

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

*This MATH-IMS Joint 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 focus on all areas of pure mathematics together with theoretical developments and applications.*

**Date:** September 3, 2020 (Thursday)

**Time:** 10am – 11am (Hong Kong Time)

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

### Mass in relativity via cubic polyhedra *Speaker: Professor Pengzi Miao* *University of Miami*

**Abstract:** Recently Stern has discovered a formula that relates scalar curvature to the level sets of harmonic maps. Prompted by Stern's formula, we find that the mass of an asymptotically flat 3-manifold has a geometric interpretation if evaluated along faces and edges of a large coordinate cube. In terms of the mean curvature and dihedral angle, the resulting mass formula relates to Gromov's scalar curvature comparison theory for cubic Riemannian polyhedra. In terms of the geodesic curvature and turning angle of slicing curves, the formula realizes the mass as integration of the angle defect detected by the boundary term in the Gauss-Bonnet theorem.

**Bio:** Professor Pengzi Miao obtained his B.S. at Peking University in 1998, and his Ph.D. from the Department of Mathematics at Stanford University in 2003 under the supervision of Prof. Richard Schoen. During 2004 and early 2006, he has been a postdoc at Mathematical Sciences Research Institute and University of California, Santa Barbara. In 2006, he moved to Melbourne in Australia as a lecturer at Monash University. Since 2010, he joined the Department of Mathematics at the University of Miami, where he is currently a full professor. Prof. Miao's research focuses on geometric problems that are motivated by Einstein's theory of general relativity.