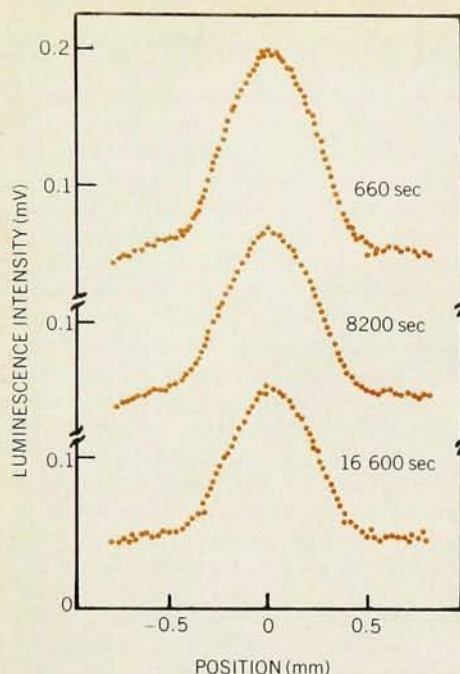




Electron-hole droplet luminescence profiles as a function of time. A low-level illumination generates a uniform-density free-exciton gas in a germanium crystal. A brief, focussed flash then generates a localized cloud of droplets. The recombination luminescence of the drops is then monitored in spatially resolved scans across the crystal face, producing the profiles shown. The droplets clearly diffuse only slowly through the crystal. Figure from Jeffries.

arrival of the ballistic phonons. The signal at the bolometer is modulated by the absorption of the phonons as they pass through the cloud of drops. If the phonon flux is strong enough, drops are transported all the way to the bolometer and produce a large pulse as the droplets break up at the crystal face. By using time-of-flight methods Hensel and Dynes can make quantitative measurements on the motion of the drops. The droplets strongly absorb longitudinal but not transverse phonons, and in the most recent experiments, Hensel told us, the group has started to use these differences to examine more closely the differences in the way longitudinal and transverse phonons propagate through the crystal.

The experiments done at Illinois show that the phonon wind has an important role in determining the distribution of droplets in the sample. The Illinois experiments are, in a sense, complementary to Hensel and Dynes's heat-pulse experiments, Wolfe told us. Both the propagation of the phonons and the interaction of phonons and carriers are highly anisotropic, and the propagation of the droplets should reflect these anisotropies. Using a focussed argon-laser beam to create droplets at the crystal surface, Wolfe's group photographed the resulting cloud of droplets by detecting the recombination luminescence with a special infrared imaging system that displays spectrally resolved pictures on a storage oscilloscope. These pictures show clearly

the anisotropic shape of the cloud. (See the photograph.) The droplets are not dispersed uniformly by the phonon wind but are channeled into directions in which the phonon flux and absorption probability are high. Hensel's most recent data, presented at the Edinburgh conference, also show this anisotropy. The experiments are in qualitative agreement with theoretical calculations by Humphrey Maris at Brown University and by Robert Markiewicz at General Electric.

Doehler and Worlock observe the scattering of light by the droplets. Probing the cloud with light at a wavelength much too long to create electron-hole pairs, they measure the spectrum of the scattered light. The resulting Doppler shifts give directly the velocity distribution of the droplets. To determine the origin of forces on the droplets, the experimenters periodically apply a known amount of heat to the cloud with an infrared beam. They then measure the change in the frequency of the scattered light using lock-in techniques to obtain the difference in scattered intensities for each small frequency range. These experiments are not sensitive to the anisotropy of the phonon propagation. They do, however, provide a quantitative measure of the increase in speed produced by an increase in the phonon wind.

The precise origin of the phonon wind is not yet certain. The original proposal by Keldysh was that the phonons are produced within the drops themselves as the electron-hole pairs decay. Another proposal is that they are produced when the electron-hole pairs, created with considerable kinetic energy, lose energy to achieve thermal equilibrium with the crystal. Although Doehler and Worlock's experiments appear to favor Keldysh's original proposal, Wolfe's and Hensel's experiments provide good evidence that an important component of the wind is created along with the droplets. —TVF

References

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NSF founds six regional instrumentation facilities

The National Science Foundation recently announced the establishment of Regional Instrumentation Facilities at six universities. The goal of the new program is to improve the quality and scope of research in various regions of the US by making sophisticated instrumentation and trained staff available. This fiscal year the program will receive \$2.94 million

from NSF and \$500 000 from the Department of Energy.

The University of Pennsylvania will have a new laser facility, under the direction of Robin Hochstrasser, receiving a total of \$1.39 million over a four-year period. It will have equipment for ultrashort laser pulses, laser flash photolysis, infrared laser photochemistry, laser spectroscopy and materials purification.

The University of Nebraska-Lincoln will have mass-spectrometry facilities, receiving \$1.42 million for four years. The facility, directed by Gerhard Meisels and Michael Gross, will have a high-resolution mass spectrometer (state of the art), a threshold coincidence photoelectron-photoionization mass spectrometer, a Cf-source mass spectrometer (built by Nebraska) for nonvolatile compounds, and an ion cyclotron-resonance mass spectrometer that operates in the Fourier-transform mode.

Colorado State University and the University of South Carolina will each have a high-resolution superconducting nmr facility for both liquids and solids. The Colorado State facility, directed by Gary Maciel, will receive \$1.12 million for a four-year period. The South Carolina facility, directed by James Durig, Paul Ellis and Elmer Amma, will receive a total of \$1.13 million in four years.

The University of Arizona will have a dedicated tandem electrostatic accelerator used primarily for C^{14} dating and trace-element analysis. The facility, directed by Paul Damon and Douglas Donahue, will receive \$1.24 million in four years.

Johns Hopkins University will have an ultrahigh-resolution mass-spectrometry facility with multiple ionization sources; initially the facility will be predominantly used for biology and biochemistry. The facility, directed by Catherine Fenslau, will receive \$1.12 million over a four-year period. —GBL

in brief

The Department of Energy has designated its Idaho National Engineering Laboratory as the "lead" laboratory for magnetic fusion reactor safety research, making INEL responsible for planning, coordinating and evaluating the fusion-reactor safety work at laboratories throughout the United States.

The DOE has selected six proposals to conduct research in certain areas of the inertial confinement fusion program. The proposals were submitted by the following corporations: KMS Fusion, Inc.; Mathematical Sciences Northwest, Inc.; McDonnell Douglas Astronautics Co. East; Physics International; TRW Corporation and Westinghouse Electric Corporation. □