

A caveat on pulsar atmospheres

Most theories that view pulsars as neutron stars require the pulsars to be surrounded with an atmosphere of ionized atoms in order to account for the observed radiation and other effects. To form such an atmosphere there must be mechanisms capable of detaching the ions from the surface of the neutron star.

In the March 5 JETP LETTERS V. L. Ginzburg and V. V. Usov of the Lebedev Physics Institute in Moscow point out that in a magnetic field as strong as a pulsar's the surface is a tightly bound solid resembling a polymer. At the temperatures suspected for known pulsars, Ginzburg and Usov rule out thermal evaporation as a possibility for forming an atmosphere. Another possible mechanism exists, extraction of ions by an electric field. Whether or not this will work for the known pulsars depends on the value of a mathematical coefficient that has not yet been sufficiently well determined. Ginzburg and Usov urge that people who make pulsar theories should seriously consider whether pulsar atmospheres can exist at all.

Looking for antineutrino-electron scattering

The reaction in which antineutrinos collide with electrons would be an important one for testing theories of the weak subnuclear force (weak interaction) if it could be found.

Henry S. Gurr, Frederick Reines and Henry W. Sobel of the University of California at Irvine report in the May 22 PHYSICAL REVIEW LETTERS that although they have not found it, they can set a more stringent limit on the probability of its occurrence. Previous work had shown the probability to be at most no more than four times the prediction of the most popular theory of the weak interaction (the Vector-Axial-vector theory of Feynmann and Gell-Mann). This work lowers the limit to 1.9 times the theoretical. Some theorists, dissatisfied with the V-A theory, are working on alternate formulations (SN: 10/9/71, p. 252). This result may limit their freedom to theorize since it places limits on the possible values of the coupling constants, mathematical terms that determine the strength of the force.

No gravitational synchrotron radiation

Joseph Weber's observations of gravitational radiation imply a total energy flux higher than anyone believes possible if the source radiates equally in all directions and Weber is recording only a small part of the total. Thus, the idea that the radiation may be concentrated into a beam that happens to hit Weber's detectors recommends itself to theorists.

A few weeks ago C. W. Misner of the University of Maryland and others published calculations that satisfy them that a body rotating around a black hole at relativistic speed will produce radiation beamed in the plane of the orbit (SN: 4/29/72, p. 284).

In the May 15 PHYSICAL REVIEW LETTERS Marc Davis and Remo Ruffini of Princeton University, Jayme Tiomno of the Institute for Advanced Study and Frank Zerilli of the University of North Carolina at Chapel Hill contend that their derivations show that for stable orbits the radiation will not be beamed at all and for unstable orbits the amount of beaming will be insignificant. The debate is not expected to end there.

Roundworms as mosquito controls

The search for biological controls of insect pests as substitutes for DDT and other persistent and harmful pesticides goes on.

Two U.S. Department of Agriculture scientists now report that *Reesimermis nielsenii*, a nematode, or roundworm, that infests mosquito larvae, may be a feasible answer, at least in Louisiana.

The two, James J. Petersen and Osborne R. Willis of the Agricultural Research Service in Lake Charles, La., say that the nematode occurs naturally only in a "spotty" fashion, presumably because it kills its mosquito hosts in the larval stage. But the worms are easy to breed in captivity and to distribute to new areas. All evidence so far indicates the worms do not infest organisms other than mosquitoes and near relatives of mosquitoes. It takes the worms about seven days to kill mosquito larvae, puncturing holes in the insects as they emerge at the end of the period.

Nematologist William R. Nickle of ARS in Beltsville, Md., assisted the two researchers in devising a system to rear large numbers of the worms. The U.S. Public Health Service is experimenting with the worms as mosquito controls in El Salvador, and the United Nations World Health Organization is carrying on similar work in Taiwan and Thailand.

Real estate lakes need planning

Newly created or developed lakes in suburban areas are all the rage; called "real estate lakes" many new developments are planned around them, and they enhance property values—for a time.

The U.S. Geological Survey warns that without planning, the lakes can turn out to be disasters. The problem is the old familiar one of eutrophication; lakes fill up with sediment, vegetation and decaying plant and animal materials and become foul-smelling mudholes.

What happens, says David Rickert, chemist and urban hydrology specialist with USGS, is that poor control of nutrient and sediment runoff—from sewage disposal systems or over-fertilized lawns, for instance—results in unchecked flow into many of the lakes. "The nutrients stimulate the growth of plants which, in turn, trap inflowing sediments." Then as dead plants decay, nutrients are released for new plant growth, and a vicious cycle begins.

Hydrologic analysis can determine optimum lake size and location; then planning can be done to minimize nutrient and sediment input. But Rickert warns that present knowledge is inadequate to ensure good water quality always.

Plants serve as an ammonia 'sink'

Three Agricultural Research Service scientists, Gordon L. Hutchinson, Richard J. Millington and Doyle B. Peters, report that plants may derive as much as 10 to 20 percent of their nitrogen requirements from atmospheric ammonia—absorbing the ammonia through the stomata of their leaves. It had earlier been thought that only a very small amount of nitrogen for plants came from this source.

The work has additional significance because of increasing levels of atmospheric ammonia from fuel burning, sewage treatment and other sources.