Space

Titanic Titan, minimal Mimas

Titan, already known to be at least three times larger than any of Saturn's other satellites, appears to be even bigger than had been thought. When earth's moon passed between Titan and the earth on March 30, 1974, James Elliot, Joseph Veverka, Jay Goguen and Edward Dunham of Cornell University took advantage of the occasion to watch Titan as it was progressively blocked off by the moon's sharp edge. They found not only that the edge of Titan appeared much darker than the center, a strong indication of a substantial atmosphere, but also that its diameter is about 5,800 kilometers, "significantly larger than the previously accepted value of 5,000 kilometers."

Mimas, on the other hand, Saturn's innermost moon and one of its smallest, appears smaller than formerly believed. Observing the tiny satellite last November with an area-scanning photometer, Otto Franz of Lowell Observatory used a newly developed method of analysis to separate the light reflected by Mimas itself and the scattered-light background. He concludes that the visual magnitude of Mimas, corrected to what it would be at its mean distance from the earth, is 13.0, nearly one magnitude fainter than the currently accepted value, which was determined 14 years ago. "This result," he says, ". . . indicates that Mimas may be significantly smaller and thus of greater and more plausible mean density than [was] inferred from previously available brightness information."

Speculations on Uranus

Lying on its side (tilted some 98 degrees from the plane of the ecliptic) and possibly near the outer fringes of the sun's influence, Uranus is an intriguing subject for research. A probe may be sent in 1979, but theories about the distant planet are already forming.

Morris Podolak of Yeshiva University has suggested some possible versions of Uranus based on the assumption that the amounts of ammonia, methane and water vapor there may together nearly equal the amount of hydrogen. This possibility, says Robert E. Danielson of Princeton University, may offer new insight into the planet's atmosphere, consistent with earth-based observations, if one further assumes that the planet's internal heating provides no more than a tenth as much energy as comes in from the sun.

The atmosphere of Uranus, if these conditions exist, may well be marked with a heavy cloud of methane droplets, Danielson says. The cloud would be concentrated at an altitude where the atmospheric hydrogen pressure is about three earth atmospheres, with a temperature of about 90 degrees K. (minus 297 degrees F.) at the top of the cloud. Above the cloud, the atmosphere would be relatively stable, since the tiny amount of internal heating would produce only a slow rise of temperature with depth, thus providing little energy for convection from beneath.

Protecting the Martians

Ultraviolet spectra recorded by Mariner 9 during the 1971 dust storm on Mars offer a tiny bit of hope for the presence of microorganisms on the red planet, suggest Kevin Pang of Jet Propulsion Laboratory and colleagues. Signs indicate a possible UV absorption band, possibly pointing to a 100-micron layer of surface material that absorbs UV but transmits visible light. This could shield organisms from harmful irradiation, the researchers point out, while allowing photosynthesis.

Behavior

Benefits of sensory deprivation

An old Japanese story tells how a famous wrestler perfected his skill but constantly lost matches because of shyness before spectators. His name translates as "Great Waves" and when he sought help from a Zen monk, the latter advised him to sit up all night in a darkened temple imagining rolling waves. As the wrestler sat in isolation, his imagination conjured up waves that eventually swept away everything before them; he ceased his fear of strangers and became a champion.

More recently, psychologists have begun to use such periods of directed isolation to modify behavior in willing subjects. Peter Suedfeld, chairman of the psychology department of the University of British Columbia, summarizes recent advances in the field in the January-February AMERICAN SCIENTIST.

Perceptual changes that occur during and immediately following isolation with a minimum of visual or auditory stimuli include increased sensitivity to pain, reduced thresholds to perceiving sight and sound and improved tactile discrimination. The ability to perform simple tasks reaches a peak after about 24 hours of deprivation, but skill in complex tasks peaks almost immediately—probably from arousal in preparation for what is to come.

The most impressive changes, however, involve behavior modification in willing subjects. (Suedfeld draws a sharp distinction with "brainwashing," which usually involves sensory overload in unwilling subjects.) A group of 72 subjects, all eager to break their heavy smoking habits, were split into four groups: Half would be isolated, the rest would not; half the members of each of these groups would hear a taped antismoking message, and the rest would not. After only one 24-hour session of isolation, the sense-deprived group showed a smoking reduction rate of 55 percent, even after two years. The control group reached only an 18 percent reduction. The message didn't matter.

The technique has also been successful in modifying phobias, and researchers are using it in cases of drug addiction, hypertension and sexual dysfunction.

Deep thought

Divers working underwater face a specialized environment with similarly specialized problems. Many of these problems, however, may be related more strongly to the psychological effects of that environment than is commonly credited, suggests Alan Baddeley, director of the British Medical Research Council's Applied Psychology Unit.

Cold, for example, is usually assumed to exert its influence through sheer physical numbness, with the corollary presumption that a diver will perform worse after 20 minutes in cold water than after only a minute or so. In a study with the London Hospitals Diving Group, however, Baddeley found that there was little difference after the initial exposure to the chill. The inference, he suggests, is that the cold serves also as a distraction, removing part of the diver's attention from the task at hand.

There is also a significant "context effect" to working in water, he says in the Feb. 13 NEW SCIENTIST. "If a diver learns something on the surface," he says, "he finds it more difficult to recall it underwater," and vice versa. Thus, "if you train a man entirely on the surface, it may not transfer entirely underwater." Furthermore, he says, dexterity tests have shown severe drops in efficiency in the open sea, even compared to performance near shore, suggesting that anxiety, too, may merit further attention.