Astronomy

Keeping track of a bright comet . . .

After having its every move imaged and analyzed for months, Comet Hale-Bopp has been granted a brief reprieve from the astronomical paparazzi. It has now slipped behind the sun and won't reemerge from the solar glare until February 1996. In the meantime, the comet remains unusually active, raising hopes that it may wow skywatchers when it passes nearest the sun in April 1997.

On Aug. 30, a month after the comet's discovery, Alan Fitzsimmons and Martin Cartwright of Queen's University in Belfast, Northern Ireland, obtained spectra of Hale-Bopp with the 4-meter William Herschel Telescope in the Canary Islands, Spain. The spectra reveal cyanogen in the gases surrounding the icy nucleus of the comet, the astronomers report in the Jan. 13, 1996 MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY. Ordinarily, researchers see this gas only in comets much nearer the sun than Hale-Bopp, which now lies beyond Jupiter.

From the intensity of the cyanogen emission, Fitzsimmons and Cartwright calculate that the comet vents about 3 kilograms of the gas every second—five times more than Comet Halley released in 1985, when it was much closer to the sun's warming rays. In other respects, however, the comet appears fairly ordinary. It releases carbon monoxide and cyanogen in roughly the same ratio as other comets do, and the dust particles that shroud its nucleus have a typical, slightly reddish tinge. Hale-Bopp, the astronomers conclude, acts like a normal comet—except that it appears much brighter and more active than any other studied at such a great distance.

A report by Michael F. A'Hearn of the University of Maryland in College Park and his colleagues in an Oct. 16 circular of the International Astronomical Union concurs with that conclusion. Analyzing observations by the International Ultraviolet Explorer in late August and early September, the researchers find that Hale-Bopp flings out an enormous amount of dust, perhaps more than any other known comet. Sunlight reflecting off a comet's dusty shroud, or coma, accounts for its brightness. Even if the rate at which the comet spews dust doesn't increase as it nears the sun, "it could still be a monster," says Harold A. Weaver of Applied Research Corp. in Landover, Md.

. . . and estimating its size

The brightness of Hale-Bopp in the latest observations with the Hubble Space Telescope suggests that the comet's icy nucleus has a diameter as large as 40 kilometers—four times bigger than the nucleus of Comet Halley. Although size alone doesn't guarantee a dazzling display, the large diameter bodes well for an impressive light show in 1997, notes Harold A. Weaver of Applied Research Corp. in Landover, Md.

He cautions, however, that his Hubble calculation represents only a rough estimate, since the comet is far smaller than the tiniest feature—about 400 km in length—that the telescope can resolve at Hale-Bopp's distance from Earth.

When Hubble imaged the comet on Oct. 23, it fortuitously caught Hale-Bopp in a relatively quiescent state, 10 days after its last outburst. During that time, the comet's dusty halo was less pronounced, and more of the light seemed to reflect from Hale-Bopp's core. With the caveat that reflected light might have come from a small, unseen outburst elsewhere in the comet, Weaver speculates that the core could indeed be a whopper.

Comet Hale-Bopp (arrow), as seen by Hubble on Oct. 23.

Biomedicine

Gene therapy oversold, panel says

Gene therapy holds great promise, but it won't be realized until the field gets back to good basic science, a special advisory panel told Harold E. Varmus, director of the National Institutes of Health in Bethesda, Md., at a meeting Dec. 7. The panel, convened by Varmus earlier this year, noted that scientists and journalists have "oversold" the concept to the public and raised false hopes. Thus far, no human gene therapy has proven effective.

"The public simply doesn't understand that gene therapy is not around the corner," says Stuart H. Orkin of Harvard University Medical School in Boston, who cochaired the panel.

NIH spends approximately $200 million of its $11 billion annual budget on developing techniques to treat disease by replacing defective genes. While Orkin maintains that this investment in the therapy is "about right," he and the panel recommend that more of the money be directed toward laboratory efforts than long-shot studies of patients.

Currently, gene therapy is hamstrung by difficulties in getting the intended gene into a patient's cells (SN: 10/28/95, p.284). Scientists often use viruses in their attempts to transfer a gene, but most of these virus vectors don't insert the gene effectively, and some of them cause side effects such as serious inflammation. Orkin points out that if a researcher can't get the gene into a patient's cell, "you get no information."

The panel also noted that in the rush to try gene therapy, scientists are overlooking opportunities to study disease physiology. Such haste may delay drug development. Orkin noted that over a decade ago, scientists discovered a genetic defect that causes high cholesterol. By studying how this gene regulates cholesterol, they developed a new class of cholesterol-lowering drugs. Had the researchers rushed to gene therapy, those drugs might not exist today.

The current climate of excitement that surrounds gene therapy left the panel concerned that people with genetic diseases would come to expect quick cures for their problems. Pediatrician David Valle of Johns Hopkins Medical Institutions in Baltimore, who serves on the NIH director's standing advisory committee, relates the story of one of his patients who stopped a restricted diet that could save his eyesight because "gene therapy is right around the corner."

The panel also recommended that NIH sponsor interdisciplinary workshops to focus the research on basic science and urged scientists and journalists to inform the public about not only the promise of gene therapy but also its limitations.

Ultrasound to detect breast cancer

An advisory panel to the Food and Drug Administration recommended last week that the agency approve an ultrasound device that can determine whether a suspicious breast lump is benign or cancerous. The technique, high-definition imaging (HDI), could reduce the 700,000 biopsies performed each year. Physicians routinely use mammograms to find small lumps in the breast. But mammograms can't tell if the lump is cancerous, so surgeons must perform a biopsy on the lump.

In a test of over 900 breast lumps, HDI's manufacturer, Advanced Technology Laboratories of Seattle, reported 99.5 percent accuracy in diagnosing benign lumps. The technique effectively picks out benign, fluid-filled cysts but is less successful at distinguishing from cancers other kinds of benign growth.

Because mammograms detect cancer at an earlier stage than HDI, the committee recommended use of HDI only when a lump has been found. The committee suggested that the manufacturer train doctors in the use of the device. Panel member David B. Hackney of the University of Pennsylvania Medical Center points out that "doctors without expertise will need to learn when ultrasound is appropriate."