Visible Pulsar Found in Large Magellanic Cloud

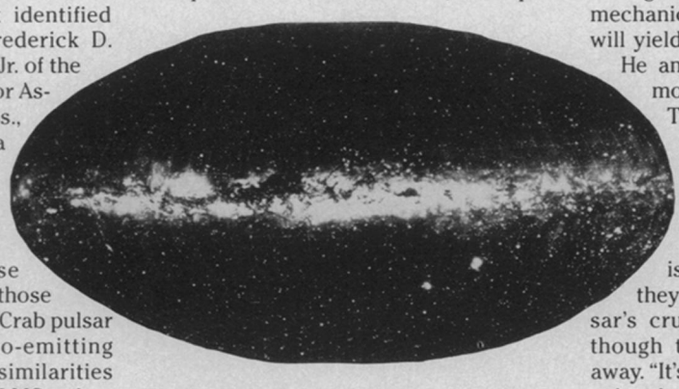
Visible pulsars are extremely rare. Several hundred are known that pulse in radio or X-rays, but up to now only two were known that pulse in visible light, and only one of those, the Crab nebula pulsar, was really favorable for observation. Now a third visible pulsar, the first to be seen in an external galaxy, has been found in the Large Magellanic Cloud (LMC).

This new pulsar was first identified through its X-ray pulses. Frederick D. Seward and Frank R. Harnden Jr. of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., and David Helfand of Columbia University in New York City found the evidence earlier this year in data recorded in 1979 by the Einstein satellite.

The LMC pulsar's pulse characteristics are similar to those of the Crab pulsar, and like the Crab pulsar it is surrounded by a radio-emitting supernova remnant. These similarities gave reason to hope that the LMC pulsar would also be visible. Carl Pennypacker of the Lawrence Berkeley Laboratory in Berkeley, Calif., told SCIENCE NEWS that as soon as he and John Middleditch of the Los Alamos National Laboratory in Los Alamos, N.M., heard of the LMC pulsar they arranged for telescope time to look for it optically. In three nights' observing, Aug. 25 to 27, Pennypacker and Middleditch found optical pulsations. They used the 4-meter telescope of the Cerro Tololo Observatory in Chile, since the LMC is visible only from the Southern Hemisphere.

Visibly the LMC pulsar is a 23rd magnitude object. This makes it several times brighter and therefore much more favorable for study than the Vela pulsar, the second found to be visible within our own galaxy, which is a 24.5 magnitude object.

Astrophysicists now generally agree that pulsars are neutron stars, the super-



The Milky Way from inside looking out. In this composite photograph, the LMC is the larger of the two bright objects below the plane of the Milky Way just to the right of the center. (Lund Obs.)

dense cores left behind when stars explode as supernovas. The radiation is produced in a magnetosphere, an atmosphere of charged particles held by the neutron star's magnetic field, near the location of one of the star's magnetic poles. If the star's magnetic axis does not coincide with its axis of rotation, the magnetic pole will be swept around by the rotation. The sweeping of the beam of radiation emitted from the pole gives the optical effect of a pulse, just as a rotating lighthouse beam does.

Study of pulsars in visible light is important, says Pennypacker, because the visible light is more closely coupled to the mechanical motions of the pulsar and so will yield better information about them.

He and Middleditch have applied for more telescope time in February. They want to look particularly for starquakes. Pulsars show sudden abrupt speedups, after which the slowdown resumes. These are attributed to quakes in the hard crust the neutron star is supposed to have. They believe they can measure changes in the pulsar's crust as small as 1 micron, even though the LMC is 150,000 light-years away. "It's crazy but feasible," he says.

Another number they want to measure is the rate at which the slowdown rate may be changing. This could tell how the pulsar is losing energy as it slows down. The LMC pulsar has a period of 50 milliseconds — that is, 20 pulses per second—and is slowing down at the rate of 40 nanoseconds per day. All pulsars are slowing down, and very little of the energy they lose thereby is accounted for in the observed radiation. Possible mechanisms include stellar winds, magnetic dipole radiation and gravitational radiation. —*D. E. Thomsen*

Studies help scientists home in on genetics of alcoholism

In recent years, extensive studies of chronic alcoholics have revealed impairments in several different brain functions, including an increase in the time it takes for certain signals to travel through the brain. In the Sept. 28 SCIENCE, researchers at the State University of New York's Downstate Medical Center in Brooklyn report evidence of a brain wave deficiency found in both chronic alcoholics and natural sons of alcoholic fathers, the group thought to be at greatest risk for developing alcoholism later in life. The scientists believe this wave deficit may serve as a genetic marker, indicating an inherited susceptibility to the disease.

According to Henri Begleiter, a professor of psychiatry and coauthor of the study, when heavy drinkers abstain from drinking for several months, every deficit but one—an abnormally low P3 wave, involved in memory and emotion — returns to normal. Begleiter's group hypothesized that, rather than being a consequence of years of heavy drinking, the P3 wave decline might have preceded alcohol abuse, possibly indicating an inherited trait.

To test their theory, Begleiter and his co-workers compared the P3 waves of 25 boys, average age 12, whose fathers were alcoholics, with those of 25 control boys —sons of nonalcoholic fathers—of similar age. More than one-third of the at-risk group showed wave deficits almost identical to those seen in chronic alcoholics. The controls' waves, in contrast, showed no deficits.

Begleiter says it is too early to label the brain wave discrepancy as a functional genetic marker. "Long-range studies are needed to see if there is indeed a relationship between these deficits and later development of alcoholism," he says, "and if so, it could help us in earlier prevention."

In a related study reported in the September ARCHIVES OF GENERAL PSYCHIATRY, Marc A. Schuckit of the University of California at San Diego looked at another factor: the subjective feeling of drunkenness following intake of alcohol. Schuckit's subjects—extensively screened with questionnaires — were nonalcoholic male college students, each of whom had an alcoholic sibling or parent, and nonalcoholic male college students without an alcoholic sibling or parent. When both groups drank small amounts of alcohol, the group with alcoholic relatives were affected less, despite identical blood alcohol levels. After more than five drinks, reactions evened out.

"It may be that at levels of modest intoxication, where most of us decide we're getting drunk and it's time to stop, they [sons of alcoholics] are not getting as much warning that they are getting drunk," Schuckit says. "They go from sober to a little drunk to very drunk."

— *S.I. Benowitz*