

point out, presents an interesting tale of three periods. There is a 3.6-hour variation in the overall output of visible light and in the wavelengths of prominent lines of the object's spectrum. There are also an optical pulsation superimposed on the other optical output every 14.3117 minutes and the X-ray pulsation every 13.415 minutes. The 3.6-hour period is identified with the orbital period of the binary system.

What is more interesting is that 3.6 hours happens to be also the *beat* period between the periods of the optical and X-ray pulses. That finding leads Patterson and Price to suggest that the optical pulses arise in the atmosphere of the companion star as an X-ray beam from the white dwarf hits it. They are so-called reprocessed radiation. The overall photometric variation with the 3.6-hour period also represents radiation from the companion star. In addition to producing a sharp pulse of reprocessed radiation, the X-rays heat up a hemisphere of the companion star, and light is produced by that heating. The brightness varies because we on earth see more or less of the heated hemisphere depending on where in its orbit the white dwarf is located at any moment. Finally, there is the 805-second or 13.415-minute X-ray pulse period. This indicates that a highly magnetized body is efficiently channeling the infall of accreting material. One would expect a neutron star in that role. Yet the underlying photometric and spectroscopic character of the object under study is that of a cataclysmic variable. Furthermore, the general ratio of X-ray to optical output is characteristic of a cataclysmic variable. "These considerations definitely favor a white dwarf identification," the observers write. □

## Snuff and cancer

Sniffing or dipping snuff rather than smoking tobacco may reduce the risk of getting lung cancer, but it may increase the risk of cancer of the mouth and throat, according to a report by Deborah M. Winn of the National Cancer Institute in Bethesda, Md., and her colleagues in the March 26 *NEW ENGLAND JOURNAL OF MEDICINE*.

Women in the rural Southeast United States have far more mouth and throat cancers than do women in other areas of the United States. These women also use far more snuff than do the latter, suggesting that snuff might be the cause of their cancers. Winn and her team studied the snuff habits of 255 North Carolina women with mouth and throat cancer and compared them with 502 control subjects. They found that 46 percent of the cancer victims had been snuff users, compared to only 30 percent of the control subjects. Or, looking at the data another way, snuff users increase their risk of mouth and throat cancer from 4 to 50 percent, depending on how long they use snuff. □

## Cricket teratogen in synfuels wastes

A contaminated waste byproduct of synfuel production, or coal gasification and liquefaction, causes the development of cricket "monsters"—insects with extra heads and compound eyes and antennae. The teratogenic, or birth-defect-causing, property of the impurity is reported in the April 3 *SCIENCE* by Barbara T. Walton of Oak Ridge National Laboratory (ORNL) in Tennessee.

Walton found the one or more contaminants that cause abnormal cricket development in the chemical acridine ( $C_{13}H_9N$ )—a three-ringed structure found in coal, in the coal-tar waste byproducts of the synfuel production process and probably in synfuels themselves. The ORNL researcher moistened sand with solutions of commercial samples of acridine and then allowed the female crickets (*Acheta domestica*) to deposit eggs on that substrate. The resulting embryos had extra compound eyes. Walton then discovered that while purified acridine caused no deformities, eggs treated with a mixture of the acridine contaminants resulted in the two-headed, branched antennae, three- or four-eyed crickets.

The abnormalities caused by the teratogen resemble deformities observed by another researcher who had seared the tips of damsel fly eggs. This suggests that the mechanism of teratogen activity involves killing cells prior to the formation of the embryonic germ band and that there is a specific time of chemical entry—perhaps during the first period of water uptake in the cricket eggs.

But little else is known about the mysterious teratogen, and research continues in an attempt to isolate and characterize the impurity or impurities in acridine. Meanwhile, Walton also has discovered that treating cricket eggs with synfuels also causes abnormal insect development.

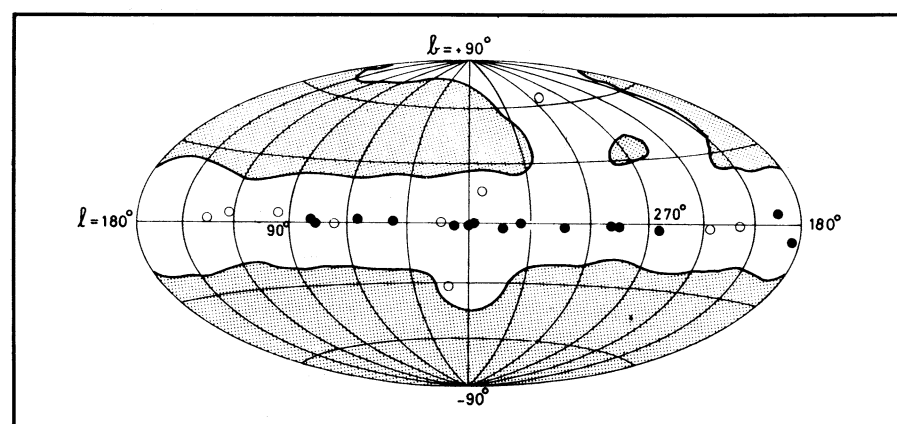


Extra compound eye in cricket treated during egg stage with acridine contaminant.

"We still don't know if the impurity from acridine is the same chemical from synfuels that produces the effect," Walton says, so her research involves not only analyzing acridine impurities, but also synfuel components. Future research will attempt to determine whether both teratogens produce the same effect in higher animals and whether they should be removed from the synthetic fuel process.

The significance of Walton's research extends beyond its obvious potential implications for the future of synfuels. "This finding underscores the necessity for complete chemical characterization of mixtures subjected to toxicological assays because a minor component can assume major significance in producing a response," Walton explains. "In a more positive light, however, this teratogen offers possibilities as a new tool for exploring cellular events in embryonic development, such as determination of cell fate, pattern formation and possibly the role of cell death in morphogenesis." □

## 2nd Cos B gamma-ray source catalog



The 25 newly found sources are black and white circles on this sky map. Twenty-one cluster along the plane of our galaxy and may represent a new class of object.

Swanenburg et al./Ap. J. Letts.