

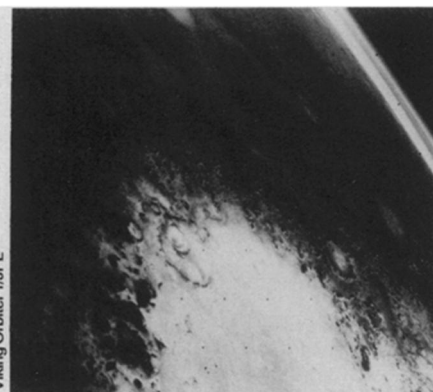
The Waters of Mars: A Quest Renewed

For nearly a century, water has been a major chapter in the story of Mars, as earthlings know it, ever since Italian astronomer Giovanni Schiaparelli published his map of what he took to be *canali* (channels) on the Martian surface. The idea was rapidly extrapolated into the notion of "canals," evoking visions of intelligently produced irrigation systems and the like. But even with no trace of such structures visible in close-up spacecraft photos, water remains perhaps the essential item in understanding the nature of Mars.

Even after the elaborate, four-spacecraft Viking mission, many of the key questions remain. Did rivers once flow on the now-parched surface? For that matter, how much water is there now? The newest approved mission on the National Aeronautics and Space Administration's planetary schedule is a Mars Geoscience and Climatology Observer (MGCO), to be

sent there in 1990. The major category among NASA-funded studies of the planet is about the evolution of its climate and atmosphere (virtually unknowable without a grasp of the role of water). And just conducted at the agency's Ames Research Center in Mountain View, Calif., was an entire two-day "workshop" devoted exclusively to the topic of "Water on Mars."

Woven among the two days of formal presentations and papers was the hope of influencing future studies. On the key matter of the planet's present water reservoir, for example, Stephen W. Squyres of NASA Ames showed Viking photos of a number of surface features whose shapes seem to have been affected by the presence of subsurface ice. There are craters, for example, whose surrounding blankets of ejected material look as though they were originally deposited on ice that turned to steam and lubricated their flow; other features appear "softened" over time by ice



The waters of Mars frost 750-km Argyre basin and form haze layers in the atmosphere.

trapped in their cracks. "Mapping of these features," Squyres noted, "may therefore provide some of the most unambiguous evidence available for the presence of ground ice...." But to do the job, he said, a spacecraft *must* have a high-resolution imaging system — and present plans for MGCO call for none at all.

Next April 1, NASA plans to send out an "announcement of opportunity" soliciting proposals for instruments to be included in MGCO's payload. There has been a "strawman payload," but that is only to give interested participants an idea of the range of capabilities envisioned for the spacecraft. And it includes no cameras. Designed to provide a relatively low-cost mission (a fundamental guideline in the proposals of the NASA-chartered Solar System Exploration Committee), MGCO will have a modest data-transmission rate (32 kilobits per second), and spacecraft imaging systems have a reputation for requiring lots of data, sometimes at the expense of other instruments.

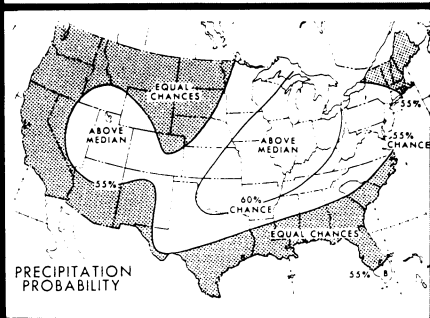
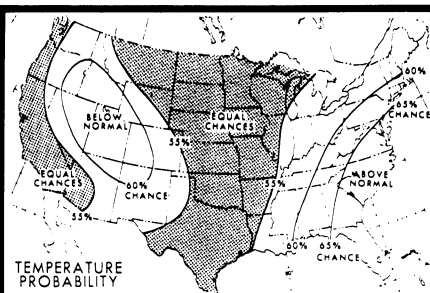
Several research groups, however, are already preparing proposals for camera systems that would require limited amounts of data as well as meeting other MGCO constraints. One, for example, would take as few as a single picture per day, of carefully selected targets, but at a resolution capable of showing features as small as 1 meter across. Another, envisioned by researchers in Germany, would minimize its crowding of the spacecraft's data-rate by transmitting its photos when the rest of MGCO's instruments are not sending. (NASA's plans call for MGCO to send back its results in "downlinks" lasting 16 hours per day; the German plan calls for pictures to be transmitted the rest of the time, for reception by a German tracking station. This could also involve the participation of the European Space Agency, possibly a tempting detail in view of NASA's recent stressing of international involvement in space

Wetter winter predicted for most

The early snowstorm that fell on the Rockies in mid-October may have signaled a wetter-than-normal winter for most of the United States. Donald L. Gilman, chief of the National Weather Service's Prediction Branch in Washington, D.C., predicts a 55 to 60 percent chance of above-normal precipitation for much of the Rocky Mountain area and for a wide band from Texas to New York. The western and southern states don't show enough strong indicating statistics for forecasters to predict precipitation patterns there.

Similarly, the middle third of the country and the West Coast are left out of the temperature forecast — meaning there is an equal chance of colder or warmer weather in those regions — but milder-than-normal temperatures in the East and colder temperatures in parts of the West could make this an unusual winter, compared with recent years. Gilman places a 65 percent chance of above-normal temperatures on the Eastern Seaboard and gives the greatest chance for colder temperatures to the stretch between the Sierra and Rocky mountains.

Every year the National Weather Service charts a three-month outlook before winter officially descends on Dec. 21. Gilman says this year's forecast was shaped by the usual factors, mainly atmospheric pressure patterns in the Northern Hemisphere. Last year the forecast missed predicting the deviant cold that most of the country felt, but overall, the winter out-



1984-85 winter outlook

looks hold true about 65 percent of the time.

Future predictions might be improved with more weather statistics available from other countries. John H. McElroy of the National Oceanic and Atmospheric Administration, the umbrella organization over the National Weather Service, this week announced the formation of an international program to share more meteorologic satellite data and maintenance, and to cooperate in space activities. The program includes participants from Europe, Canada and the United States.

— C. Mlot

ventures.)

Several scientists at the meeting discussed the significance of various kinds of clay on Mars, which Robert B. Singer of the University of Hawaii in Honolulu noted could be important for clues about climatic conditions at the time of such minerals' formation. Several researchers advocated equipping MGCO with a mid-infrared spectrometer, which they said could provide more precise identifications than either near-infrared spectra or the Viking landers' element-by-element chemistry.

Even a reanalysis of earth-based radar indications of possible liquid water under the Martian surface met with a more tolerant hearing at the meeting than during its original presentation in 1980. Because on Mars these days, water is the name of the game. —J. Eberhart

Ultrasound as pregnancy predictor

One of the mysteries of infertility treatment is why some women are helped by medical therapy that fails others with seemingly the same problem. A difference in the uterine lining that can be picked up with ultrasound imaging may explain some of these discrepancies, researchers said at last week's meeting in Washington, D.C., of the Radiological Society of North America.

Ultrasound screening could aid in determining for whom the odds of getting pregnant are woefully long, and save women the time, anguish and several thousand dollar cost per try of in vitro fertilization, says Thomas D. Brandt of Michael Reese Hospital in Chicago. Abnormal uteruses that are missing a healthy lining lack a characteristic central stripe and surrounding halo in ultrasound images, he says.

Brandt and his colleagues looked at women whose infertility was due to a failure to ovulate or who were in an in vitro fertilization program because of blocked fallopian tubes. Among 51 women who received medical treatment for ovulatory difficulties, 28 percent (9) of those with normal uteruses got pregnant, compared with 5 percent (1) in the abnormal uterus group. And of the 46 women who had in vitro fertilization, where fewer pregnancies were achieved due to the greater difficulty of the procedure, 15 percent (2) of the women with normal uteruses conceived, compared with 3 percent (1) with abnormal uteruses.

"It appears that we've isolated a subset of patients who have not been described before," says Brandt. The uterus has for the most part been ignored in infertility research, he notes, because a fertilized egg can implant itself in "hostile" environments like the fallopian tube and ovary, so that a "friendly" uterus hasn't been considered crucial. —J. Silberger

Immunity: Two sides of the brain

Each hemisphere of the human brain is specialized for certain recognized cerebral functions, such as language skills, music appreciation or spatial recognition. But a more subtle brain activity may also be unequally distributed in the two hemispheres. Experiments on mice indicate that the right and left hemispheres of the brain assume different responsibilities in the control of immune system activity.

Gerard Renoux of the Medical School of Tours in France has looked at the influence of the brain neocortex on immunity. The neocortex is a seat of sophisticated perceptual, motor and thought processes. There is anecdotal clinical evidence that patients with traumatic losses of neocortex have suppressed immune function, Renoux told SCIENCE NEWS.

"B cells [the immune system's white blood cells that make antibodies] and macrophages [scavenger cells] are not under direct control of the neocortex," Renoux told the First International Workshop on Neuroimmunomodulation, held last week in Bethesda, Md. But he finds that the neocortex influences T cells, the major class of white blood cells responsible for cell-mediated immunity. The two hemispheres of the neocortex play different roles in that influence.

In their experiments, Renoux and colleagues surgically removed about a third of the neocortex from one or the other hemisphere of a strain of mice that does not show right or left hemisphere dominance over aspects of behavior. "The surgery produces absolutely no change in gross behavior, feeding, drinking, movement, weight and mating in the female mice," says Renoux. But the removal of right or left hemisphere brain tissue does produce a variety of effects on T cell activity.

The total number of T cells in the spleen, one of the specialized organs where immune system cells react with foreign molecules, is reduced in animals with the left neocortex removed. In animals with the right neocortex removed the number of spleen T cells is the same as in sham-operated controls. The left removal decreases the immune system response to certain foreign materials, whereas the right removal increases the response.

Immune system reaction to a stimulatory drug, imuthiol, and to tumor cells also differs depending on which side of the brain has been removed. Renoux suggests that the left hemisphere most directly controls the immune system, but that the right hemisphere modulates that influence. —J. A. Miller

Nerve chemicals direct immunity

The languages of the body's two great communicators — the nervous system and the immune system — seem to share various words. Recent studies have found that many disease-fighting cells produce or have receptors for chemicals, called neuropeptides, which were previously recognized for their role in carrying signals between nerve cells and for influencing mood and behavior. Now scientists report a specific immune system role for some of these chemicals: They attract macrophages, cells that migrate from the bone marrow to injured tissue and contribute to wound healing.

In laboratory experiments, three chemicals that are considered natural opiates are "potent stimulators" of human macrophage migration, Michael R. Ruff of the National Institutes of Health (NIH) in Bethesda, Md., reported at the First International Workshop of Neuroimmunomodulation, held at NIH last week. In work with Candace Pert, he demonstrated that at extremely low concentrations these opiates — beta-endorphin, D-ala-D-leu-enkephalin and dynorphin — attract macrophages. Because naloxone, the standard inhibitor of opiate actions, interferes with this attraction, the scientists are confident that the immune system cells are sensing the chemicals with an opiate receptor similar to those on nerve cells.

Opiates are not the only neurochemicals that set macrophages in motion. Ruff also reports that macrophages are attracted to benzodiazepines, which bind to the receptors where such sedatives as Valium bind. Ruff also has preliminary evidence that two other nervous system chemicals, called bombesin and substance P, attract macrophages.

Whether neuropeptides influence macrophage activity in the body is still uncertain. Macrophage migration can be induced by a large variety of substances, including bacterial products, peptides generated by blood clotting activity, broken-down fragments of the body's structural materials and other products of immune system cells. Ruff and Pert hypothesize that at a site of tissue damage, neuropeptides are released either from pain-sensing nerve cells or from immune system cells.

In a paper to be published in the December issue of the European journal NEUROPEPTIDES, Ruff, Pert and colleagues say, "Because these peptides have potent effects on macrophages, as well as other cells of the immune system and body, these compounds may represent a major class of biochemicals which subserve information exchange between the brain and the body." —J. A. Miller