Astronomers identify a new class of comet

When astronomer Uwe Fink began studying the pattern of light emissions from nearly 30 comets a few years ago, he suspected some of the spectra might yield a mild surprise or two. In particular, he reasoned that a few comets might contain slightly lower concentrations of two compounds commonly found in high abundance in these solar system bodies — molecular carbon and cyanogen, a daughter product of either hydrocarbon dust grains or hydrogen cyanide. But he never expected to find a comet containing no traces of either compound.

These spectral studies now indicate that the comet known as Yanaka (1988r) belongs to a new class of comets — one that originally may have orbited a Milky Way star other than the sun. Fink and his colleagues at the University of Arizona in Tucson presented their findings in Palo Alto, Calif., last week at the annual meeting of the American Astronomical Society's Division for Planetary Sciences.

Using the University of Arizona's 61-inch telescope atop Mt. Bigelow, near Tucson, Fink photographed and collected three light-emission spectra from Comet Yanaka during the early morning hours of Jan. 15, 1989. At the time, the object was a relatively close 34 million miles from Earth and just 86 million miles from the sun — roughly 93 percent of Earth's distance from the sun.

Though the three visible-light and near-infrared spectra indicate that the comet contains normal concentrations of ammonia, the data reveal no evidence of cyanogen or carbon. Even at much greater distances from the sun, the vast majority of comets — including Halley — show detectable levels of both compounds, Fink observes. "No other comet in our spectral library has shown this behavior," he says.

"It's an anomalous finding," agrees Paul R. Weissman of the Jet Propulsion Laboratory in Pasadena, Calif. Moreover, he adds, "It's intriguing to speculate about how the comet formed."

Weissman notes that Yanaka's orbit, while still somewhat unclear, indicates this object belongs to a group of long-period comets that pass near the sun every 10,000 years or so. Astronomers believe such comets spend much of their time in the Oort cloud, a huge spherical region postulated to exist near the edge of the solar system (SN: 4/21/90, p.248). Such a cloud would appear too faint for observation from Earth.

Yanaka may have emigrated to the cloud from a region of the solar system that contained relatively little carbon, Weissman speculates. Alternatively, he says, the comet may represent the remnant of an icy body that once orbited a planet and lost most or all of its carbonaceous compounds by chemical processes.

In a more exotic but less likely scenario, Yanaka may have resided in an Oort-like cloud orbiting another Milky Way star until our sun gravitationally captured the comet. However, Weissman notes, calculations indicate that such kidnappings have occurred only rarely during the life of our solar system. Fink adds that since most stars contain lots of carbon, this scenario still does not readily explain Yanaka's lack of carbon compounds.

Yanaka, which has headed away from the sun since the 1989 observations, now appears too dim for researchers to take further spectra. Fink told SCIENCE NEWS that an additional group of about 30 comets his team has studied seems to contain normal amounts of carbon compounds. He and his colleagues are now comparing the relative abundances of carbon and ammonia compounds in these comets with those of better-studied comets, such as Halley. In addition, the team has begun to take spectra from another group of comets not previously studied, he says. *— R. Cowen*

Fink

A new class of comet? Yanaka (1988r) as photographed on Jan. 15, 1989, when it was located some 86 million miles from the sun.

Stress puts squeeze on clogged vessels

Mental stress may deliver a double whammy to people suffering from coronary artery disease, suggests a team of cardiologists. Their research indicates stress causes vessels already choked with atherosclerotic plaque to narrow even more, thereby increasing a person's chance of suffering dangerous ischemia — bouts of reduced blood flow to the heart that can lead to a heart attack.

When faced with a stressful situation, the adrenal gland pumps out epinephrine, a hormone that boosts heart rate and constricts blood vessels. A new study presented this week at the American Heart Association's 64th scientific sessions in Anaheim, Calif., hints that people with coronary artery disease suffer not just from plaque-clogged vessels, but also from an impaired vascular ability to handle stress.

Cardiologist Alan C. Yeung of the Harvard Medical School in Boston and his colleagues studied 26 men and women who had symptoms of coronary artery disease, such as chest pain. The team looked at each recruit's coronary arteries, the main blood vessels supplying the heart. Using an X-ray method called angiography, Yeung's group obtained a baseline picture of the arteries, classifying them as relatively smooth, irregular (with a modest amount of plaque) or stenosed (clogged with plaque).

The researchers then told the recruits to count backward by sevens from a random three-digit number — a laboratory challenge often used to provoke stress.

When the researchers compared the baseline angiograms with those taken during the counting test, they discovered that, on average, stenosed arteries constricted 24 percent more during the test, while irregular vessels constricted 9 percent more. The average dilation of the smooth arteries remained unchanged, although most of the smooth vessels did dilate to some extent, Yeung says.

An analysis of blood flow confirmed those results: The team found that flow increased an average of 10 percent in the smooth vessels, but declined by 27 percent in the irregular and stenosed vessels.

The researchers speculate that people with healthy blood vessels react to epinephrine's vessel-constricting message by stepping up production of a natural, nitroglycerine-like substance called endothelium-derived relaxing factor (EDRF). This theory suggests that endothelial cells, which line the vessel interior, actually secrete EDRF to relax the blood vessel. Previous research by the same team (SN: 11/25/89, p.349) indicated that people with very early atherosclerosis may lose their ability to fine-tune vessel diameter, perhaps because of a problem with EDRF.

"Healthy vessels secrete EDRF to balance the constricting effect of [epinephrine]," Yeung says. "But if you have unhealthy vessels, that balancing act is gone."

If further studies can prove EDRF's constriction-preventing prowess, researchers may one day devise therapies aimed specifically at improving the coronary arteries' ability to respond to stress, Yeung speculates. That advance might help prevent ischemic attacks, helping to lessen the risk of heart attack, he adds. *— K.A. Fackelmann*