

A-Fri-Ka Riemannian Topology Research Seminar

Meeting, 21. January 2021 (online)

2:00 - 2:45 pm **On the homotopy type of the space of metrics of positive scalar curvature**

(CET)

Speaker:

Michael Wiemeler (Münster)

Abstract:

I will report on recent joint work with Johannes Ebert. In this work we study the space $\mathcal{R}^+(M)$ of positive scalar curvature metrics on simply connected spin manifolds M of dimension at least 5. We show that its homotopy type depends only on the dimension of M and the question whether or not M admits a metric of positive scalar curvature, i.e. whether or not $\mathcal{R}^+(M)$ is non-empty. I will also discuss a similar result for non-spin manifolds.

3:00 - 3:45 pm **Metric inequalities with scalar curvature**

(CET)

Speaker:

Daniel Råde (Augsburg)

Abstract:

Inspired by Gromov's work on *Metric inequalities with scalar curvature* we establish band width inequalities for Riemannian bands of the form $(V = M \times [0, 1], g)$, where M^{n-1} is a closed manifold. We introduce a new class of orientable manifolds we call *filling enlargeable* and prove: If M is filling enlargeable and all unit balls in the universal cover of (V, g) have volume less than a constant $\frac{1}{2}\varepsilon_n$, then $width(V, g) \leq 1$. We show that if a closed orientable manifold is enlargeable or aspherical then it is filling enlargeable. Furthermore we establish that whether a closed orientable manifold is filling enlargeable or not only depends on the image of the fundamental class under the classifying map of the universal cover.

4:15 - 5:00 pm **Positive Ricci Curvature and Surgery**
(CET)

Speaker:
Philipp Reiser (Karlsruhe)

Abstract:

It is an open question whether positive Ricci curvature is preserved under surgery. Partial answers were given by Sha-Yang and Wraith for higher dimensional surgeries, and recently by Burdick for surgeries of dimension 0, i.e. connected sums. We will review these theorems and, by combining methods from all three theorems, we will generalize the surgery theorem of Wraith. This will lead to new examples of Ricci-positive manifolds, including connected sum constructions and boundaries of plumbings of disc bundles.

5:15 - 6:00 pm **Topological rigidity and positive scalar curvature**
(CET)

Speaker:
Jian Wang (Augsburg)

Abstract:

Thanks to Thurston's Geometrization conjecture, the topological structure of compact 3-manifolds is fully understood. However, the topological structure of open 3-manifolds is much more complicated, especially contractible 3-manifold. In this talk, we will present the topological rigidity for contractible 3-manifolds and its relationship with positive scalar curvature. Precisely, we give the proof that a complete contractible 3-manifold with positive scalar curvature is homeomorphic to \mathbb{R}^3 .