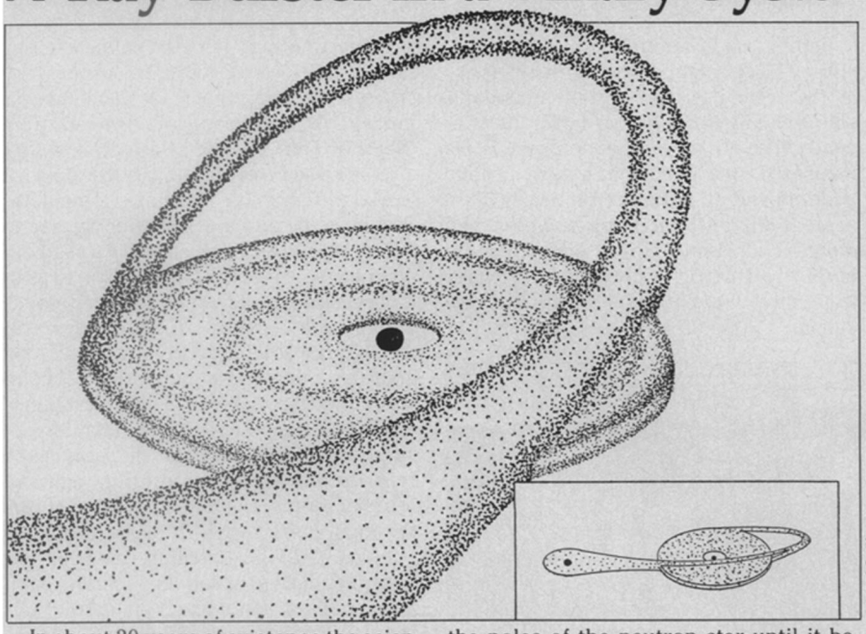
X-Ray Burster in a Binary System



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In about 20 years of existence the scientific discipline known as X-ray astronomy has discovered a very large number of sources of X-rays in the sky. Many of these can be readily identified with already known objects, such as galaxies, quasars and ordinary stars. There is, however, a sizable class of point X-ray sources that cannot be so identified. Most of these objects emit X-rays at a more or less steady rate, but some of them, the so-called X-ray bursters, occasionally have outbursts that can be 10 times their steady output rate.

The bursters have been something of a recent fascination in this branch of astronomy. At last week's meeting of the American Astronomical Society in Boulder, Colo., observational evidence that strongly supports a theoretical model for them was presented by Stuart Bowyer of the University of California at Berkeley. It represents work done by Bowyer, Fred Walter, John Clark and Keith Mason of Berkeley, Patrick Henry of the University of Hawaii and Jules Halpern and Jonathan Grindlay of Harvard University.

The model proposed for the bursters is a variant of the model for both bursters and nonbursters. The source of the X-rays is seen as a neutron star. The X-rays are produced by frictional heating of matter falling onto the surface of the neutron star. This matter is supplied by an ordinary star that is the neutron star's companion in a binary system. It is drawn by the strong gravity of the neutron star and streams across the intervening space to form a so-called accretion disk around the neutron star. From the inner edge of the disk matter falls onto the neutron star. For the steady sources this infall is continuous. For the bursters material builds up at the poles of the neutron star until it becomes unstable and explodes in a blinding flash of a thermonuclear explosion.

There is a good deal of evidence that the steady sources are in binary systems, and that tends to raise confidence in the general model. Now, for the first time, Bowyer and co-workers present evidence for a burster in a binary system.

The burster under observation is called 4U1519-05. (The numbers give its coordinates, right ascension 15h 19m, declination −5°.) It is in the constellation Aquila.

The discovery came by serendipity. Walter, who was studying something else in data from the Einstein Orbiting Observatory, noticed a pattern of dips every 50 minutes in the output of 4U1519-05. Busy with other matters, he could do no more, but Halpern got X-ray data that showed a consistent pattern of cyclic dips in the output. Such a datum makes an astronomer suspect a binary system. The interpretation in this case is that we see 4U1519-05 at such an angle that the stream of inflowing gas periodically passes in front of the neutron star, blocking some of its X-ray output.

With attention thus focused on 4U1519-05, Grindlay calculated a very precise position for the X-ray source with an error not more than 3 seconds of arc. It was then possible for the others to search a circle of that radius around the position to look for a star that might be the companion of the neutron star. Bowyer, Clark and Mason took spectra of two stars in this circle but rejected them as unsuitable. Finally Bowyer and Henry found an almost invisible 22nd magnitude star that looks the right color. The next step is to get a spectrum of it.

—D. E. Thomsen

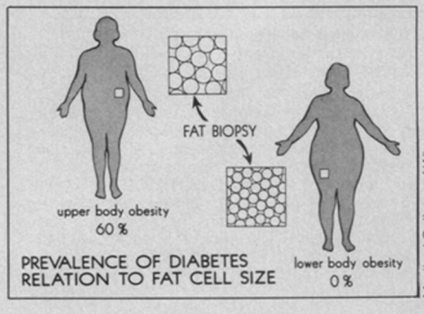
Female obesity and diabetes risk

The more a man weighs, the greater his risk of diabetes. But the link between weight gain and diabetes is more complex among women, research results are showing. It is those women who gain weight in the neck, shoulders and abdomen (body areas where men usually put on weight) who are susceptible to diabetes, not those women who gain weight in the buttocks and thighs.

Following research reported in France in the 1970s, Ahmed H. Kissebah and colleagues of the Medical College of Wisconsin in Milwaukee surveyed 15,000 women. Last year they reported a statistical link between upper-body weight and diabetes, and now have tightened the association still further. They studied 16 upper-body obese women and nine lower-body obese women to see whether they could predict undiagnosed diabetes on the basis of upper-body weight. They report in the February JOURNAL OF CLINICAL ENDOCRINOLOGY AND METABOLISM that they could identify symptoms that precede diabetes (increased levels of glucose, insulin and fatty acids in the bloodstream) in 10 of the women with upper-body obesity, but in none of the women with lower-body obesity. Kissebah and co-workers also examined the composition of fat cells in their subjects and found that women with upper-body weight have enlarged fat cells, whereas women with lower-body weight have normal-sized fat cells but have an excess number of them. Abnormally large fat cells might trigger the release of too much glucose, insulin and fatty acids into the bloodstream and thus cause diabetes, Kissebah and his team speculate.

This discovery might also explain why women with upper-body obesity find it much easier to lose weight: "It is much easier to shrink an enlarged fat cell than it is to kill that cell," Kissebah says.

—J. A. Treichel



Medical College of Wisc.