

astronomy

Pulsars from supernova remnants

One current theory of the origin of pulsars is that they are what remains of the body of a star that has undergone a supernova explosion. Yet only three or four pulsars appear to be visibly related to the nebulous remnants of supernovas. The latest, PSR 0611 + 22, turned up as one of 18 new pulsars discovered in a systematic search undertaken between July 26 and Sept. 21 by J. G. Davies, A. G. Lyne and J. H. Seiradakis of the University of Manchester in England.

PSR 0611 + 22, they report in the Nov. 24 NATURE, is associated with a supernova remnant that appears in the infrared and is called IRC 443. It lies near the boundary between the constellations Orion and Gemini. The Manchester group figures the age of the pulsar at 125,000 years, a figure that correlates well with the age of the supernova remnant as determined from its appearance.

Hewish on the begetting of pulsars

The low observed correspondence between pulsars and supernova remnants has led many astronomers to question whether every supernova begets a pulsar. At a meeting of the Royal Astronomical Society two weeks ago, Anthony Hewish of Cambridge University, who led the team that discovered the first pulsar, said he still gives the question a "qualified yes."

Hewish's belief is based on statistical counting. There are in the neighborhood of the earth about as many pulsars as supernova remnants in the same range of ages. NATURE, commenting editorially (Nov. 24) on Hewish's talk, points out that a lot depends on how far back in time or out in distance the survey goes. Since pulsars appear to be born with velocities that could take them away from the supernova remnants in which they were born, one-to-one identification is hardly possible. NATURE opines that not everybody would take Hewish's view, but that there may be a subclass of supernovas that generate pulsars.

Unevenly heated pulsars

The theory of pulsars can be described as a kind of solid-state astrophysics because the outer crust of a pulsar is believed to be a rather weird kind of solid. In the Nov. 20 NATURE PHYSICAL SCIENCE Roman Smoluchowski of Princeton University extrapolates from the more usual terrestrial solid-state physics to a consideration of the thermal properties of the pulsar surface, especially its thermal conductivity.

Smoluchowski says that it is usually assumed that a pulsar crust has a high and isotropic thermal conductivity. His derivation, however, shows that this assumption is false: There is a distinct anisotropy, which causes the magnetic poles of the pulsar to be about three times as hot as the magnetic equator (3.3 million degrees K. to 1.2 million in one calculated example; 650,000 degrees to 220,000 in another).

The difference in temperature, Smoluchowski calculates, produces stronger thermal emission at the magnetic poles (in a ratio of 120 to 100). As the pulsar rotates, this difference would cause a distant observer to see a pulsed effect. Smoluchowski suggests that a mechanism of this kind may explain the pulsating X-ray sources that are seen.

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medical sciences

Hyperactivity and lead poisoning

Hyperactive children are exceptionally active physically, have short attention spans and are easily frustrated. Psychological conditions or neurological disease can cause hyperactivity. Oliver David and his colleagues at the State University of New York Downstate Medical Center in Brooklyn now have strong clinical evidence that hyperactive children from the inner city may be victims of lead poisoning.

The pediatric-psychiatric researchers compared hyperactive children with nonhyperactive children from various New York City neighborhoods. Hyperactive children whose hyperactivity had not been diagnosed had significantly higher amounts of lead in their blood and urine than did controls. In contrast, hyperactive children with a probable cause for their hyperactivity were not much different from controls.

Although there is no proven causal relationship between hyperactivity and lead, David and his colleagues believe that blood and urine lead levels should help clinicians better diagnose the causes of hyperactivity in children.

Yes, there is an intestinal flu virus

For the first time, an intestinal flu virus appears to have been visualized, by Albert Z. Kapikian and his co-workers at the National Institute of Allergy and Infectious Diseases.

They visualized a cube-shaped, virus-like particle, known as the Norwalk agent, by a sophisticated technique known as immune electron microscopy. After identifying the virus, the investigators infected human volunteers with it. They exposed blood samples from these volunteers to the immune electron microscope technique. Significant increases in antibody were noted in blood from volunteers who had come down with intestinal flu. There was little change in the antibodies in a blood sample from a volunteer who had not gotten sick from the virus infection.

Kapikian says that he and his team will now try to grow the virus in the lab—a crucial first step toward preparing a vaccine.

Iron deficiency and immunity

Iron deficiency is known to impair various tissues in man and animals. In the Nov. 18 LANCET, D. H. M. Joynson and his team at the Welsh National School of Medicine in Cardiff report that iron deficiency may impair the immune system of the body as well.

They tested 12 patients with iron deficiency anemia. These patients reacted less to immune sensitivity tests than did control patients. In addition, lymphocytes and macrophage migration inhibition factor (MIF), major immune components of the body, were taken from anemic patients and controls and exposed to antigen. The lymphocytes and MIF of the patients responded less to the antigen than did the lymphocytes and MIF of the controls. When the patients were given iron therapy, their immune responses, as measured both in vivo and in vitro, promptly improved.

"It seems possible," the authors conclude, "that iron deficiency per se may affect immunological competence, and its presence in individual patients may potentiate an existing primary or secondary immunodeficiency."

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