BIOLOGY

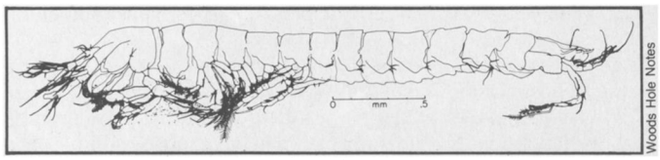
A sharp focus on hawks' eyes

The kestrel, a small falcon also called the sparrow hawk, can spot and dive for an insect from 18 meters. Its larger relatives can spot small animals from 1,500 meters. Such feats of apparent visual acuity have engendered the phrases "eagle eyes" and "eyes like a hawk," and with them, the popular belief that hunting birds possess eyesight far superior to humankind's. Now, thanks to three Vanderbilt University psychologists, this notion has become scientific fact.

Robert Fox, Stephen W. Lehmkuhle and David H. Westendorf trained a pet kestrel named Wulst to take eye tests. They showed Wulst two illuminated windows, one with vertical gratings and the other with blank fields. When Wulst flew to the perch in front of the window in which the grating appeared, he was rewarded with beef heart. The team showed Wulst narrower and narrower gratings—those at the end of the test below the acuity of the human eye. With this method, they were able to determine that the hawk's eyesight is about 2.6 times better than a human's—an ability the equivalent of reading an eye chart at 100 yards or a traffic sign half a mile away.

The study, the team states in the April 16 SCIENCE, confirms the superior eyesight belief, but not the "hyperbolic" claims (eyesight 8 to 10 times better) some have made.

Surprise from the not-so-barren depths



Woods Hole Notes

Marine biologists used to think the deep ocean was so inhospitable that it was largely barren and lifeless. That is, until they discovered the problem lay in poor sampling techniques. Current methods, says a recent article in WOODS HOLE NOTES, can retrieve more kinds of animals in one sampling than were collected during the first 100 years of deep-sea dredging. One surprising find made with an epibenthic sled by Woods Hole biologist Howard Sanders was this primitive looking marine syncarid thought to have disappeared 300 million years ago.

Hairy twin helps dry plant study

Two western U.S. plant species are nearly twins, except that one has hairy leaves. *Encelia farinosa* is a desert Composite shrub with pubescent (hairy) leaves; *E. californica* is a nonpubescent shrub native to the moist Southern California coast. Botanists James Ehleringer and Olle Björkman of Carnegie Institution of Washington at Stanford, Calif., and Harold A. Mooney of Stanford University compared these nearly identical plants and report interesting findings in the April 23 SCIENCE.

They measured the absorption of solar energy by both hairy and nonhairy leaves, correlated the absorption rates with precipitation and measured photosynthetic rates of the hairy leaves. These measurements allowed them to conclude: 1) The leaf hair layer acts like a blanket reflector and reduces light absorbed to about 56 percent below that of the nonhairy leaves; 2) the amount of hairiness depends on the dryness of the climate—the drier, the hairier and less light-absorbent the leaves; 3) while this decreases heat load and moisture loss, it also reduces photosynthetic rates.

This is the first report, they state, that leaf hairs can reduce photosynthesis. The plant genus *Encelia,* they add, appears to be a model system for studying the adaptive significance of leaf hairs to plants in dry environments.

SPACE SCIENCES

From our reporter at the meeting of the American Geophysical Union in Washington

Martian hydrogen at solar minimum

Measurements made with the Copernicus observatory satellite have provided the first data from the vicinity of the earth on the amount of hydrogen escaping from the atmosphere of Mars. The results are also the first Martian hydrogen data to be collected during a period of minimum solar activity, thus providing confirmation of the theory that the hydrogen escape flux is constant, a balance between the number density of the escaping hydrogen atoms and the effusion velocity outward from the Martian upper atmosphere.

The Copernicus data showed a Lyman-alpha (hydrogen emission) intensity of 3.2 ± 0.8 kilorayleighs, considerably brighter (when corrected for the differing geometry) than was measured by the Mariner 6 and 7 spacecraft as they flew past Mars during solar maximum in 1969. Since the temperature of the Martian exobase, the primary hydrogen escape layer in the atmosphere, was only 260°K during the Copernicus measurements (based on earth-based, 10.7-centimeter radio data), compared with about 350°K in 1969, the effusion velocity during the more recent measurements must have been only about one fourth of its earlier value, according to Joel S. Levine and David S. McDougal of the NASA Langley Research Center and Donald E. Anderson Jr. of the Naval Research Laboratory. Thus the amount of hydrogen at the exobase level—about 200 kilometers above the surface, says Levine—would have to be four times as great, about 100,000 atoms per cubic centimeter, to sustain the escape flux balance. This was confirmed by the brightness measurements.

The use of Copernicus to gather Martian data is part of a broadening in the use of the satellite, which was originally devoted entirely to stellar astronomy. It was programmed for the Martian observations by Edwin S. Barker of Princeton University Observatory.

Lunar lava took the easy way out

The broad, dark maria that blanket much of the moon's earth-facing side are in conspicuously short supply on the opposite lunar hemisphere. The latest hypothesis to account for this assymetry is that of Jack B. Hartung of the State University of New York at Stony Brook, who proposes that it could have been due to the gravitational attraction of the earth influencing the molten, mare-forming magmas to favor the earth-facing side as an easier path to the surface.

Tidal forces created on the moon by the earth are almost the same on the near and far sides, Hartung points out, but the difference would have been much greater in the early history of the earth-moon system, when the two bodies were much closer together. At about one-third the present distance, he says, the difference would have favored the near side by 100 times its present value, and by 10,000 times at about one-tenth the current earth-moon span. "If some kind of global communication or connection of basalt magmas existed," says Hartung, "surface flows on the earth-facing side of the moon could occur at the expense of possible flows at other places on the moon, thus further enhancing the front-back assymetry."

Such a favored-flow process, he adds, could also have produced a net transfer of mass within the moon toward the center of the earth. "This mechanism could explain the observation that the center of mass of the moon is displaced toward the earth about 2 kilometers relative to the center of the moon's figure."