

An X-ray burster's visible trail

Searching a crowded cluster of stars with the Hubble Space Telescope, astronomers have found the visible-light counterpart to perhaps the most baffling X-ray-emitting source in the Milky Way. The discovery may provide new clues about the orientation and composition of this double star, which has intrigued astronomers for two decades.

This stellar system made headlines in 1975 when the Astronomical Netherlands Satellite revealed it as the first known X-ray burster in the heavens. Subsequent studies with the orbiting Einstein Observatory brought a second claim to fame. That work revealed that the two components of this double star — a neutron star, the collapsed core of a massive star, and a white dwarf — lie only 160,000 kilometers apart, less than half the Earth-moon distance. The tiny separation qualifies this duo as the most compact binary ever found.



King/NASA/ESA

One star outshines all others in the ultraviolet image (left) of the core of the globular cluster NGC 6624. The ultraviolet-bright star coincides with a dim star in a visible-light image (right) of the same cluster. The star, indicated by tic marks, lies at the same position as a known X-ray burster.

Despite these properties, the search for a visible counterpart to the X-ray signal proved elusive because the binary resides in the globular cluster NGC 6624, a dense knot of stars 28,000 light-years from Earth. Ground-based telescopes couldn't pick out the star's dim optical emission from the crowd.

While using Hubble's Faint Object Camera to search for visible-light emissions, Ivan R. King of the University of California, Berkeley, and his colleagues also happened to take an ultraviolet image of the cluster. That proved fortunate, because the binary, though dim in visible light, far outshines neighboring stars in the ultraviolet. Comparing the ultraviolet and visible-light images, the researchers easily identified the source. King and his colleagues report their findings in the Aug. 20 *ASTROPHYSICAL JOURNAL LETTERS*.

According to King and other astronomers, the double star emits X-rays because its neutron star gravitationally rips helium from the white dwarf partner. The helium forms a swirling disk around the neutron star and some of it spirals onto the star's surface. The energy unleashed by the infalling matter produces a steady stream of X-rays occasionally interrupted by X-ray bursts. Scientists conjecture that this radiation heats the surrounding disk, prompting it to emit the ultraviolet and visible light detected by Hubble.

Preliminary measurements of the intensity of this light indicate that the disk has a tilt of perhaps 45° relative to the line of sight of Earthbound observers, King says.

He adds that the Hubble images may solve a long-standing puzzle about the double star. As the neutron star steals more mass from the white dwarf, the dwarf recedes. Thus the time it takes for the two partners to orbit each other should slightly lengthen. But X-ray astronomers found just the opposite.

Hubble shows that the binary lies only about 0.1 light-year from the dense core of the globular cluster, much closer than thought. The core thus exerts a stronger tug on the burster, and if it pulls the burster toward Earth, the motion would make it appear as if the double star's period is decreasing rather than increasing, King speculates.

Seasonal swings in violent suicide

Investigators have long noted that, at least in some populations, suicide rates peak in spring and summer, dropping off during fall and winter. A new study indicates that this pattern stems mainly from steep jumps in violent suicides that occur in April and May in adults younger than 65 and in August for those of older ages.

Previous evidence suggests that chemical messengers involved in psychological reactions to various types of stress — such as unemployment, depression, alcoholism, and loneliness — exhibit regular dips and rises during the year, asserts a research team led by psychiatrist Michael Maes of University Hospital of Cleveland. Disturbances in these seasonal shifts may influence violent suicide, they theorize.

Maes and his co-workers reviewed officially mandated physician reports of all deaths by suicide and homicide in Belgium between Jan. 1, 1979, and Dec. 31, 1987. A total of 19,943 suicides and 1,462 homicides occurred in this nine-year period. A majority of those who killed themselves used violent means, such as guns, hanging, or jumping off a high place. The remainder used nonviolent methods, often a drug overdose or carbon monoxide inhalation.

The weekly number of violent suicides peaked in April and May for adults younger than 65 and in August for older adults. At all ages, both violent and nonviolent suicides occurred more often among men than among women. Older adults displayed a greater tendency to kill themselves in violent ways.

No seasonal pattern emerged for homicides. This suggests that murder and violent suicide stem from different biological and psychological triggers, the researchers contend in the September *AMERICAN JOURNAL OF PSYCHIATRY*.

The difficulty of obtaining handguns in Belgium may discourage some citizens from attempting violent suicide, they note (*SN*: 8/15/92, p.102). And physician reports probably underestimate the total number of suicides. Still, the seasonal swings in violent suicides appear genuine, the scientists argue.

Giving the elderly the time of day

Young adults typically outperform the elderly on tests of memory and other thinking tasks. But researchers may have inadvertently exaggerated the mental advantages of youth by conducting most of their experiments in the afternoon, a team of psychologists contends in the September *PSYCHOLOGICAL SCIENCE*.

The time of day when psychological testing takes place has an important effect on the responses of younger and older people, assert Cynthia P. May of Duke University in Durham, N.C., and her colleagues. The researchers asked 210 young adults, age 18 to 22, to specify the time of day during which their mental facility and work performance attained the highest levels. Exactly half expressed no time preference, 93 opted for evening hours, and 12 chose the morning. In contrast, 74 of 91 older adults, ages 66 to 78, said they operated best in the morning; the rest had no favorite time of day.

May's group gave memory tests to 20 young adults who said they functioned best in the evening and to 22 older adults who stated a preference for the morning. Participants read 10 short passages and then tried to identify sentences that had appeared in the passages. Half of each group took the test in the morning, half in the late afternoon.

In the afternoon, memory scores of younger volunteers greatly surpassed those of their older counterparts. But in the morning, the performance of young adults dropped and that of older adults rose, reaching about the same level.

In an informal survey of researchers conducted at a scientific conference last year, May's team found that most studies of aging and mental function occur in the afternoon.