Strange, colossal flare-up in Orion

People often think of astronomy as a rather timeless, ageless occupation. After all, the universe is billions of years old and changes very slowly. The pattern of stars alters so little over the years that for centuries astronomers could think of the stars as "fixed." Ironically, a large part of what fascinates modern astronomers are transient phenomena, not merely those that are transient in a millenial sense, but those whose transiency is a matter of days or even hours.

As astronomy has moved from visual light to other parts of the electromagnetic spectrum, the variety and incidence of such things has increased. The latest example, according to a report from Dartmouth College, is the identification of a strange new transient X-ray source in the constellation Orion with a very odd star that is doing something highly unusual and extremely violent. The visual identification is claimed by Forrest I. Boley, chairman of Dartmouth's physics and astronomy department, and Richard L. Wolfson, a doctoral candidate at the college. It is a tale that combines astronomical serendipity and purposeful multimedia cooperation.

The story begins rather quietly in the middle of August. The British satellite Ariel 5, routinely watching the X-ray sky, picked up a flare source in Orion. Such flaring X-ray sources have been known for more than a decade. They flash up suddenly and then decay quickly. In between flares they may perk along as low-level sources.

This one seemed a mild example, according to Ariel's report, but since such X-ray flares remain, as one might say, shrouded in mystery, it seemed worthwhile to get a fix on its location to see what information that might add. The American astronomy satellite SAS-3 was called into the act for a better triangulation of the flare's position. (To underline the international flavor of things, Ariel was launched from the United States by NASA for the British, SAS-3 was launched from the Italian San Marco station off the coast of Kenya.

It took SAS-3 about 24 hours to fix the position. At the same time, it became clear that something highly unusual was coming off. The source intensity had increased until it had become entirely surprising, five times as powerful as any X-ray source previously registered. So the world of astronomers began to buzz, and reports appeared in at least one newspaper.

At the time Boley and Wolfson, whose specialty these flare sources are, were at the McGraw-Hill Observatory on Kitt Peak in Arizona ready to begin a course of observations. (The McGraw-Hill Observatory, which opened in May, was set up with the main purpose of making optical studies of X-ray sources.) With the precise triangulation of the direction the X-rays were coming from provided by SAS-3 (which has a special collaborative operational link to the observatory that was set up for just this kind of situation), Boley and Wolfson could zero in on the location with the observatory's 52-inch optical telescope.

But there was still a complication. At Kitt Peak's location at this time of year Orion comes above the horizon only for about half an hour before sunrise. Normally the brightening sky would render photography difficult or impossible at that time of day, but the astronomers were able to use one of the recently developed optoelectronic image intensifiers to take pictures with two-minute exposures instead of the 30-minute ones that would normally be required.

On Aug. 15 they got eight shots of the target area. The number is important for confidence in the findings; a single photo might be suspect. In the light of what they found, the precaution was worthwhile: "We looked at the newly defined region and found something amazing to behold," Boley relates. "There was an object more than 1,000 times brighter than what had been found in that location in the Palomar Sky Survey 20 years earlier." The implication is that a star in Orion has flared to 1,000 times its base luminosity, a truly stupendous achievement. If the sun did that, we wouldn't have to worry about X-ray sources or anything else ever again.

Replacing the camera with a spectrograph, Boley and Wolfson got four spectrograms on the mornings of Aug. 16 and 17. These served to screw up the amazement a couple of notches. They show no differentiated light emission or absorption lines such as stellar spectra usually show. "This is a clue to us that we're looking at an unusual thing," Boley says. "Such a spectrum suggests it is made from something of incredible heat intensity, a ball of something or other burning with a high temperature undifferentiated in any way, with no part of it hotter or cooler than any other." That would be a most unusual kind of star.

"Sometime between the time that Palomar Sky print was taken 20 years ago and the night of Aug. 15 something had happened to that star," Boley sums up. "A star of undetermined characteristics—a star of some kind that we have *not* yet been able to model—has in some way changed its mode of life. And since it is precisely in the same area as the X-ray definition given us by SAS-3, the inference is strong that we are onto something." Exactly what that is is likely to be vigorously debated by astrophysicists when they see the full data extracted from these and other studies that are sure to be done while the flare lasts. □

Centaurus A is now a gamma source

Gamma rays are astronomy's newest frontier. They represent the shortest wavelengths of the electromagnetic spectrum, less than a tenth of an angstrom and down to hundred-thousandths of an angstrom. They behave more like particles than waves. Scientists tend to prefer to describe them by particle energy (hundreds of thousands to millions of electron-volts), and their detection is accomplished by particle detectors rather than reflecting telescopes.

The first extension of gamma-ray astronomy to specific sources outside the solar system was announced last week at the 14th International Cosmic Ray Conference in Munich by a group of scientists from Rice University in Houston led by Robert C. Haymes. In recent years, it is true, gamma-ray recorders on satellites have detected bursts of gamma rays coming from some unknown source or sources, but Haymes's report is the first of gamma rays from an identifiable source, the radio source Centaurus A.

The observation was made with an 1,800-pound detector carried by balloon to a height of 24½ miles over Argentina (gamma rays of this type do not penetrate the atmosphere well). These gamma rays are generally produced by energy changes within atomic nuclei, and recording them from astronomical sources will give information about the nuclear physics going on in those sources. The analysis of the Centaurus A data indicates the presence of particular isotopes of carbon, neon, silicon and magnesium in that radio galaxy, confirming theories that have predicted the presence of those elements. The group hopes to make the next data-gathering flight over Brazil sometime in November. □

Earth's plantlife: Ultraviolet peril

Practically overnight, like a mushroom in damp soil, an entire scientific issue has sprung up, involving the effects of chlorofluorocarbons on the earth's ozone layer. A sense of urgency accompanies most discussions of this issue because it hinges on the belief that decreased stratospheric ozone and increased ultraviolet light penetration will harm life on earth. But life already exists quite happily in a continuous shower of ultraviolet light. Is all the fuss, one wonders, really justified?

Biologists met this week to consider that question, and the answer seems to be an unequivocal yes. Photobiologists pre-