Astronomy

Ron Cowen reports from Philadelphia at a meeting of the American Astronomical Society

Probing stars in nearby galaxies . . .

Recent images and spectrograms taken with the Hubble Space Telescope offer new insights about the evolution and current status of some of the most massive stars known in the universe. Using Hubble's Goddard High-Resolution Spectrograph, researchers have found supporting evidence that Melnick 42 – a star with a mass about 85 times that of the sun – is slimming down more rapidly than previously estimated. The finding, along with planned Hubble observations of stars that have a range of masses and chemical compositions, may provide new details on how a star's chemical makeup affects its evolution, says astrophysicist Sara R. Heap at NASA's Goddard Space Flight Center in Greenbelt, Md.

Heap and her co-workers analyzed far-ultraviolet emissions from Melnick 42, which lies about 169,000 light-years from Earth in a neighboring galaxy, the Large Magellanic Cloud. These spectra show a large drop in intensity over a particular range of wavelengths. This spectral "fingerprint" reveals that a significant number of high-speed, triply ionized carbon atoms absorb light emitted by the star. The absorption indicates that the hot star ejects an energetic wind of carbon ions and other particles, which attain speeds of up to 2,900 kilometers per second, Heap says. Over a period of 100,000 years, she estimates, this wind carries away a quantity of gas equal to the mass of the sun.

The amount of mass expelled by the star appears surprisingly large, she notes, because Melnick 42 has a relative paucity of elements heavier than helium. A standard model suggests that without an abundance of these heavier atoms – which readily absorb energy from the ultraviolet radiation dominating starlight – stellar winds remain weak and the star expels relatively little matter.

Heap suggests that the temperature of Melnick's hot surface – about seven times hotter than the sun's – may create and strengthen the star's powerful wind, even with a low concentration of heavy elements. To learn more about the relationship between mass loss and chemical composition, she and German colleagues from the University of Munich plan to compare the spectra of Melnick 42 with those of 20 other young, massive stars to be observed by Hubble.

. . . and in our Milky Way

Hubble has also examined massive stars closer to Earth. These include Eta Carinae, some 8,000 light-years away, which astrophysicists speculate may be the next Milky Way star to explode as a giant supernova. Using the telescope's Wide-Field/Planetary Camera, J. Jeff Hester and his colleagues at the California Institute of Technology in Pasadena photographed this bright star, its gas halo and the surrounding interstellar medium in unprecedented detail, resolving structures just a few tenths of an arc-second across. (Computer software compensated for distortions caused by Hubble's optical flaw.)

The Hubble photograph reveals that a previously pictured shell of matter, observed hurling from the star in 1843, contains small clumps of matter – a strong indication, Hester says, that it has begun to fragment. The new image also shows that the shell – about one-third of a light-year from the stellar core – has a well-defined boundary, a feature that scientists hope may clarify how Eta Carinae expelled the mass.

The Hubble Space Telescope's image also delineates a network of clumps and filaments farther out from the shell, about half a light-year from the star's center. These structures, explains Hester, stem from shock waves in regions where material from the outburst observed in 1843 has slammed into both the interstellar medium and matter from previous outbursts. The collision zones may provide clues about the history and future of this unstable star, she says.

Behavior

Beauty in diversity

Recent studies indicated that infants and adults perceive the same white adult female faces as attractive (SN: 5/16/87, p.310), suggesting that perceptions of beauty develop in the first months of life and may derive in part from innate influences. Further investigations now demonstrate that babies and adults also share clear preferences for attractive faces of white adult males and females, black adult females and 3-month-old white girls and boys.

Even with little exposure to cultural standards of beauty, "infants treat attractive faces as distinctive regardless of the sex, age and race of the stimulus faces," write psychologist Judith H. Langlois of the University of Texas at Austin and her colleagues in the January DEVELOPMENTAL PSYCHOLOGY.

In one experiment, 60 healthy 6-month-olds from middle-class families viewed slides showing eight pairs of white male faces and eight pairs of white female faces. Each pair, displayed for 10 seconds, consisted of one attractive and one unattractive face, as previously judged by a group of male and female college students. An experimenter viewed the young participants on a video monitor and recorded the direction and duration of each infant's gaze.

The 35 boys and 25 girls looked longer at both male and female faces judged as attractive, the researchers found.

Their second study of 6-month-olds involved 15 boys and 25 girls, predominantly white, who saw eight pairs of slides showing an attractive and an unattractive black female, as previously judged by both white and black college students. Again, the babies looked much longer at attractive faces.

Finally, 19 boys and 20 girls, all 6 months old and almost all of them white, viewed eight pairs of slides showing the faces of 3-month-old boys and girls previously rated as attractive or unattractive by college students. Attractive baby faces drew significantly longer looks, the psychologists report.

Further studies must explore whether infants perceive attractive faces as "best examples" of a face, the investigators maintain. Langlois and a co-worker recently reported that attractive faces may possess features that approximate the mathematical average of all faces in a particular population (SN: 5/12/90, p.298).

Lights-out for some flashbulb memories

Some psychologists suspect that inaccuracies sometimes creep into the recall of vivid "flashbulb memories" for experiences just before, during and after learning of a startling event (SN: 6/4/88, p.358). Thus, flashbulb memories require no special memory mechanism wired for perfect recall, according to these researchers.

Their argument may indeed hold up, but a major puzzle about flashbulb memories remains unanswered, says psychologist Ulric Neisser of Emory University in Atlanta: Why do people so often have vivid recollections that prove incorrect?

Neisser's query stems from a study he conducted with Emory colleague Nicole Harsch. On the morning after the Jan. 28, 1986, space shuttle explosion, the researchers asked Emory freshmen in an introductory psychology class how they had heard the news of the disaster the day before. Three years later, 44 of the students again told the researchers how they learned of the tragedy.

Although the students gave plausible and confident accounts after three years had passed, nearly one-third of them provided descriptions that differed substantially from their day-after recollections, Neisser reports in the January AMERICAN PSYCHOLOGIST.

The large number of "utterly false reports" concerning such a shocking event came as a surprise, Neisser says, and deserves further scrutiny in flashbulb-memory studies.