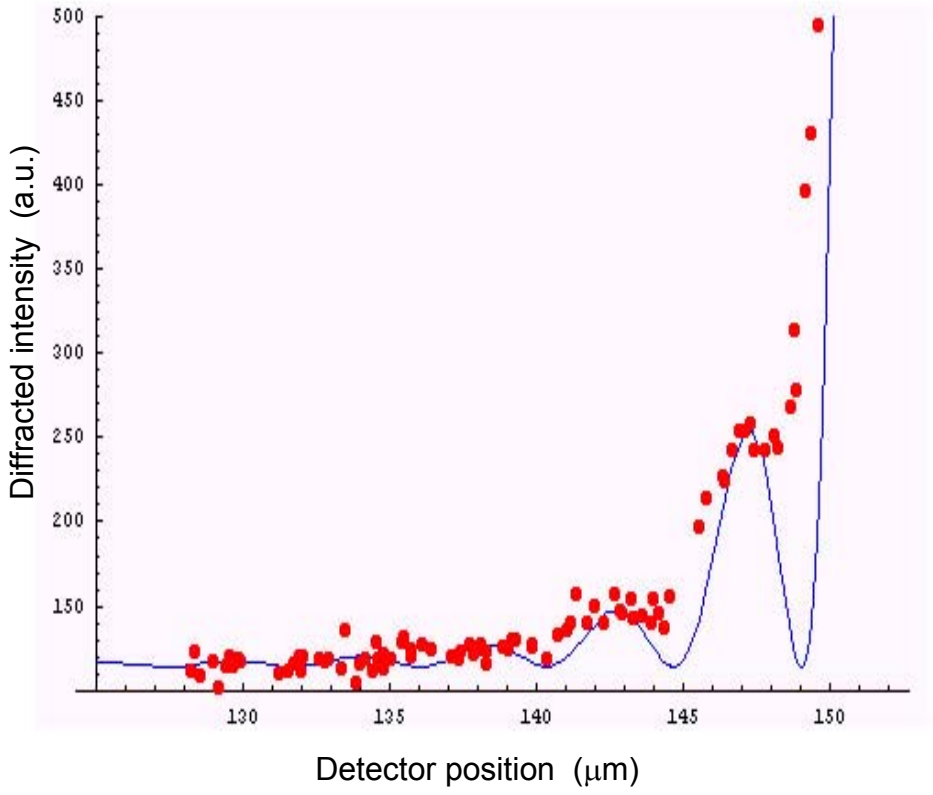
Development of a Dynamic Helium Atom Scattering Apparatus to Probe Nanoscale Surface Fluctuations

Stephen D. Kevan, Univ. of Oregon, DMR-6289996

How can we close the structure-function loop in emerging nanoscale materials? Many excellent probes of static material structure exist, but few offer the ability to probe the kinetic time regime where these materials often will function. To help answer this question in the context of surfaces, we are developing an application of helium atom beams closely related to dynamic laser light scattering. A key step in this development is to produce a thermal helium atom beam with smooth de Broglie wave fronts so that speckle-diffraction patterns of nanometer scale objects can be produced. One key step, a diffraction pattern of a micron-sized pinhole using helium atoms with $\lambda = 0.7$Å, is shown in the figure at right.



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Education:

Three undergraduates (Kazuto Usui, Lauri Kelly, and David Haskell) and two graduate students (Dan DePonte and Forrest Patton) contributed to this work. Usui entered graduate school in 2002, and Haskell is about to receive is teaching certificate. DePonte will finish his Ph.D. in fall, 2003, and Patton continues on the project at present.

Outreach:

Kevan has administered a small K-12 outreach program the past few years, the UO Science Outreach Program. He is presently spearheading a significant expansion of the program, so as to include undergraduate and graduate students from the science departments and also the College of Education.