

Eta Carinae's star turn puzzles astronomers

Tempestuous as a diva and just as unpredictable, the massive star Eta Carinae is stunning astronomers with its brightest performance in over a century. Observations taken with the Hubble Space Telescope between December 1997 and this February reveal that the star had more than doubled its brightness and that the light emitted by the billowing gas and dust immediately surrounding it had tripled its intensity.

"This is the largest and most rapid brightening of Eta Carinae in the past 50 years, and the object is now brighter than at any time in the past 130 years," elated researchers reported in an April 19 circular of the International Astronomical Union. This week, the team, which includes Kris Davidson of the University of Minnesota in Minneapolis and Theodore R. Gull of NASA's Goddard Space Flight Center in Greenbelt, Md., described their latest analyses to *SCIENCE NEWS*.

The recent activity might be a prelude for the kind of light show that made Eta Carinae famous 150 years ago. Visible to the naked eye, it resides 7,500 light-years from Earth in the constellation Carina. In the 1840s, Eta Carinae hurled into space two ballooning gas clouds, ejecting as much mass as would be found in three suns and temporarily becoming the second brightest star in the sky. It underwent a smaller burst 50 years later, and in late 1997 showed an unprecedented upswing in the intensity of X rays it emits (*SN*: 2/7/98, p. 88). But after making a spectacle of itself, Eta Carinae seemed to be settling down.

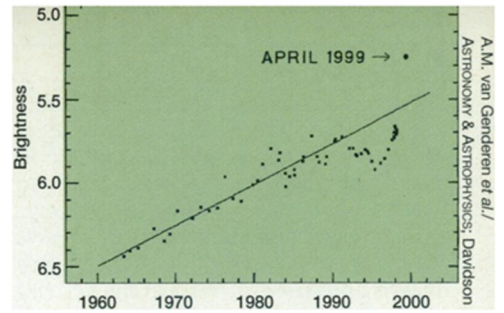
"When there is an eruption, it stabilizes the star for a long time afterward," Davidson says. He would have expected another outburst in 2200 or 2300. "It looks like it's throwing all the hand-waving theories out the window," he notes.

Gull suspects that in addition to an increase in the star's luminosity, some of the recent brightening may be due to the clearing of its dust veil, which would allow more starlight to emerge. Increased

ionizing radiation from the star may cause some of the surrounding dust to evaporate, he says. Davidson cautions, however, that it's unlikely dust could vanish so rapidly.

Several astronomers, including Elisha Polomski of the University of Florida in Gainesville, have confirmed the Hubble observations. Using a 4-meter telescope at the Cerro Tololo Inter-American Observatory in La Serena, Chile, Polomski and her colleagues have found that since 1997, the amount of mid-infrared radiation emitted by dust surrounding the star has doubled.

"If the only evidence were in the Hubble Space Telescope data, I'd be really



Recent data show that Eta Carinae has dramatically brightened since 1997.

nervous about its reality," says Davidson. But at this point, "the only way all this stuff could be a mistake is if everyone concerned . . . has simultaneously erred in the same direction." —*R. Cowen*

Dioxin confirmed as a human carcinogen

Nearly everyone in the world carries traces of dioxin. Some chemical-plant workers, however, have carried 1,000 times as much dioxin as other people. Such high exposures to dioxin in the workplace pose a cancer risk, a new federal analysis concludes.

Researchers at the National Institute for Occupational Safety and Health (NIOSH) in Cincinnati studied 5,132 chemical workers from 12 U.S. facilities. All these plants have produced chemicals contaminated with TCDD, the most potent dioxin.

People who sustained high exposures over the years were 1.6 times as likely to die of cancer as coworkers with low exposures, the new study finds. In fact, the high-risk workers had exposures "similar to the [dioxin] levels used in animal studies," report epidemiologist Kyle Steenland and his NIOSH coworkers in the May 5 *JOURNAL OF THE NATIONAL CANCER INSTITUTE*.

Although the team found signs of excess cancers among these workers almost a decade ago, at that time the researchers were unable to correlate dioxin dose with disease. They recently completed exposure estimates for 70 percent of the workers by considering each person's specific job, how long he or she was exposed, and in what plant the person worked.

What the new calculations indicate, Steenland told *SCIENCE NEWS*, "is that there is a dose response—we see a trend of more disease with more exposure." Such a relationship, he explains, "increases our confidence that the observed association is real."

While an excess cancer risk was apparent only among the most highly exposed workers in this study, Steenland says this does not prove that there is no risk for people with low exposures.

In their work 10 years ago, the NIOSH scientists sampled blood from 250 of the chemical-plant workers. Knowing how long dioxin tends to stay in the body and

when each worker's occupational exposure started and ended, "we were able to back-extrapolate what their [workplace] dioxin levels would have been," Steenland says.

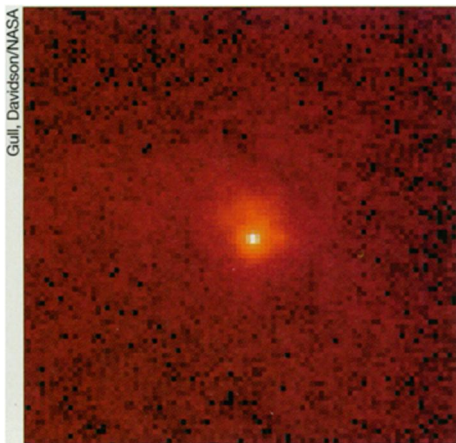
Whereas blood concentrations of dioxin in the general population are typically just 6 to 8 parts per trillion, the NIOSH assays retrospectively calculated an average of about 2,000 ppt in the 250 workers' serum during their job exposure.

The most heavily exposed chemical-plant workers in the new study may have had substantially higher concentrations, Steenland notes. The scientists haven't calculated blood-dioxin concentrations for the larger group.

On the basis of earlier NIOSH analysis of chemical-plant workers and studies of a few other populations receiving heavy exposures (*SN*: 9/4/93, p. 149), the International Agency for Research on Cancer (IARC) in Lyon, France, designated dioxin a human carcinogen 2 years ago. Steenland says that the new analysis of U.S. workers suggests that IARC made a good call.

In an editorial accompanying the latest NIOSH findings, Robert N. Hoover of the National Cancer Institute in Bethesda, Md., agrees that "TCDD should be considered a human carcinogen." He also concurs with Steenland that it's difficult to determine whether dioxin exposures typical of the general population increase cancer risks, especially since there are almost no unexposed groups.

Ordinarily, to learn more about low-dose risks, he notes, scientists would call for further research on people with high exposure to the chemical. Such research "is unlikely," Hoover says. Virtually all the populations that had been heavily exposed "have been studied, and fortunately, high-level exposures no longer occur," he adds. Indeed, people's average blood concentrations of dioxin have fallen to a quarter of what they were 25 years ago. —*J. Raloff*



Eta Carinae, as seen by Hubble's imaging spectrograph in February.