Physical Sciences

Swimming in the neutrino sea

It is more than 12 years since Steven Weinberg suggested that the universe is pervaded by a "sea" of neutrinos left over from primordial times, which accounts for a large portion of the universe's mass and energy. The idea is a neat way of solving a number of astrophysical problems about why the universe doesn't exhibit as much mass as some people think it ought. But neutrinos are virtually undetectable, so the sea remains an unseen speculation.

Or will it? In the Jan. 13 PHYSICAL REVIEW LETTERS L. Stodolsky of the Max Planck Institute for Physics and Astrophysics in Munich speculates on how to detect it. He bases his ideas on one of the few handles to grab a neutrino by, the effect of its presence on the spins and parities of other particles. He finds that immersion in the neutrino sea would cause the spins of transversely polarized moving electrons to change direction. The same effect would happen for neutrons or atomic nuclei under certain assumptions about recent experimental results regarding "neutral weak currents," and in that case the experiment would be easier because neutrons are less subject to magnetic disturbance. Another effect is that the motion of the earth in the neutrino sea would produce a torque on a ferromagnet. None of the experiments that these effects would lead to is easy, but Stodolsky believes the importance warrants a try.

KMS fusion claim revisited

Early in 1974 scientists of the firm KMS Fusion, Inc., in Ann Arbor, Mich., reported that they had detected neutrons produced by thermonuclear fusions occurring deep in the interior of a fuel pellet compressed by irradiation with laser light. If substantiated, the achievement would be a significant step in the development of laser-induced fusion, but the announcement was greeted with a lot of skepticism.

Now in the Jan. 13 PHYSICAL REVIEW LETTERS three KMS scientists, P.M. Campbell, G. Charatis and G. R. Montry, present a supporting argument based on compression of glass shells rather than the deuterium-tritium fusion targets. They take pictures with X-ray pinhole cameras as the glass shells are compressed by pulses from a neodymium-glass laser. The degree of compression they detect is sufficient, they claim, that when the thing is done with deuterium or deuterium-tritium targets, fusions could occur in their centers.

Kohoutek invisible to radar

The comet, not the astronomer, that is. On Jan. 12, 1974, a group of radar astronomers, E. J. Chaisson of Harvard College Observatory and the Smithsonian Astrophysical Observatory, R. P. Ingalls and E. E. Rogers of the Haystack Observatory and I. I. Shapiro of Massachusetts Institute of Technology, tried to get radar echoes from Comet Kohoutek. They used the Haystack Observatory radar system with a signal at a frequency of 7,840 megahertz. Bandwidths from 2 hertz to 66,000 hertz were tried, but no echo was received.

In the absence of an echo they do not know what its bandwidth might have been, but assuming 100 hertz as likely, they conclude that the comet's nucleus, if a perfect spherical reflector, is less than 250 kilometers in diameter, and the density of particles in the coma, if they are millimeter sized, must be less than one per cubic meter for a coma with a 10,000-kilometer diameter. The report is in ICARUS (Vol. 24, p. 188).

Natural Sciences

Monkey mating: Help from sex film

The Sacramento Zoo has two frustrated gorillas on its hands, who can't seem to figure out how to breed. The pair, imported from the wilds as infants and raised by hand, missed out on observations they would have received if they'd grown up in a gorilla community. Now, eight years old and fully mature, they "just can't seem to make things click," Bill Meeker, zoo director, says.

With the help of Terry Maple, a University of California zoologist, the zoo has obtained a Swiss film all about the mating rituals of gorillas. Although Chris and Suzie, the Sacramento pair, have already seen the 25-minute film three times, they've been so preoccupied with the mechanics of the projector and lights they haven't really watched the movie. Meeker says he'll show the apes the film as many times as it takes. But Maple is afraid the pair, which were raised together, are simply bored with each other. Even if they do mate, Maple says using the film won't prove anything about instinctive breeding, since mating depends on so many other factors.

If the film works, the zoo has another problem. Since Suzie was raised by humans, she'll have to study another film on nursing and rearing her young.

A plastic lunch for fish larva

When John B. Colton Jr. discovered that the fish eggs he thought he was studying were really bits of plastic, he began a pollution research project that has resulted in classification of more than half a dozen types of ocean debris. Although most beachcombers can already attest to the increasing accumulation of plastic littering shorelines, previous research raised questions about particles ingested by fish (SN: 1/26/74, p. 59). Colton says in OCEANUS (Fall 1974) that bits of plastic and styrofoam "have been found in the stomachs of 10 species of larva, juvenile and adult fishes," and in marine bird pellets, gizzards and stomachs.

Since plastics don't decompose, as more and more waste is dumped into the sea, the more serious the threat of accumulations of plastics, gradually broken down and ingested as pollutants, becomes. The chief culprits, Colton says, are sewage outlets of plastic manufacturing plants, primarily along the eastern seaboard, which usually dump packing material and sheets of cellophane. But plastics are also found along major ship routes far out at sea, which, Colton concludes, proves that commercial vessels are doing most of the ocean garbage dumping.

Flybombs: Screwworm killer

Mexico, with a little help from the NASA weather bureau, may successfully eliminate its screwworm fly population soon. The larva of the pest bore into sores of herd animals, killing or maiming them. The U.S.-originated project, which costs the U.S. Department of Agriculture about $12.5 million a year to maintain, involves bombing fly-infested areas with sterile male of the species. The Mexicans have been after the worm since the United States eradicated it in Texas in 1965, but now, using NASA weather satellites to locate potentially good drop sites for sterile flies, the Mexicans hope to save up to 25 percent of the sterile flies normally used. By combining forces with the Mexicans, and stretching the eradication line south to Vera Cruz, the United States stands to save about $1.8 million annually. The eradication program is scheduled for fall 1975, when a sterile fly factory in central Mexico becomes operational.