



THE HONG KONG UNIVERSITY OF SCIENCE TECHNOLOGY

Department of Mathematics

MATHEMATICS COLLOQUIUM

Guiding Stress : From Pentamodes to Cable Webs to Masonry Structures

By

Prof. Graeme Milton

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Abstract

Pentamode materials guide stress and have been proposed, and built, for acoustic cloaking by routing stress around objects. Their key feature is that each vertex joins four double-cone elements. As a result, the tension in one element fixes the tension in the others and so uniquely determines the stress throughout the metamaterial. We extend this feature to networks of wires under tension that support forces at terminal nodes and may have internal nodes with no applied forces. The network geometry controls how forces are distributed. It can be designed to support only one set of terminal forces, thus generalizing the essential property of pentamode materials. We then consider compression-only "strut nets" under fixed and variable nodal loads. These model masonry bodies that lie inside the polygon or polyhedron whose vertices are the load points ("underlying masonry structures"). Finally, we solve the 2D problem of designing a strut net that avoids given obstacles while allowing reactive forces. This is joint work with Amendola, Bouchitte, Cherkaev, Fortunato, Fraternali, Mattei, and Seppacher.

Bio: Graeme Milton is a distinguished emeritus professor at the University of Utah. He has made significant contributions to the fields of composite materials, metamaterials, inverse problems, cloaking theory, discrete networks, electromagnetism and elasticity theory, with over 190 published papers. He has been awarded Sloan and Packard Fellowships, the 2003 SIAM Ralph Kleinman Prize for research bridging the gap between mathematics and applications, the 2007 Society for Engineering Science Prager Medal for contributions to theoretical mechanics, the 2012 Landauer Medal of the ETOPIA association for seminal contributions to the field of composite material science, the 2015 International prize Tullio Levi-Civita for the Mathematical and Mechanical Sciences, and this year the MetaMAT medal. He is a fellow of the Society for Industrial and Applied Mathematics.

Date : 20 November 2026 (Friday)

Time : 3:00pm - 4:00pm

Venue : Lecture Theatre K (near Lift 31/32)

All Are Welcome!