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SOLID-STATE SECRETS: Probing the Mysteries of Surface Physics at RLE



Dean Robert J. Birgeneau at the spectrometer controls of the High Flux Beam Reactor at the Brookhaven National Laboratory on Long Island, New York. The reactor employs neutron scattering to characterize the properties of solid-state materials. Dean Birgeneau and his collaborators also use a beam line at Brookhaven's National Synchrotron Light Source to conduct high-resolution x-ray scattering experiments. (Photo courtesy Brookhaven National Laboratory)

Since the development of the scientific method in the 17th and 18th centuries, investigations into the properties of matter have not only answered many questions, they have also revealed even more deeply puzzling phenomena. How can some materials emit light energy

without shining light on them? Why are the semiconductors silicon and germanium highly sensitive to impurities while other materials are not? Is it possible to change the atomic binding energies that keep solids together in order to create different materials? Can we create solids

without their usual crystalline lattice and instead obtain the atomic structure of a liquid? These questions illustrate the many complicated and fascinating issues addressed in the study of solid-state matter—a multidisciplinary field that involves both experimentalists and theo-