

Condensed Matter / Quantum Information Seminar

THURSDAY, DECEMBER 16, 2004

4:00 PM

BROIDA ROOM 3302

TOPOLOGICAL CRYSTALS

Professor Satoshi Tanda
Department of Applied Physics
Hokkaido University
Sapporo, Japan

The Mobius strip, which can be made by simply twisting an ordinary strip by 180 degrees and then joining the two ends, provides an exotic one-sided world, and has inspired many people ranging from artists, like M. C. Escher who put several ants on its surface in his paintings, to scientists who put Cooper pairs, electrons and Ising spins instead of the ants on its surface. Besides fictitious and theoretical worlds, one may wonder if such the one sided world can be realized in a crystal? Crystal rigidity at first sight seems to prevent either bending or twisting. How can a crystal grow in the shape of Mobius strip? Here we report the discovery of a Mobius crystal of NbSe₃, conventionally grown as ribbons and whiskers. We also reveal their formation mechanisms of which two crucial components are the spherical selenium (Se) droplet, which a NbSe₃ fiber wraps around due to surface tension, and the monoclinic (P21/m) crystal symmetry inherent in NbSe₃, which induces a twist in the strip when bent. Our crystals provide a non-fictitious Mobius world governed by a non-trivial real-space topology.

Ref: *Nature* **417** (2002) 397.