Topological defects on thin crystallized shell

By

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Date: 22 December 2010, Wednesday
Time: 11.00am to 12.00pm
Venue: Hilbert Space (PAP-02-02)
Host: Prof. Alfred Huan

Abstract:
When a thin spherical shell membrane initially filled with fluid is dehydrated, it buckles and then starts to crumple, forming rich and interesting faceted structures. This formation of faceted structure is due to energy focusing where the elastic energy, which is initially smoothly distributed, becomes more and more non-uniform, with high energy concentrated in the bent regions. This energy focusing becomes more prominent in thinner rather than thicker shells. Such buckling in thin elastic shell membranes are ubiquitous, appearing in microscopic viruses, pollen grains, mesoscopic dried raisins and in the buckling of ping-pong and soccer balls in everyday life. In particular, David Nelson and collaborators have showed that the 5-fold disclinations are responsible for the faceting of an otherwise spherical triangulation into an icosahedral-like structure, which could explain the shapes of viruses. In this talk, I will explain the role of disclinations in the crumpling process and show that under the right combinations of 3,4,5-fold disclinations, highly symmetrical faceted structures may arise.

Short Biography
Yong Ee Hou is a graduate student at Mahadevan Lab in Harvard University. He works on the application of elasticity theory to physical and biological systems. He has a M.Sc in Statistics, B.Sc in Physics and B.Sc in Mathematics from Stanford University.