# Student standouts tackle ills, theorems

Studies of a cell-killing weapon that oozes out of tumors and of a way to foil the AIDS virus won two of the three top awards at the 1999 Intel International Science and Engineering Fair. A project by a young mathematician who proved five theorems also garnered highest honors.

"I've known many people who died of cancer, so I wondered why our bodies can't fight against cancer," says Nisha Nagarkatti, 17, of Blacksburg, Va., explaining why she pursued her cancer research. The work has now netted her a $40,000, 4-year college scholarship.

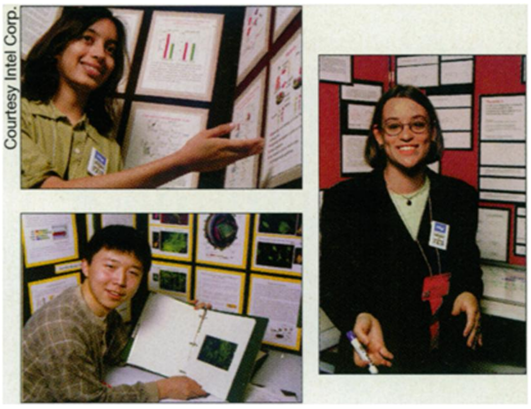
Also receiving $40,000 scholarships are Feng Zhang, 17, of Des Moines, Iowa, for his AIDS-related investigation and Jennifer Pelka, 16, of Orlando, Fla., for her mathematics project, which is relevant to deciphering the human genome. In all, 753 projects won shares of the more than $2 million in travel, scholarships, and cash awards.

This year's fair attracted 1,179 9th-to-12th-grade winners of regional competitions in about 40 nations. The contest ran May 2–8 in Philadelphia, the scene of the first such fair 50 years ago. Only 30 students competed in 1949.

Increasing global communication among students through the Internet may help explain the fair's growing international popularity and rising level of project sophistication, says Eugene S. Meieran, a contest judge and scientist at Intel Corp. in Chandler, Ariz. Intel is the major funder of the fair, which is coordinated by Science Service, publisher of SCIENCE NEWS.

Besides immersing themselves in serious science and rubbing elbows with Nobel laureates, contestants socialized, played computer games, and scarfed down a 215-foot-long dessert—billed as the world's largest strawberry shortcake—honoring the fair's 50th birthday.

A second chance to hobnob with Nobel laureates awaits Nagarkatti and James Lawler, 16, of Greenwich, Conn. They were awarded trips to the Nobel ceremony in Stockholm this December.



Courtesy Intel Corp.

*Top winners Nisha Nagarkatti (top left), Feng Zhang (bottom left), and Jennifer Pelka (right) describe their projects.*

Lawler studied heat-generating reactions of gases. He had won a $40,000 scholarship in the 1998 fair (SN: 5/23/98, p. 327).

Other students destined to travel include Nicole Young of Palm Bay, Fla., and Summer Acevedo of Grant, Fla., whose project on cancer diagnosis won them a trip to the European Union Contest for Young Scientists in Greece. Bound for Brazil are John Keefner of Black Hawk, S.D., and Mark Hanhardt of Sturgis, S.D., who jointly studied superconductors and will visit the International Fair in South America.

Judges also awarded 14 best-of-category honors, worth $5,000 each, to the top winners of $3,000 first-place prizes. In behavioral and social sciences, the accolades went to Derek Zanutto of Fresno, Calif., for a study of a chemical's effect on planarian behavior. In biochemistry, Zhang won for his AIDS-related research; in botany, John Korman of Greer, S.C., for a plant-tumor investigation; in chemistry, Lawler; in computer science, Gabor Bernath of Budapest, for devising a three-dimensional scanner; in Earth and space sciences, Jay Michaels of Cocoa, Fla., for a study of rotating winds linked to severe weather; in engineering, Jonathan Condit of Lake Charles, La., for a low-cost device to detect irregular atrial rhythm; and in environmental sciences, Sirisha Kalicheti of Chantilly, Va., for examining metal-ion contamination in fish.

Other best-of-category winners were, in gerontology, Eric Stern of Great Neck, N.Y., for Alzheimer's disease research; in mathematics, Matthew Ong of Cheyenne, Wyo., for work on group theory; in medicine and health, Kapualokelanipomaika'I Katherine Medeiros of Honolulu for exploring a possible anticancer agent in papaya seeds; in microbiology, Jeremy Farris of Bonaire, Ga., for research on biological control of the kudzu vine; in physics, Han-Chih Chang of Chang-Hwa City, Taiwan, for a study of magnetic fluids; in zoology, AmyLyn Woolley of Bend, Ore., for shrimp research; and for a team project, Young and Acevedo. —P. Weiss

# Once over lightly with chemical microscope

Like a record needle, the sharp probe of an atomic force microscope (AFM) scans the surface of a material, tracing out the hills and valleys of the molecular landscape. Now, a microscope developed by researchers in Germany takes the method one step further by mapping the chemical, as well as the topographical, features of a material.

The technique marries an AFM with infrared spectroscopy, says Fritz Keilmann of the Max Planck Institute for Biochemistry in Martinsreid. He and his coworker Bernhard Knoll shine infrared light of a single wavelength on an AFM probe tip as it moves. Different molecules scatter the light in characteristic patterns, which are affected by the tip.

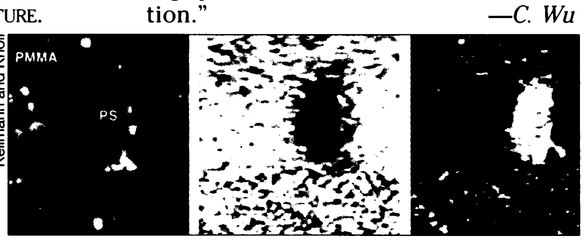
By detecting the scattered photons, the researchers mapped out the two polymers or two elements making up each test surface. Meanwhile, the AFM tip recorded topography in the standard way. Keilmann and Knoll describe their new method in the May 13 NATURE.

The technique brings scientists closer to being able to identify unknown molecules simply by passing a tiny probe over them. Such probes could be used to explore the proteins on cell membranes or to monitor the quality of computer chips—"every problem you can apply regular microscopy to and then some," says Lori S. Goldner of the National Institute of Standards and Technology in Gaithersburg, Md.

To make a chemical microscope that could differentiate among a wide variety of compounds, scientists would need to shine a range of infrared wavelengths on each bit of the sample, Keilmann says. In the current study, he and Knoll only used two different wavelengths.

The new device grows out of a method known as near-field scanning optical microscopy (NSOM), which is widely used for imaging. NSOM has advantages over electron microscopes, which require difficult sample preparation and must operate at low pressures, says Goldner (SN: 10/24/98, p. 268). Until now, NSOM using infrared light, could not image objects smaller than about 1 micrometer.

Keilmann's technique is "very impressive," Goldner says. "This is the first convincing evidence that you can do chemical mapping with a scattering probe at 30-nanometer resolution." —C. Wu




Keilmann and Knoll

*An image from an atomic force microscope (left) shows the topography of a material containing polystyrene (PS) embedded in polymethylmethacrylate (PMMA). When illuminated with 9.7-micrometer-wavelength infrared light, PS absorbs more light than PMMA and therefore appears as a dark patch (middle). At 10.2 μm (right), PMMA absorbs more light, so the contrast is reversed.*