Pacific Institute *for the* Mathematical Sciences

PIMS-UVic Distinguished Lecture

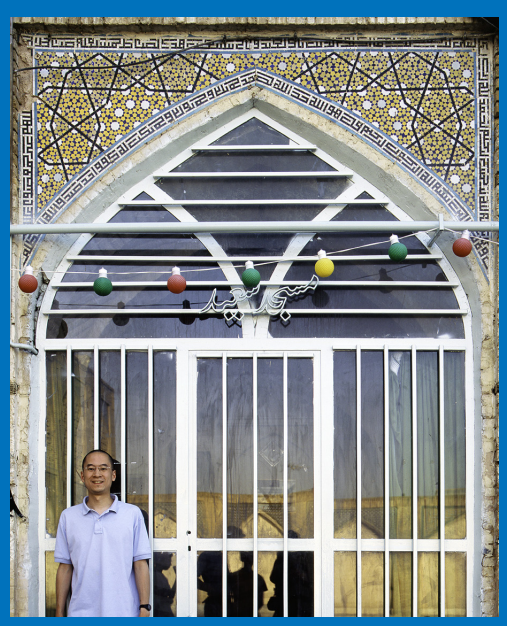
Peter J. Lu (Harvard University)

11 January, 2016
2:00 pm

MAC (MacLaurin Building) room # D110
University of Victoria

MODERN MATH IN MEDIEVAL ISLAMIC ARCHITECTURE

The conventional view holds that girih (geometric star-and-polygon) patterns in medieval Islamic architecture were conceived by their designers as a network of zigzagging lines and drafted directly with a straightedge and a compass. I will describe recent findings that, by 1200 C.E., a conceptual breakthrough occurred in which girih patterns were reconceived as tessellations of a special set of equilateral polygons (girih tiles) decorated with lines. These girih tiles enabled the creation of increasingly complex periodic girih patterns, and by the 15th century, the tessellation approach was combined with self-similar transformations to construct nearly-perfect quasicrystalline patterns. Quasicrystal patterns have remarkable properties: they do not repeat periodically, and have special symmetry – and were not understood in the West until the 1970s. I will discuss some of the properties of Islamic quasicrystalline tilings and their relation to the Penrose tiling, perhaps the best known quasicrystal pattern.



PETER J. LU received his AB summa cum laude in physics (2000) from Princeton University, and AM (2002) and PhD (2008) in physics from Harvard University. He is presently a post-doctoral research fellow in the Department of Physics and in the School of Engineering and Applied Sciences at Harvard University; his main focus is on the physics of attractive colloids and the integration of high-performance imaging and analysis techniques. He has conducted a series of experiments aboard the International Space Station, examining phase separation of colloid mixtures in the absence of gravity. He has also published his discoveries of modern quasicrystal geometry in medieval Islamic architectural tilings; the first precision compound machines, from ancient China; the first use of diamond, in prehistoric China; and the first quasicrystalline mineral found in nature.

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