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COVER: Perception is something taken for granted in most sighted people. University of Toronto psychologists are now finding, however, that blind people also seem to have an intuitive sense of perception. The cover drawings — one of a chair and the other of a bath with two taps, a water-spouting faucet and a person standing to the side — were done by persons totally blind since early in life. See p. 332. (Drawings: Courtesy of J. M. Kennedy)

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Coming: The Daily Planet

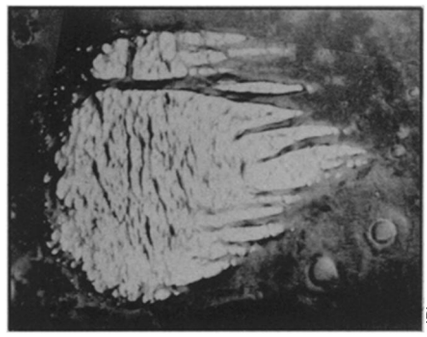
The first gathering of the "planet people" — the American Astronomical Society's Division for Planetary Sciences — took place in 1969, the year that human beings first set foot on the moon. At its decennial meeting in Pasadena last week, the DPS stood at another significant threshold: the eve of the most concentrated period of planetary exploration that the Space Age has ever seen. Before the group reassembles next fall, as many as 16 separate orbiters, landers, flybys and entry probes will have gathered new information on four different worlds, even as ground-based research continues to pursue recent major discoveries such as the rings of Uranus and the possible moon of Pluto. (Even the earth will be part of the action, as an armada of satellites aid scores of countries in the huge International Magnetospheric Study, beginning next month.)

• **Mars:** Both Viking landers and one of the two orbiters are still at work on the ruddy planet, piling new data atop scientists who have yet to work their way out from beneath the existing mountain. A strange feature known only by the noncommittal title of "White Rock" was first seen by the Mariner 9 spacecraft in 1972, but it looked so intriguing when photographed at high resolution by Viking Orbiter 1 a few weeks before the DPS meeting that Nancy Evans of Jet Propulsion Laboratory has been named principal investigator in a project to study it. Measuring about 14 by 18 kilometers, White Rock sits at the bottom of a 93-km crater only 8° south of the Martian equator, where some scientists think the temperatures too high for the rock's highly reflective surface to be due to frozen CO_2 or water ice.

Other researchers continue to study the vast Martian dust storms, while yet others argue over the major mystery of water in the planet's past. David Pieri of Cornell University, conducting a major study of the controversial Martian channels, last week reported that, although some of the channels may indeed have been cut long ago by flowing water, "it did *not* rain." His evidence includes a detailed study of the channel banks, revealing, he says, erosion patterns on slopes (where any source of water could have made them) but not on level areas where falling rain would have been required.

Water's role is also important to weather and climate studies, where the thin Martian atmosphere and dusty ground contribute to an exquisitely sensitive meteorology. The Vikings have now been on Mars for more than a 688-day Martian year, which enabled Gunnar Lindal of JPL to show the DPS audience that the planet's atmospheric pressure only 5 km above the ground varies through the seasons by fully 30 percent. Some Viking researchers, in fact, hope to extend the operations of lander 2 a few additional months to see another winter, prompted by the recent finding that terrain where frost has been and gone looks substantially different from its pre-frost appearance.

• **Venus:** December will be Venus Month, as the U.S. Pioneer Venus orbiter arrives on the 4th, followed by five kamikaze atmosphere probes on the 9th, with two Soviet Venera flybys due about two weeks after that, each of which will also send a landing craft down to the surface. U.S. officials have been trying to coordinate the two countries' missions with their Soviet counterparts, according to Pioneer Venus project scientist Lawrence Colin of the NASA Ames Research Center. Soviet officials have indicated to NASA that the Venera landers will make their descents on the 21st and 25th, Colin told SCIENCE NEWS at the meeting last week, but as of that time had provided neither exact predicted landing times nor the intended sites. Also of interest would be the trajectories of the Venera flybys, since for a while after the landers are jettisoned the flybys will be between Venus and the sun, enabling them



JPL

"White Rock" on Mars, as seen by Viking.

to monitor the oncoming solar wind before it reaches the Pioneer Venus orbiter closer to the planet. (Flyby spacecraft, Colin believes, were selected for the Venera mission because they will give a longer period of line-of-sight radio contact with the landers than would orbiters that would curve away behind the planet.) The Venera flybys are expected to pass about 25,000 km from Venus on the day side, Colin says, and it would be only coincidence if either "periapsis" occurred while the Pioneer Venus orbiter was making one of its own closest approaches, which will be about 150 km from the planet. (The early Pioneer Venus periapses will occur near the outbound terminator.)

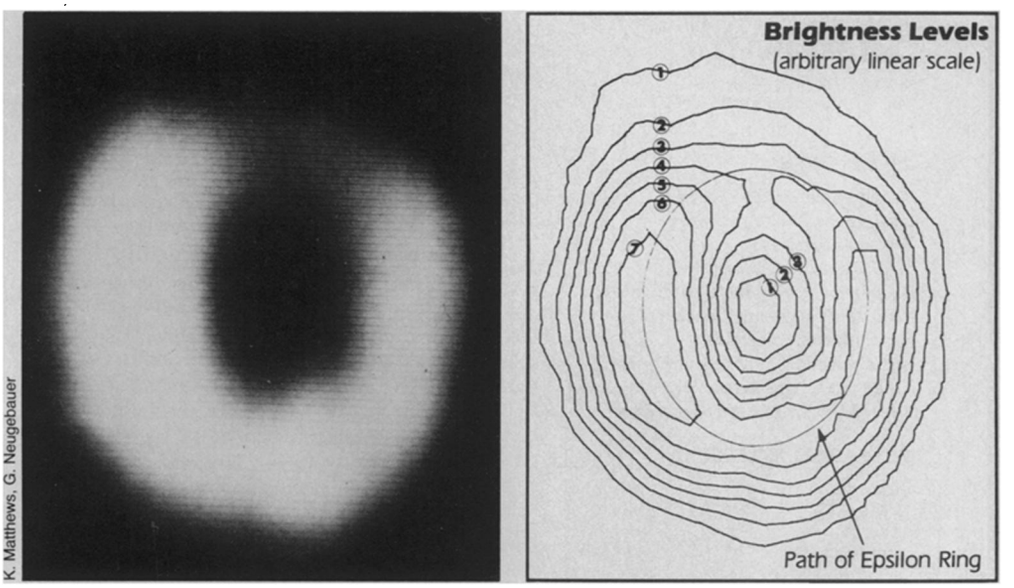
Meanwhile, scientists have been studying the planet from earth by spectros-

copy, radar and other techniques, incorporating data from the probes that have been there already. E. S. Barker of McDonald Observatory in Texas told the DPS of detecting sulfur dioxide and possibly carbon disulfide in the atmosphere from earth-based ultraviolet spectra, and Ron Prinn of Massachusetts Institute of Technology adds that the striking cloud features visible only by UV light in the Mariner 10 spacecraft's photos are virtual "sulfur maps." The vertical changes in atmospheric composition leading to the high-altitude sulfur will be a key result of the Pioneer Venus probes.

• **Jupiter:** In January, Voyager 1 will turn on its instruments for a months-long run at the giant planet, climaxing with a close flyby in early March of Jupiter and its major satellites; the feat will be repeated in July by Voyager 2, whose slightly different path will show it more of the satellites' surfaces and set up a course for a 1980 trip past Saturn. Jupiter is the solar system's planetary powerhouse, and Alex Dessler of Rice University last week offered an idea which, while counter to some previous concepts, adds to the planet's mighty image as ruler of its domain in space. The Pioneer 10 and 11 spacecraft, which flew past Jupiter in 1973 and 1974, surprised scientists by detecting repeated crossings of the "magnetopause" that divides the planet's magnetic field and the solar wind. It has been suggested that the multiple crossings were due to the field's being in effect a huge, flaccid bag that is pumped in and out by the varying speed of the solar wind. Dessler suggests instead that Jupiter itself is responsible: Nearly all of the crossings, he says, occurred over a limited range of Jovian longitudes, leading to the inference that a certain portion of Jupiter — perhaps as much as a hemisphere — is more "active" than the rest, allowing the planet's odd, electrically conductive moon Io to preferentially draw out "bulges" of ionospheric plasma to distort the magnetic field. Other data presented at the meeting were at least consistent with this idea, and the Voyagers will help find out.

• **Saturn:** Pioneer 11 will fly by next September, beating Voyager 2 by more than a year. Of key interest is the huge moon Titan, in part because of its possible dense atmosphere. Interest should stay high, since the meeting seemed to produce a wider range of predicted atmospheric pressures than ever.

• **Uranus:** Voyager 2 may get there in 1986, but the planet's newly found rings were discovered from earth, by their occultations of a star. Keith Matthews of California Institute of Technology showed the DPSers the first direct-detection image of the rings, made with colleague Gerry Neugebauer by scanning them at a 2.2-micron wavelength and simultaneously at 1.6 microns (where only the planet shows), enabling Uranus itself to be "subtracted out." The high ellipticity and varying width of the outer, "epsilon" ring enabled Caltech's Peter Goldreich to calculate its precession (1.374° per day), leading to a rotation period for Uranus of 15 hours (amid past estimates ranging from 12 to 24). The mass of the epsilon ring, says Goldreich, is probably equivalent to that of a satellite about 20 km across. The Voyagers, meanwhile, will even seek rings at Jupiter. □

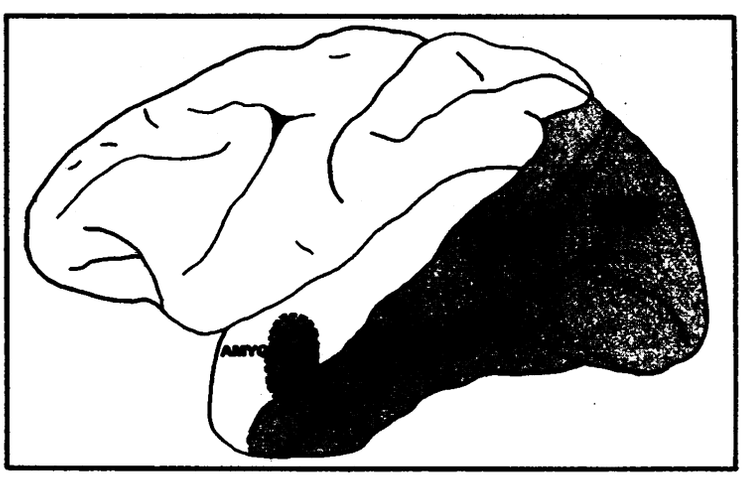


Lighting the brain's visual path

Seeing is a matter of making sense out of patterns of light and darkness. The eye reports to the brain that cells in the retina have sensed light, and a variety of brain areas interpret that information. In sequence, both logically and anatomically, each area adds to the information processing until a sight is recognized and the animal reacts. For the past 20 years, biologists have employed several techniques, some using microscopes and others using electrodes, in the search for clues that would help them follow the visual processing pathway deep into the brain. A technique that boldly lights up active brain areas now confirms and extends the previous findings. "We have succeeded in mapping this entire visual system at work," Mortimer Mishkin and colleagues from the National Institutes of Health told the meeting in St. Louis of the Society for Neuroscience.

Mishkin's group used a technique developed by Louis Sokoloff, also at NIH. Active brain cells must take in the sugar glucose as they work, but they will also take up the modified sugar 2-deoxyglucose. Once inside the cell, 2-deoxyglucose is trapped because, unlike glucose, it cannot be fully metabolized to provide energy. By using radioactively labeled 2-deoxyglucose, the scientists can detect how much of the compound collects in different areas of the brain, and thus whether an area is active.

In experiments on monkeys, Mishkin and co-workers cut the connections between brain halves and then compared 2-deoxyglucose concentration in the "seeing" hemisphere with that in a hemisphere "blinded" by cutting the processes that carry incoming visual information. A monkey, thus prepared, is either seated passively amid a rotating visual display or



Brain at work on vision: From analysis to reaction.