

## MATH-IMS Joint Pure Mathematics Colloquium Series The Chinese University of Hong Kong

*This Colloquium Series in Pure Mathematics is organized by the Department of Mathematics and the Institute of Mathematical Sciences (IMS) at The Chinese University of Hong Kong. The series focuses on all areas of pure mathematics together with theoretical developments and applications.*

**Date:** September 30, 2021 (Thursday)

**Time:** 10:00-11:00 (Hong Kong Time)

**Zoom Link:** <https://cuhk.zoom.us/j/98846779826>

### Recent developments in Ricci flow

*Speaker: Professor Richard Bamler  
University of California, Berkeley*

**Abstract:** Ricci flows are a powerful geometric-analytical tool, as they have been used to prove important results in low-dimensional topology.

In the first part of this talk I will focus on Ricci flows in dimension 3. I will briefly review Perelman's construction of Ricci flow with surgery, which led to the resolution of the Poincaré and Geometrization Conjectures. Then I will discuss recent work of Lott, Kleiner and myself on an improved version of this flow, called "singular Ricci flow". This work allowed us to resolve the Generalized Smale Conjecture, concerning diffeomorphism groups, and a conjecture concerning the contractibility of the space of positive scalar curvature metrics on 3-manifolds.

In the second part of the talk, I will focus on Ricci flows in higher dimensions. I will present a new compactness theory, which can be used to study the singularity formation of the flow, as well as its long-time asymptotics. I will discuss these and some further consequences. I will also convey some intuition of the new terminology that had to be introduced in connection with this compactness theory.

**Bio:** Prof. Bamler is a Professor at the Department of Mathematics at UC Berkeley. He received his undergraduate education at the University of Munich, where he was mentored by Prof. Bernhard Leeb. In 2011, he obtained his Ph.D. under the supervision of Prof. Gang Tian at Princeton, and between 2011-2014 he was a Simons postdoctoral fellow at Stanford University. Prof. Bamler's field of research is geometric analysis, with particular focus on Ricci flow. Some of his work, in part with Bruce Kleiner, is aimed at studying geometric analytic aspects of Ricci flows (with surgery) in dimension 3. This has led to a number of topological applications, such as the resolution of the Generalized Smale Conjecture. More recently, he has devised a new theory that allows the study of singularity formation in higher dimensional Ricci flows. Prof. Bamler was awarded the Sloan Fellowship in 2015 and is an invited speaker of ICM 2022.