curvature is the weakest invariant involving the curvature of a Riemannian metric. On surfaces, where the concept of curvature was first developed by Carl-Friedrich GAUSS, the curvature reduces to it, but in higher dimensions this scalar function misses a lot of information about the curvature which is a 4-tensor field (it has 20 components in dimension 4).

Still, in the last 60 years problems connected to it have generated a huge amount of literature because of an a priori totally unexpected deep interplay of the existence of a metric with positive scalar curvature with the topology of manifolds.

This has mobilised many radically new approaches, involving in particular spinors and a deeper understanding of a number of topological or differentiable invariants or constructions.

There are still a number of open problems connected to prescribing the scalar curvature on a manifold, and some will be presented.

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