Seeking stellar flares in a deceptive sky

Stargazers through the years have noted many odd flashes of light in the night sky. These have been traced to airplanes, camera glitches, reflections off satellites, imagination, asteroids and even fireflies. Astronomer Bradley E. Schaefer of the NASA Goddard Space Flight Center in Greenbelt, Md., thinks some of these flashes may originate from more distant, stellar sources.

Schaefer suggests that some flashes could be outbursts from ordinary-looking but temperamental stars. In the Feb. 15 ASTROPHYSICAL JOURNAL, he lists 24 stars that appear to have given off solar-flare-like flashes, several of them 10 times more powerful than the star's normal brightness. Some of these flare-ups were photographed, while others were seen through telescopes or with the naked eye.

Schaefer's list excludes "exotic" stars, whose behavior is poorly understood or more unstable than that of other stars. He also disqualifies objects known as "flare stars," which are so dim to start with that they need only a little energy to flash many times their original brightness. He lists those stars whose flashes he thinks least likely to be flukes. One flash was noted independently by three people in different countries. Others simply started up too gradually or lasted too long to be explained away as instrument glitches or satellite glints. The 24 listed stars are all considered "normal," like our sun, except they may flare up vigorously perhaps every 100 or 1,000 years.

Our sun has been relatively serene – at least as long as people have recorded its behavior. It does have flares, but they are tiny compared to a flash that can be seen from another star. Solar flares are caused by unstable patches in the sun's magnetic field, and a similar change in magnetic field could explain the more distant flashes: If part of the field were annihilated, its potential energy could explode out as light. But a magnetic mechanism might not provide enough energy to account for the biggest flashes Schaefer lists. Another explanation, he suggests, is a comet crashing into a star's unknown white-dwarf companion – but again, it's difficult to account for the amount of energy released. "You have to believe in very big supercomets and there's no evidence – but they are possible," he says.

But many other things can trigger a flash in the sky and fool even professional astronomers. Canadian researchers recorded some spectacular flashes in the direction of the constellation Perseus several years ago. Later, they discovered they had recorded glints of light reflected from a Soviet satellite (SN: 6/20/87, p.397). In another instance, French astronomers reported some dramatic, potassium-laced stellar flares, only to learn later that the flares came from a night watchman who was lighting matches near the observing equipment.

Despite the hazards of scientific embarrassment, Schaefer says more astronomers should be watching what the sky does on a short time scale. However, confirming observations of brief events can be difficult. "What can science do to reproduce things that are so rare?" Schaefer asks. "We just have to wait."

One thing that might speed up the search is a project to systematically watch for flashes. Up on Kitt Peak in Arizona, a sensitive imaging device called the Explosive Transient Camera, or ETC, is taking quick consecutive pictures of stars to spot sudden changes. It was set up to catch mysterious explosions producing gamma-ray bursts (see story below), but the ETC can catch other sudden flashes, says co-designer and builder Roland Vanderspek of the Massachusetts Institute of Technology. The camera works in conjunction with the Rapidly Moving Telescope, which can swing over to a suspect star within a second and zoom in on it before it stops flashing.

Schaefer implores astronomers to design more experiments to detect flashes from stars. He also urges people not to be afraid to report any flash they observe. "There are too many cases of bright flashes on normal stars to be dismissed," he says. "If we watch for these things we might learn something new from them."

– F. Flam

Dye laser clears children's birthmarks

Researchers report success in using a new form of laser treatment to clear up port-wine stains in children. Until now, physicians have had no reliable treatment for children with this distinctive birthmark, which appears as a red or red-purple stain on the skin.

During the past several decades, researchers grappling with the problem have tried grafts and even tattooing techniques to produce normal-looking skin, but to no avail. About 10 years ago, scientists developed an argon-laser therapy for adults with port-wine stain. But the argon laser failed to win wide pediatric use because it produced unacceptable scars in children.

In the Feb. 16 NEW ENGLAND JOURNAL OF MEDICINE, Oon Tian Tan, Karen Sherwood and Barbara Gilchrest of the Boston University Medical Center describe testing a more accurate laser, the dye laser, on 35 patients aged 3 months to 14 years with disfiguring port-wine stains on the head and neck. The researchers found the average patient needed 6.5 laser sessions to clear the stain, but the results were dramatic. "Treated skin was identical in texture and color to adjacent normal skin in 33 of the children," they report. The other two children had small, isolated scars in parts of the skin that had been accidentally traumatized after laser treatment, the researchers note.

The work suggests the dye laser preferentially targets the abnormally large blood vessels underlying the skin that cause port-wine stain. The researchers picked a specific dye that emits energy in a wavelength absorbed by oxyhemoglobin, the red pigment in blood. The laser delivers its heat only to blood vessels, which it destroys, but passes harmlessly through nearby translucent tissue. During the next few weeks, the abnormal blood vessels are replaced by blood vessels of normal size, and skin color gradually fades to a normal tone.

The argon laser may not be as specific as the dye laser, Tan says. She suggests heat from an argon laser spreads to damage nearby collagen, causing scar formation. The problem is especially serious in children, whose skin tends to scar more than that of adults.

The treatment may bring relief to parents worried about the birthmark's impact on a child's development. "These children need not be scarred by the psychological impact of these lesions anymore," says Tan, who notes that children with port-wine stain often are shunned by other children.

– K.A. Fackelmann

Bursts from a comet cloud

Every year, astronomers detect nearly 100 intense bursts of gamma rays. Each of these mysterious bursts seems to originate from a single point in the sky, yet astronomers have so far failed to identify them with particular stars. In almost every case, observers detect the burst only once, but a few sources flash repeatedly. In the Feb. 23 NATURE, French and German researchers suggest that comets falling onto small, dense stars known as white dwarfs could explain these repeating gamma-ray bursts.

The researchers argue that an orbiting comet passing close to a white dwarf would break into several pieces. These fragments, perhaps during different orbits, would crash into the star at high speed, creating a hot spot that cools off by emitting X-rays and gamma rays. The theory can be tested by looking specifically for white-dwarf stars wherever repeating gamma-ray bursts appear to originate. □