

AMSI/AustMS Conference on Geometric Analysis and Stochastic Methods in Geometry

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Geometric analysis is a modern and vibrant area of mathematics. In the recent past, it has achieved remarkable results and found numerous applications, several of which we mention below. The conference focused on three key subfields of geometric analysis: heat kernels, equations involving Ricci curvature, and the Willmore functional. The participants of the conference explored these subfields using traditional techniques, as well as probabilistic ones. This represented the achievement of one of the goals of the conference: to showcase the application of probabilistic methods in the analysis of problems from differential geometry and partial differential equations.

In particular, Professors Elton Hsu, Anton Thalmaier, and Bruce Driver contributed presentations tailor-made as “User’s Guides” to probabilistic methods in geometric analysis, detailing for example the connection between Hamilton’s classical gradient estimate and Brownian motion. This alternative point of view enables the observation that Hamilton’s gradient estimate is the limiting case of an entire family of gradient estimates.

The conference enjoyed contributions from established experts in the area as well as new stars. Professor Rick Schoen (Stanford U, UC Irvine) opened the conference, with a fundamental new contribution on an application of localisation in cones to the analysis of the rigidity of asymptotically flat space-times. A vast survey was contributed by Professor K.-T. Sturm (Hausdorff Center), and Professor Gerard Besson (Fourier Institute) presented startling facts on how weird and wonderful 3-manifolds may be. Leading Australian mathematicians were well-represented, with a deep application of interior ball curvature presented by Professor Ben Andrews (ANU) and Laureate Professor Xu-Jia Wang (ANU) detailing recent developments on the p -Minkowski problem.

Distinguished presentations from young mathematicians included that of Dr Yann Bernard (ETH), speaking on energy quantisation for the Willmore functional, work that recently appeared in the *Annals of Mathematics*, and Dr Richard Bamler (UC Berkeley), who found new insights in Perelman’s work on the Ricci flow, enabling him to drastically improve on previous results. Given the level of activity in Ricci flow and in particular the level of interest in Perelman’s work, this is an astonishing achievement.

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