Top STS winners chosen

Nayak

Tseng

Abella

A shared standard of excellence won scholarships this week for high school students in the 47th annual Westinghouse Science Talent Search (STS), but their winning research projects and personal motivations showed pure individuality. It was a summer course two years ago, for example, that fueled first-place winner Chetan Nayak's passion for physics and led to his mathematical analysis of the interaction between electromagnetic and gravitational fields. Because there were unanswered questions in the scientific literature about the theory linking the two types of forces, Nayak developed a version of the theory that he says might allow quantum-level measurements of the field interactions. A senior at Stuyvesant H.S. in New York City, Nayak won a $20,000 scholarship.

Janet Tseng won second place with her study of an opportunistic infection called cryptosporidiosis, a cause of chronic diarrhea in AIDS patients. Born in Taiwan, Tseng is also a senior at Stuyvesant. Using a fluorescent assay, she studied patients' antibody profiles at different stages of *Cryptosporidium* infection, finding that AIDS patients lack a specific antibody response. Tseng, who did her research during summers and after school at St. Vincent's Hospital, became interested in AIDS research after reading a magazine article on AIDS and the immune system.

Third place went to a molecular genetics project by Benjamin S. Abella from University of Chicago Laboratory Schools H.S. Using facilities at the university's Department of Molecular Genetics and Cell Biology, Abella located several genes in the nitrogen-fixing bacterium *Rhodobacter capsulata* that are involved in the synthesis of proteins needed for nitrogen fixation. Tseng and Abella each won $15,000 scholarships.

Other awards announced this week include $10,000 scholarships to fourth-place winner Vijay S. Pande of Langley H.S. in McLean, Va., for his computer simulation of a space-based laser ballistic missile defense; fifth-place winner Brian D. Conrad of Centereach (N.Y.) H.S. for his own mathematical concept of "inverted continued fractions"; and sixth-place winner Weiva Y. Sieh of the Bronx (N.Y.) H.S. of Science, who demonstrated areas of decreased brain activity as a result of chronic treatment with the drug naltrexone.

The remainder of the top 10 winners each received $7,500 scholarships. They are, in descending order: Stacey E. Beaulieu of Palm Beach Gardens (Fla.) H.S., Kurt M. Cuffey of State College (Pa.) Area Senior H.S., Brian C. Hooker of Benjamin E. Mays H.S. in Atlanta, and Meredith A. Albrecht of Evanston (Ill.) Township H.S. Beaulieu showed that a xanthan-gum coat on bacteria causing canker diseases in plants accelerates the disease process. A study of glaciers and valley shape and size in Montana's Glacier National Park won Cuffey his award. Hooker won with his portable carbon monoxide detector, while Albrecht's winning project looked at heat distribution in materials made of epoxy and copper particles.

The other 30 national finalists each received $1,000. Chosen as first and second alternates to the winners were Meivile Chen of Stuyvesant and Scott D. Zucker of South Plantation (Fla.) H.S. Sponsored by Westinghouse Electric Corp., the competition is conducted by Science Service, Inc.

During the awards ceremony, the 40 finalists were urged to keep the promises their talents imply, by excelling in their chosen professions. Principal speaker Purnell W. Choppin, president of the Howard Hughes Medical Institute, said the public "should be cheered by the fact there are so many [young people] interested in science." In a videotaped message, President Reagan told the young scientists that, as today's students, they symbolize the future and are part of "America's most valuable asset." Since 1942, five STS finalists have gone on to win Nobel Prizes. □

How high-speed iron dust does damage

The Van de Graaff machine is one of the oldest designs of accelerators for subatomic particles. Invented more than 50 years ago, Van de Graaffs have done yeoman work accelerating first protons and later ions. Today a few laboratories are using them to accelerate dust motes made of iron, particles between 0.1 and 1 micron in size. The most powerful machine used for this purpose, with an energy range between 6 million and 8 million electron-volts, is at the Los Alamos (N.M.) National Laboratory. Recently it succeeded in accelerating these iron particles to speeds of 50 kilometers per second.

This is a velocity never reached before in this fashion for particles of this size. It is 50 times as fast as a bullet fired from a high-powered rifle. The other two laboratories that do this work, the University of Kent in Canterbury, England, and the Max Planck Institute in Heidelberg, West Germany, use less powerful machines, according to Paul Keaton, who leads the work at Los Alamos. After some adjustments he hopes to reach 100 km/s.

Such particles each contain about a billion atoms of iron, Keaton estimates. When they come out at this speed, they carry 100 to 1,000 times the energy needed to vaporize iron. Thus if they hit a solid iron target they will vaporize 100 to 1,000 times as many atoms as they contain. The main purpose of the work is to study how this damage is done, developing "codes" that describe in detail these processes of melting and vaporization that result in pitting of the surface of the target. Experimental verification of theoretically calculated codes for particles of this mass and velocity was previously impossible, according to a Los Alamos announcement.

Even at 50 kilometers per second, these particles, which are about the size of the particles in cigarette smoke, would not go far in the atmosphere without being stopped. However, in space such particles travel long distances and are a constant hazard to spacecraft. They come from cosmic dust, meteoritic dust and cometary dust. Right now there should be a good supply left by Comet Halley.

Although there is a national defense interest in the details of such damage codes, there seems to be no practical way of using such a system to fire these particles as projectiles. It wouldn't work in the atmosphere; the accelerator would have to be in space. And, says Keaton, "Nobody is thinking of putting a Van de Graaff into space. Ours weighs 140 tons." — *D. E. Thomsen*