disclosing one's emotions facilitated [psychological] adjustment."

The new findings are consistent with evidence that psychotherapy benefits only the small proportion of bereaved individuals who suffer from severe, unrelenting yearning for a deceased person and seek out professional help (*SN: 1/14/95, p. 22*).

In one of their new studies, the researchers contacted 105 widows and 23 widowers about 3 months after their spouses had died. Participants, all under age 66, completed questionnaires that asked about their psychological health and how much they had talked about their loss and related feelings. The volunteers also completed the questionnaires 1 year, 1½ years, and 2 years after their partners' deaths.

Bereaved individuals exhibited an overall improvement in mood and outlook over the 2 years, the researchers say. Those who frequently discussed their emotional lives with friends and family experienced no signs of speedier adjustment, such as a larger reduction in depression.

In the second study, 66 widows and 53 widowers completed questionnaires on their psychological health and emotional disclosure between 4 and 8 months after their partners' deaths. They were then randomly assigned to write in a diary each day for a week or placed in a control group that didn't keep a diary. Diary participants, in three groups, were told to write about bereavement-related emotions, daily problems related to the spouse's death, or a mix of feelings and problems.

Six months later, bereaved participants in the two groups reported a comparable reduction in psychological distress. Also, people who had kept diaries for that 1 week reaped no apparent gains in physical health; they visited their physicians just as often as those who hadn't, the researchers report.

Moreover, diary writing yielded no special benefits for individuals whose partners died unexpectedly rather than after a long illness or for those who said they liked to disclose their feelings rather than keeping them secret.

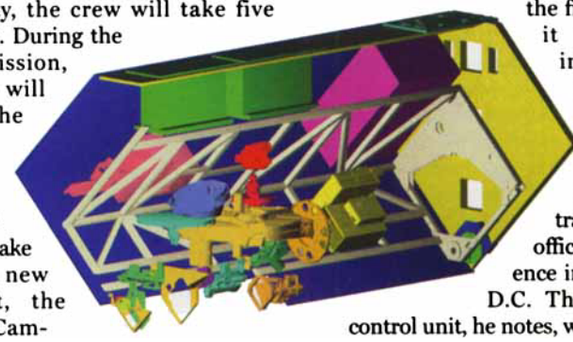
Other research suggests that grief work may do more harm than good if it fosters the expression of negative emotions, remarks psychologist George A. Bonanno of Columbia University. For example, he has reported that bereaved spouses who most readily show anger and other negative emotions in their facial expressions encounter the most problems adjusting to their loss. In contrast, those who spend relatively little time trying to comprehend their loss and cite mainly positive feelings about a deceased spouse exhibit the best adjustment, Bonanno says. —B. BOWER

Ambitious Mission

Hubble slated to get one heckuva tune-up

If all goes according to plan next week, astronauts aboard the space shuttle Columbia will embark on the fourth and most technically challenging mission to replace damaged parts and install new detectors on the Hubble Space Telescope.

After catching Hubble with the shuttle's robot arm and securing it in Columbia's payload bay, the crew will take five space walks. During the 11-day mission, astronauts will remove the European Space Agency's faint-object camera to make room for a new instrument, the Advanced Camera for Surveys (ACS).



NEW EYE FOR HUBBLE A schematic of the Advanced Camera for Surveys.

The size of a telephone booth, ACS has twice the field of view and can detect celestial objects one-fifth as bright as Hubble's current workhorse detector, the Wide-Field and Planetary Camera 2 (WFPC-2). Featuring individual light sensors, or pixels, that are half the size of those on WFPC-2, ACS also has twice the resolution of that camera.

During its first 18 months of operation, ACS will enable Hubble to detect more faint stars and galaxies than the telescope has since the observatory's launch in 1990, says Holland Ford of Johns Hopkins University in Baltimore, who leads the ACS team.

The camera's improvements will be especially important in finding rare objects, such as distant supernovas and the earliest galaxies to have formed in the universe, Ford notes. The instrument's chronograph, which blots out the light of nearby stars, will provide new details about protoplanetary disks. These dim, doughnut-shape regions of gas and dust surround young stars and provide the material for making planets.

During one space walk, astronauts will install an experimental refrigerator in an attempt to revive Hubble's near-infrared and faint-object spectrograph. This instrument stopped working in 1999 when a heat leak caused it to prematurely run out of its nitrogen-ice coolant. The infrared camera had examined the cosmos at wavelengths longer than any other instrument aboard Hubble, enabling it to see through dusty regions that visible light can't penetrate.

But before the shuttle crew attempts to bolster Hubble's scientific capabilities, they'll have to address the basic health of the spacecraft. Their first order of business is to install a new power-control unit, which distributes current from Hubble's solar arrays and batteries. Electrical problems in the unit are now preventing Hubble from using two of its six batteries, and the trouble "doesn't have to become much worse before we could lose the ability to do any science with this observatory," says Hubble project manager Preston Burch of NASA's Goddard Space Flight Center in Greenbelt, Md.

To replace the unit, astronauts will power down the telescope for the first time since it was placed in orbit. "That scares me a lot," admits Edward J. Weiler, associate administrator for NASA's office of space science in Washington, D.C. The 160-pound control unit, he notes, wasn't designed to be replaced, so the astronauts will have to manually unscrew 36 electrical connectors. While the power is off, the crew will keep Hubble's instruments warm by wrapping them in thermal blankets.

The crew will also provide Hubble with a new set of solar arrays. The craft's third set, the arrays have only two-thirds the solar-collecting area of those now in place but will produce 20 percent more power. Before coming home, the astronauts will also replace one of the observatory's reaction wheels, which keep the observatory focused on a celestial target. —R. COWEN

Broken Weapon

Mutation disarms HIV-fighting gene

A gene that once produced a small protein able to prevent HIV from infecting cells now lies unusable in the human genome, scientists have found. In addition to suggesting a new weapon in the battle against AIDS, this so-called pseudogene reignites speculation about why infection with HIV kills people but not nonhuman primates.

Several years ago, researchers found that

rhesus monkeys have a gene encoding a novel microbe-killing protein (*SN: 10/30/99, p. 283*). More recently, Robert I. Lehrer of the University of California, Los Angeles School of Medicine and his colleagues noticed that people have a closely related gene that's active in their bone marrow cells. Yet the human gene contains a mutation that prevents cells from completing manufacture of the protein it encodes.

Intrigued, the researchers deduced what the amino acid sequence of the protein might be if the pseudogene didn't have the flaw. They synthesized this protein, dubbed it retrocyclin, and tested it against various bacteria and fungi growing in test tubes. Retrocyclin turned out to have antimicrobial activity similar to that of the related monkey protein.

NO TEARS Adult male Asian elephant drips liquids (right of eye) during testosterone surges.

Recreating retrocyclin is "ingenious," says Charles Bevins of the Lerner Research Institute in Cleveland, who studies similar antimicrobial compounds.

In further test-tube experiments, Lehrer's group found that retrocyclin protects cells from infection by several distinct HIV strains. In the Feb. 19 *Proceedings of the National Academy of Sciences*, the scientists report that the protein blocks the virus early in its infection cycle, perhaps preventing HIV from entering cells.

Both Lehrer and Bevins suggest that retrocyclin could serve as a prototype for a new class of anti-HIV agents. Bevins also raises a provocative question about the ancient mutation that deprived people of retrocyclin. "Could this be part of the reason we are so much more susceptible to HIV compared to monkeys?" he asks. —J. TRAVIS

Honey-Scented Elephants

Young males' faces drip sweet signals

When testosterone begins spiking in young Asian bull elephants, they secrete a liquid from their facial glands that smells like honey, says an international team of researchers.

Ancient Hindu poetry referred to bees gathering "sweetness" from elephants, but a paper in the Feb. 28 *Nature* represents the first scientific description of the phenomenon and its possible function, says coauthor L.E.L. Rasmussen of Oregon Health and Science University in Beaverton.

She says she first heard about the honey-scented secretions from Heidi Riddle, who runs an elephant sanctuary in Greenbrier, Ark., and is a coauthor on the report. One of Riddle's Asian bulls was just reaching adulthood and displaying a junior version of musth, the weeks-long phase of testiness and heightened interest in mating that characterizes adult males (*SN: 11/25/00, p. 341*). Musth is typically the only time an Asian elephant secretes much liquid from glands on its temples.

A maturing male doesn't go into full musth all at once but starts with sporadic days of erratic behavior and quick spikes in testosterone concentration in his blood. Rasmussen analyzed samples of secretions from young males and found compounds known from bee honey and bee pheromones. These compounds dwindle in musth secretions as the males mature, while other, pungent compounds appear.

The researchers hypothesize that the honeylike scent in a youngster's secretions indicates to its elders that this sexually mature male is still basically a kid. Rasmussen tested captive elephants' reactions to gland secretions by pouring them on recently washed concrete flooring. Mature males didn't pay much attention to the secretions of the youngsters, but young males grew agitated when sniffing samples from adults.

Observations in the wild were consistent with that pattern, the team reports. At a foraging spot in India, a mature bull sniffed in the direction of a young male secreting the honey scent. The adult bull didn't pursue the youngster but stalked and attacked a slightly older elephant already secreting some of the grown-up compounds. The honey-scented compound may deter attacks from older males, Rasmussen proposes.

"I've never even heard this hypothesized before," says John Lehnhardt, an elephant specialist at Disney's Animal Kingdom in Lake Buena Vista, Fla.

Jill Mellen, a behaviorist there, says it's important to ask which animals would benefit from the sweet secretions. Perhaps they save the youngsters from battle while they present no mating competition. On the other hand, the youngsters' secretion might let them slip by big bulls for sneaky courtships.

Although only male Asian elephants exhibit musth, both males and females of African elephants secrete liquids from their temples, says chemist Thomas Goodwin of Hendrix College in Conway, Arkansas. He's examining these secretions to see if elephant bulls have their own special chemicals in Africa, too. —S. MILIUS

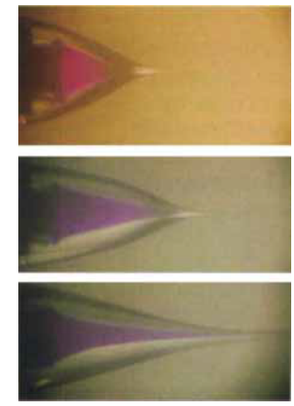
RASMUSSEN; A. BARRERO/UNIV. OF SEVILLE

Thin Jet Flies Two for One

Double streams yield sheathed nanoballs, fibers

Powerful electric fields can stretch liquids into narrow jets that burst into sprays of droplets. This phenomenon has revolutionized mass spectrometry, a technique for weighing a sample's constituent atoms and molecules. Meanwhile, some industries are testing the technique, known as electrospray, for such uses as making and delivering drugs.

Researchers in Spain and the United States have now applied electrospray principles in a novel way, creating ultrathin liquid jets in which a stream of one liquid encloses a stream of another. When such a coaxial jet breaks up, it produces exceptionally tiny, coated droplets. Or, if the coaxial flow is allowed to quickly solidify, the technique yields coated fibers.



GETTING THE POINT Stretched into a cone by an electric field, a jet of two fluids—ethylene glycol (pink or purple) inside a clear polymer—elongates as the flow rate of the liquids increases (top to bottom).

Whether particles or fibers, the products are uniform in size, coating thickness, and other structural characteristics, says Ignacio González Loscertales of the University of Málaga in Spain. Potential uses of the products range from encapsulated drugs and food additives, such as flavors and aromas, to insulated nanometer-scale wires for ultrasmall electronic circuits (*SN: 2/9/02, p. 83*).

"It's a very promising technique," comments Jan C.M. Marijnissen of the Technical University of Delft in the Netherlands.

To make the coaxial jets, Loscertales and his coworkers use hollow needles up to a millimeter in diameter. The needles are