Science students fare very well at fair

Young scientists won scholarships and trips to other science competitions at the 46th International Science and Engineering Fair held May 7 to 13 in Hamilton, Ontario.

More than 750 students of the 1,028 participants received prizes worth a total of nearly $1 million at two award ceremonies. The top prizes were overseas trips with all expenses paid. Scholarships worth $100 to $5,000 went to winners of the fourth- through first-place awards in 16 project categories. More than 70 professional science societies, federal agencies, and industrial groups awarded prizes. Science Service, Inc., publisher of SCIENCE NEWS, organizes the annual fair.

A wallet-size electronic device that tells the visually impaired the denominations of their bills won Tracy Caroline Phillips, 18, of Long Beach (N.Y.) H.S. a Glenn T. Seaborg Nobel Prize Visit Award. Two months ago, the project won her second place in the Westinghouse Science Talent Search, sponsored in partnership with Science Service (SN: 3/18/95, p.166).

Neil Ashok Hattangadi, 17, of Winter Park (Fla.) H.S. also received the Seaborg award for his project to boost nitrogen fixing by nonleguminous plants, an effort aimed at reducing fertilizer use. Both students will travel to Stockholm in December to observe the awarding of the 1995 Nobel prizes.

A project using satellite data to examine the unusual location of hydrogen around Saturn won Jonathan William Edwards, 17, and Mani S. Mahjouri, 17, of Atholton H.S. in Columbia, Md., a trip to Newcastle-upon-Tyne, England, this September for the Seventh European Union Contest for Young Scientists.

Ben Carter, 16, Richard Stuart Castle, 17, and Michael Ross, 18, all of the Coleraine (Ireland) Academical Institution, won a trip to the 10th International Science and Technology Fair in Santiago, Chile, in November. They developed a low-cost milling machine that can translate pictures scanned into a computer into three-dimensional models.

Alfred McLaren

Hattangadi and Westinghouse first-place winner Irene Ann Chen.

For his project on the effects and speed of degradation of organophosphate pesticides, Jeremy David Kassebaum, 17, of Sunnyside (Wash.) Senior H.S. won an opportunity to study this year at the Weizmann Institute of Science's Bessie Lawrence International Summer Science Institute in Rehovot, Israel. *— T. Adler*

Adding up light from comet's Jovian crash

When the fragments of Comet Shoemaker-Levy 9 plowed into Jupiter last July, dozens of large telescopes on Earth and several in space recorded the light show. Last week, scientists orchestrated the data from these instruments into one giant symphony.

"Now we're putting all the pieces together," says astronomer Heidi B. Hammel of the Massachusetts Institute of Technology. She and other researchers presented their findings in Baltimore at a meeting of the International Astronomical Union devoted to the comet crash.

Intriguingly, scientists have now confirmed that even though the fragments struck the back of Jupiter, just out of view of Earth, ground-based telescopes were the first to see the initial flashes of light — even before the Jupiter-bound Galileo spacecraft, which had a direct view of the comet crashes.

An analysis of the fireworks associated with several of the larger fragments indicates that for each event, the first emissions came as a chunk entered Jupiter's upper atmosphere, streaking like a meteor. (Cometary debris just in front of some of the fragments may also have contributed to the initial light emission.)

At an altitude of 400 to 500 kilometers above the Jovian cloud tops — well above the darkened limb of the planet — the fragments emitted enough light for large telescopes on Earth to record the faint entry flashes.

"It's quite understandable that Galileo didn't see this, even though the emission happened right in front of [the craft], because the flux of light was too faint for it to detect," says Philip D. Nicholson of Cornell University.

For a few impacts, Galileo caught the tail end of the entry, which occurred about 10 seconds later, after the fragments had sunk below Jupiter's limb and out of sight of telescopes on Earth. The craft saw no gap between this meteor phase and the subsequent explosion of the fragment because, scientists theorize, the events overlapped.

As each large fragment began to explode, it continued to tunnel down into thicker Jovian atmosphere, creating a rising column of hot debris in its wake.

This is the one time, Nicholson says, that their viewing angle seriously hampered ground-based observers. The explosion and the emergence of the plume "would have really knocked your socks off. It lasted only about 30 seconds, but it would have been 10 times brighter than [Jupiter's moon] Io, visible to the naked eye."

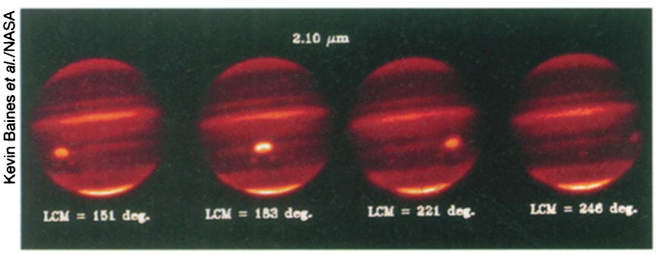
But within 8 minutes, the plume shot some 3,000 km above the planet's cloud tops. Above 1,000 km, the plume became clearly visible to the Hubble Space Telescope.

Here, says Nicholson, "the geometry was almost ideal." Because the plumes emerged from the limb, against dark sky, researchers could readily measure their height.

By the time each plume crashed back into the Jovian atmosphere, the impact site had rotated into view and telescopes on Earth had a direct view of this supersonic splat.

For this "main event," which produced a torrent of infrared radiation for several minutes, "the [viewing] geometry couldn't have been better if we had designed this experiment ourselves," notes John R. Spencer of Lowell Observatory in Flagstaff, Ariz.

Now that scientists agree on what they've detected, they can use the light emissions to estimate the size of the fragments, says Mordecai-Mark Mac Low of the University of Chicago. Estimates vary, but he and his colleague, Kevin Zahnle of NASA's Ames Research Center in Mountain View, Calif., calculate that the largest fragment was about 700 meters in diameter. *— R. Cowen*



Kevin Baines *et al.*/NASA

False-color infrared images of Jupiter taken in April at NASA's Infrared Telescope Facility in Hawaii. Nine months after the fragments of Comet Shoemaker-Levy 9 struck Jupiter, the impact sites were still visible as a bright red band just above the planet's south polar cap. Bright oval is Jupiter's Great Red Spot.