physical sciences

Laser plasma in a stellarator

If a beam of laser light is focused on a small solid pellet, it will vaporize and ionize the pellet. This forms a plasma of ions and electrons of the sort used in controlled nuclear fusion experiments.

Some physicists have suggested that laser-generated plasmas may be a good way to inject plasma into magnetic-trap devices that try to hold plasmas of sufficient density and pressure so as to make steady fusion burning occur. A group from the Lebedev Physics Institute, Academy of Sciences of the U.S.S.R., including E. D. Andryukhina and eight others, report in JETP LETTERS for Sept. 5 that they have injected such a laser plasma into a stellarator, a toroidal vacuum chamber in which magnetic fields try to hold the plasma.

They placed a lithium pellet inside the chamber and focused laser light on it. The resulting plasma was caught in the magnetic field. When the laser energy reached 5 joules, the plasma density was about 2×10^{12} particles per cubic centimeter. The other important characteristic is the temperature of the plasma ions. The Russian experimenters believe that it is quite high but they have not yet succeeded in measuring it.

Two more new galaxies make three

In addition to the dwarf spheroidal galaxy reported in last week's issue (SN: 11/13/71, p. 325) Sidney van den Bergh of the University of Toronto's David Dunlap Observatory now reports two more.

All three galaxies were found on photographic plates taken with the 48-inch Schmidt camera on Palomar Mountain in California. These galaxies are small, spheroidal in shape (in contrast to the large flat spirals of the Milky Way or the Andromeda galaxy), and only about one-ten-thousandth as luminous as the larger galaxies. Their discovery was made possible by the development of very fast photographic emulsions by the Eastman Kodak Co.

Van den Bergh believes that two of the three, which are both about 2 million light-years away, are satellites of the Andromeda galaxy. The third lies about halfway between the Andromeda galaxy and the spiral galaxy in Triangulum, but it is not yet possible to say with which of the two the dwarf is associated.

Lunar soil transmits radio

The moon is a body that has been generally considered opaque to radio waves. When a spacecraft passes behind it, communication is interrupted until the vehicle emerges into view again.

It turns out to be not quite so opaque. Using a 150-foot antenna, Winfield Salisbury and Darrell Fernald of the Smithsonian Astrophysical Observatory managed to receive signals from the command module of the Apollo 15 flight at a time when it was behind the moon.

They report in the Nov. 12 NATURE that at 12:28 a.m. EST on Aug. 3, when the command module Endeavour was 63 kilometers beyond the visible edge of the moon, they recorded the unmistakable signal of the radio transmitter used to communicate between the command module and the landing party.

The event is taken as a partial confirmation of a theory of Salisbury's that the moon's upper layers might serve as a radio transmission medium.

environment

Composting urban trash

Most efforts to compost urban trash into a usable fertilizer have failed. As in all digestive processes, sugars are most easily composted, cellulose least easily; proteins and other organic materials range in between. With municipal waste now consisting of about 75 percent paper, the organisms that would digest the trash are "choked" on cellulose.

Ecology, Inc. of Brooklyn, N. Y., reports that its 100-ton-a-day operation in Brooklyn has succeeded in overcoming the paper glut. The process relies on no new organisms but rather on a careful manipulation of the conditions of composting—temperature, aeration, humidity and the addition of nutrients to keep the bacteria healthy.

The process begins with the magnetic removal of iron from garbage, followed by shredding. Garbage then goes to the digester where it spends 4 to 5 days. The resulting compost is then screened again, this time for plastics and foreign materials other than iron; nutrients are added, and the finished material is dried and bagged for sale.

Monolayers for mosquito control

Two British scientists report in the Nov. 5 NATURE a possible alternative to DDT in the control of malaria-transmitting mosquitoes: the spraying of biodegradable, nontoxic fats on the surface of mosquito-breeding waters to prevent respiration by mosquito pupae—and perhaps larvae and adults, as well.

Spraying oil on mosquito-breeding waters was the first technique ever used in mosquito control. But the hydrocarbons used could themselves cause a pollution problem. The two scientists, A. I. McMullen and M. N. Hill of the Microbiological Research Establishment in Wiltshire, say their experiments show that insoluble monomolecular layers of a number of biodegradable lipids, some of them extracted from animals and actually edible, are highly effective in asphyxiating the pupae of numerous mosquito species in the laboratory. Relatively small quantities are required to cover large surfaces.

The films are insoluble in water, but they do not prevent gas exchange across the air-water interface, and thus would not interfere with organisms other than the mosquitoes.

Slime aids fish speed

Two scientists at the Naval Undersea Research and Development Center, Moe W. Rosen and Neri E. Cornford, report in the Nov. 5 NATURE that fish slime can reduce the friction of water by as much as 66 percent and thus aid certain fish in speeding through the sea.

The two researchers captured fish, then dissolved their slime in water at various concentrations. They measured reduction in water friction with a rheometer, a device which forces water through two orifices and measures water pressure.

The slimes appear to reduce friction proportionate to the needs of various aquatic organisms for moving speedily. The slime of the Pacific barracuda, a fast-moving predator, gave the 66 percent reduction in friction; the slime of non-predatory organisms produced lower percentages of friction reduction.