Mathematics Department Colloquium

Organizer: Nicolai Reshetikhin

Thursday, 4:10–5:00pm, 60 Evans

Oct. 4 **Alberto Grünbaum**, UC Berkeley

Imaging problems in biology and medicine as a source of new mathematical problems

I will illustrate some important uses of mathematics that have helped in the solution of problems such as a) the structure of DNA and proteins such as hemoglobin b) X-ray and MRI tomography c) ultrasound and optical tomography.

I will show how, as one decreases the energy of the probe (going from X-rays to an infrared laser) problems become nonlinear opening up the need for new mathematical tools.

In some concrete examples these imaging issues show the power of tools from very old algebraic geometry (Plucker identities) as well as very old representation theory (Young diagrams). This is an area with many open problems.

When looked at from a mathematical perspective many of these tools could be used to analyze problems in areas such as network theory and other inverse problems where scattering is the dominant issue.

This is an area with lots of hard open mathematical problems.