Space

Venus a la Russe

Despite all the spacecraft that have visited her, Venus, like a true lady of mystery, clings to her secrets. Instruments fail, readings are ambiguous, certain probes lack key sensors. Thus it is only with frustrating uncertainties that a picture of the veiled world is slowly beginning to emerge. John Ainsworth and J. R. Herman of NASA's Goddard Space Flight Center are among those who have been struggling through the fascinating, albeit sometimes conflicting, data from five Soviet Venus probes, Veneras 4 through 8. More than two-and-a-half years after the most recent landing, their results are still less than ironclad, often yielding three different solutions to as many types of analysis. But a picture, or at least a sketch, is there.

The surface temperature, they report in the Jan. 1 JOURNAL OF GEOPHYSICAL RESEARCH, is 750 degrees K. (892 degrees F.) from Venera 8 (Soviet analysis of the same data produced 741 degrees K., SN: 3/16/74, p. 176), and 748 degrees from Venera 7, which landed at a spot 3.6 kilometers higher than its successor. A much more complicated problem is that of the temperature "lapse rate"—the rate at which the temperature drops with increasing altitude. Venera 7 reported what amounts to a sharp cold layer, less than 2 km thick, about 2.5 km above the surface. Within this layer, the "cooling"—relative to a surface temperature that would melt lead—is far more rapid than in the atmosphere above and below it. Venera 8's low-altitude results, however, were so ambiguous that the researchers found a wide range of possible interpretations. A composite analysis of data from the five Veneras and the U.S. Mariner 5 suggests the existence of several such quick-chilling regions ranging up to about 45 km above the surface, possibly representing cloud or haze layers. Because the probes made their findings from a wide range of trajectories, the Goddard scientists assume that some of these layers may be long-lasting or permanent features, reaching perhaps 30 degrees of latitude north and south of Venus's equator. There could be as many as six such layers.

With such extreme atmospheric layering and the huge amounts of energy pouring in from the sun, radical shear winds are not surprising. In the upper part of the visible atmosphere, the Venera data seem to show, the wind whips along over the equator at about 111 meters per second. About 44 kilometers from the surface, the wind speed suddenly drops by as much as 60 percent, to be met, 4 km farther down, by a layer of winds some 20 km thick blowing in the opposite direction at 15 to 40 meters per second. Another sudden slowdown apparently exists about 15 km up, leaving surface winds of as little as 0.1 meter per second or less.

The family of Juvinas

A class of meteorites known as basaltic achondrites, or eucrites, may all have come from the same volcanic cataclysm some 4.6 billion years ago, which could mean that they date back to the formative years of the solar system. A large eucrite named Juvinas was sampled with rubidium-strontium and ion microprobe techniques by C. J. Allègre and three colleagues from the University of Paris, who report in the Feb. 7 SCIENCE that the volcanism that produced the eucrites happened at least that long ago. If it was triggered by gravitational energy released during accretion, they maintain, the parent body must have been at least as large as the moon.

Natural Sciences

Searching for steps in the 'ladder web'

Scientists in 1972 were puzzled by a subtropical spider that spun an elongated web, dubbed a "ladder web," instead of the conventional orb spiral. But William G. Eberhard in the January-February JOURNAL OF NATURAL HISTORY reports the discovery of a second spider deviant, which spins a web similar to that of the as yet unidentified New Guinean spider, except that it is inverted 180 degrees, with the long part above rather than below the hub. The latest discovery, photographed by a Smithsonian Tropical Research Institute team confirms construction techniques used by the *Scoloderus* spider (family araneid). Scientists used a cornstarch dustcloth to coat the web with white chalk, then photographed progressive steps in its construction. All webs were built at night, based on an inverted Y frame, with the spider making long descents between short bursts of activity, in which she extended her network laterally by walking along leaves. One of the female spiders studied remained near one site for 14 consecutive nights, receiving regular feedings from scientists, but none of the webs observed survived more than one night.

Fireflies: Using love lights to kill

The brains of fireflies may be more complex than scientists suspected, a University of Florida entomologist reports in the Feb. 7 SCIENCE. By studying the mimicry habits of female fireflies of at least 12 species of *Photuris,* James E. Lloyd discovered that female predators effectively lured males of the genera *Photinus, Photuris, Pyractomena* and *Robopus* to them by mimicking the mating signals of the prey species' females. Although his research is not conclusive, Lloyd successfully demonstrates that female fireflies flashed answers to passing males using the correct timing patterns. Important parameters in the male patterns are flash numbers, rate and duration, and in the female response, flash length and the delay at which it occurs after the male pattern. When a male's flash signal is correctly answered by a female perched on a low limb or leaf, he flies toward it and emits his signal again. A dialogue ensues, and in one in 20 cases observed, the female predator successfully captured and devoured her prey. Female fireflies apparently are not specialized, but instead demonstrated versatility in signals, responding appropriately to various species' rhythms. Lloyd suggests the technique evolved from locomotion flashes commonly emitted when females walk, land or take flight. These signals would need little modification, the author says, to attract some congener male.

Seals that sleep at sea

Gray seals may have evolved their own mechanism for rest especially suited for sleeping in the water, S. H. Ridgway, a biosystems researcher at the Naval Undersea Center in San Diego, concludes in the Feb. 14 SCIENCE. The gray seal's system is opposite that of most terrestrial animals. During rapid-eye movement sleep (deep sleep) seals breathe faster, their hearts pound rapidly and regularly, and REM sleep is preceded, not followed, by slow-wave sleep. Ridgway says REM occurs only when the seal floats to the surface or "hauls out," never underwater. Seals apparently surface, opening the nasal passages to inhale, and either sleep floating or sink two or three feet underwater. They need only five hours light sleep per night, and probably go ashore to nap if denied adequate rest. Ridgway's findings may help explain mammals' ability to reorient sleep requirements.