

astronomy

Deuterium abundance on Jupiter

Deuterium can join an ordinary hydrogen atom to produce the molecule HD. Comparing the incidence of HD in astronomical bodies with that of ordinary molecular hydrogen, H₂, yields an abundance ratio of D to H, which is of intrinsic interest to students of planetary atmospheres or interstellar clouds. Many cosmologists believe it can be used to determine the density of the universe and thus settle the question of whether the universe is open or closed.

In the Sept. 15 *ASTROPHYSICAL JOURNAL LETTERS*, J. T. Trauger and F. L. Roesler of the University of Wisconsin at Madison and N. P. Carleton and W. A. Traub of the Smithsonian Astrophysical Observatory and Harvard University report the discovery of HD on Jupiter and calculate the ratio of deuterium to hydrogen in the Jovian atmosphere to be 2 to 100,000. Assuming that this ratio is good for the universe at large and assuming that deuterium could only be produced in the "big bang" at the beginning of the universe, the ratio leads to a universal density which is far too small to affect closure.

But Traub enters a caution: Until recently cosmologists believed that the only place to produce deuterium was the big bang. In the weeks between submission of the paper and publication, Stirling A. Colgate of New Mexico Institute of Mining and Technology at Socorro has suggested that shock waves in supernovas could make deuterium. In that case, one could have a far denser universe with the present deuterium abundance. But it remains to be seen whether this idea will be generally accepted.

What binds clusters of galaxies?

One of the severe problems facing cosmologists is that galaxies appear to associate in clusters, but the clusters do not appear to have enough mass to remain gravitationally bound. The motions of the galaxies, therefore, ought to disrupt the clusters.

Since the discovery of intergalactic X-ray sources in a number of clusters, suggestions have been made that the X-rays are produced by intergalactic gas and that this gas is enough to do the binding. In the Sept. 15 *ASTROPHYSICAL JOURNAL LETTERS* Susan M. Lea and Joseph Silk of the University of California at Berkeley and Edwin M. Kellog and S. Murray of American Science and Engineering in Cambridge, Mass., say no. They have calculated the cases of three such sources, the Coma, Perseus and Virgo clusters, on the basis that the X-rays come from bremsstrahlung caused by atomic collisions in a hot gas cloud. In each case the mass of the gas was only a small fraction of the mass necessary to bind. For Coma it was approximately one-eighth.

Hydrogenation in interstellar clouds

The molecules found in the interstellar clouds and the physical conditions there lead to the supposition that reactions in which hydrogen unites with other elements or compounds take place there. Some species are found that are hardly hydrogenated at all; others are quite saturated, having all the hydrogen they can hold. A search for the intermediately saturated molecules, acrylonitrile, pyrimidine and pyridine, has failed, Martha M. Simon of Brookhaven National Laboratories and Michal Simon of the State University of New York at Stony Brook report in the Sept. 15 *ASTROPHYSICAL JOURNAL*. They conclude that compounds of intermediate saturation do not exist abundantly. It remains a mystery how representatives of the extremes of saturation occur without any of the middle ground.

zoology

Roaring crocodiles may be misunderstood

Crocodiles and alligators, says zoologist Howard W. Campbell, have variously been reported to roar, hiss, bellow, bark, chirp, grunt, growl and snarl, often in "wildly imaginative" accounts that make it difficult to form clear ideas of the meanings of crocodilian sounds. The similarity of sounds produced in widely varying situations, Campbell reports in *ZOOLOGICA*, "appear to reflect the writer's interpretation of the call's significance rather than the alligator's."

The breeding song of a male frog, for instance, "encodes vastly different information for another male of the species, an egg-laden female and a spent female. In squirrel monkeys the relative social status of the recipient individual has been shown to determine the message content of acoustic signals."

Not even graphs of the sounds of some species have been able to show differences between sounds used in seemingly unrelated situations, Campbell says, but the variety of the sounds and their uses suggest that analysis is possible.

Food-growing ants

A group of ants (*Attines*) native to Latin America and the Caribbean has the remarkable ability to grow its own food. They gather leaves and use them as a compost for growing fungus for food. But in so doing, they have severely damaged crops, forest trees and grazing land. The British Overseas Development Administration is supporting studies on these ants so that new baits can be produced to control the foragers. Fascinating facets of their behavior have come to light.

Entomologist Trevor Lewis at the Rothamsted Experimental Station in the Caribbean reports that the distance traveled by some species is as far as 300 yards—the distance of three football fields—and entails a 10-hour return journey.

The ants usually forage at night, but on occasion they forage during the day. The shift to daytime food gathering occurs when the brood begins growing rapidly. Leaf fragments collected in the day are richer in fungal nutrients than those picked at night.

"Complete understanding of the foraging behavior of these ants is clearly a long way off," says Lewis, "but as a result of the work of the ODA much of what actually happens has now been recorded. . . . All this will assist in the formation of new baits."

A disease caution for hunters

Leptospirosis is a common cause of obscure fevers. Spread by urine contamination, its occurrence is probably much more frequent than definitive diagnosis would indicate, with hunters, farmers and sewer workers particularly susceptible. The disease is usually benign, but kidney failure can occur, so when an outbreak of leptospirosis was discovered recently among moose in Minnesota, University of Minnesota veterinarian Stanley Diesch began warning farmers and hunters of possible danger.

Diesch warns that the disease is commonly spread between different animal species and that the largest outbreak among moose has occurred in the same part of the state where the greatest cattle and swine populations are raised. Hunters can be exposed while dressing game in the field, and farmers, from handling livestock that have contacted the disease from game animals. Particular care, he says, should be taken to avoid puncturing an animal's urinary bladder during dressing.