More Momentum for Mars — and Martians

"The Viking biology experiments gave us essentially no information about life on Mars," recalls Christopher P. McKay of the NASA Ames Research Center at Moffett Field, Calif. The complex mission's four spacecraft, which reached the planet in 1976, neither found Martians nor ruled out the possibility of their existence, though some researchers concluded that the failure to detect organic materials on the surface made the case a considerably weaker one.

The next U.S. Mars mission, scheduled for launch in 1992, will only orbit the planet, not land on it, and Soviet researchers have given only brief indication that any of four planned Soviet missions — the first of them due to take off next summer — would be equipped to carry on the search for life.

But a satellite-aided television conference-call last week between space-program representatives from the two superpowers left the U.S. participants with the feeling that Soviet interest in the issue has been underestimated.

Arranged by the Planetary Society, a large, pro-space group based in California, the call was conducted between a Soviet group in Moscow and an American group on the campus of the University of Colorado in Boulder, the site of a Mars-mission conference called the Case for Mars. "I was surprised by the extent to which they were interested in looking for life on Mars," says McKay. "It was their big thing. In fact, as chairman, the biggest problem I had was that they wanted to give us too much information — I had to cut them off so that we [the U.S. scientists] could talk."

Unfortunately, communications during the "teleconference," dubbed "Spacebridge" by the Planetary Society, were less than perfect, preventing as much conversation as the participants had hoped. "We wanted to ask them details," McKay says, and during an unplanned audio gap the intrigued Americans thought about follow-up questions. "We thought we were going to get linked up again, so we went through and talked over what we would like to ask them — things like 'How exactly would you measure life?' came up, and 'Why do you think there's water under the ground?'"

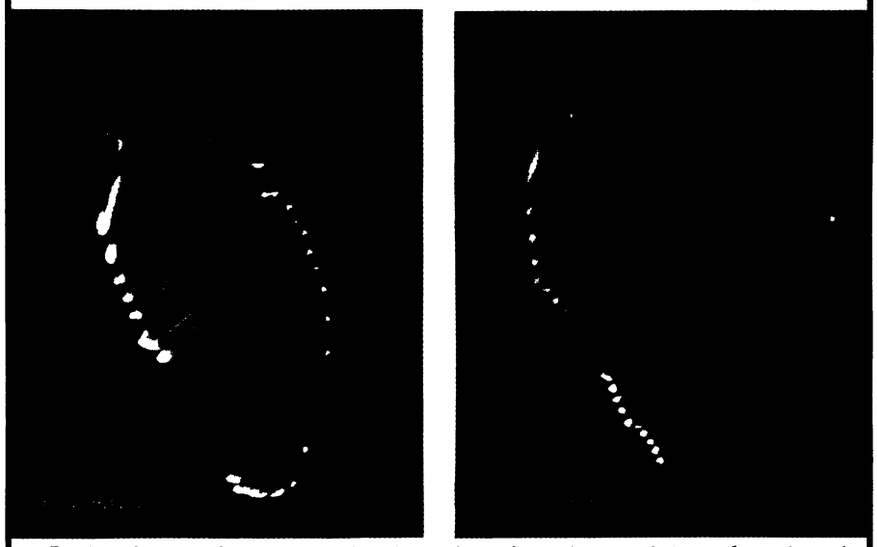
U.S. and Soviet officials alike have been considering the possibility of sending human beings to Mars, perhaps in a cooperative international program. Another question from the American side, says McKay, might have been "Do you consider your presently planned missions part of a long-term program that leads to humans?"

The limited time remaining did not provide the opportunity, but one Soviet scientist did suggest that interest in the possibility of Martians is high enough to warrant pursuing it well before humans go there to look, which could be 20 years or more. "There's no point," he said, "in waiting to send man to Mars."

Even apart from further searches for Martian life-forms, many U.S. space scientists have expressed frustration in recent years about the decline in NASA's plans for planetary exploration, including Mars missions beyond the planned 1992 "Mars Observer." According to former NASA Administrator Thomas Paine, head of the presidentially appointed National Commission on Space as well as of last week's Case for Mars meeting, "Mars should be the central focus of our long-range, manned space program.

"Today NASA's budget is about a third of the size that it was when I was running it," he told the meeting. "I don't think it has to be back at the peak of Apollo, but I think it ought to be at least half. And I think, furthermore, that that half should be related to the total economy of the United States, so that as that economy

'Precancer' gene localized in embryo, sperm



During the past five years, it has become clear to scientists that certain proto-oncogenes — those genes involved in tumor growth following activation by cancer-causing viruses — also play a regulatory role in normal embryo development. Based on evidence that proto-oncogenes can code for growth factors and control cell differentiation, research groups have searched for products of the genes in embryonic tissues. Two of those groups independently report in the July 3 CELL *that the product coded for by the proto-oncogene called* int-*1 is restricted in the embryo to specific cells in the developing brain and spinal cord.*

Using radioactive int-*1 DNA as a probe, scientists at the National Institute for Medical Research in London assayed sections of mouse embryos for expression of* int-*1, which also is found in mammary tumors in mice. David G. Wilkinson, Juliet A. Bailes and Andrew P. McMahon compiled data from embryos of different ages and used computers to reconstruct three-dimensional models of* int-*1 distribution in embryonic neural tissue (see photos). The figure on the left shows a 10 1/2-day embryo; that on the right shows a 14 1/2-day embryo. Neural tissue is indicated in green. The pink, red and blue regions mark* int-*1 expression in various regions of the embryonic brain; the yellow represents* int-*1 expression in the spinal cord.*

Gregory M. Shackleford and Harold E. Varmus at the University of California at San Francisco also report that expression of the int-*1 gene is restricted to specific regions in the developing central nervous system of embryos 11 to 15 days after conception. In addition, they say that* int-*1 is expressed in adult mouse testes only in the immediate precursors of mature sperm. Shackleford and Varmus note that this "severely restricted pattern of expression" is unusual among proto-oncogenes. Although these results suggest that* int-*1 is important in early development of the central nervous system and in spermatogenesis, both the British and U.S. research groups say the mechanism of* int-*1's influence is unknown.*

grows, we also increase our efforts on the space frontier."

A complaint often raised about NASA's planetary program recently has been a lack of continuity. With appropriate continuity, Paine said, launch vehicles should be "coming down the assembly line, at a rate that we've all agreed is an efficient rate to produce them, and then we go ahead and put the spacecraft for the outer-planet missions – which, again, will have been built either serially or else in batches of three or four or five – and we put each of those where it does the most good.... The biggest expense with any of these spacecraft is the R&D to produce the first one. It costs very little then to make the additional ones, and we haven't been taking advantage of those economies."

As for the possibility of Martian life – dismissed these days by some researchers but still as vital and potentially momentous as ever to others – Paine takes another view, independent of whether the Big Question can be answered by robot space probes. A staunch advocate of human exploration of Mars as a goal, in part, to get the U.S. space program back on track for the future, Paine told the Boulder meeting: "If there isn't life on Mars, and if there wasn't life on Mars, there's damn well going to be."

– J. Eberhart

Star motions may alter view of galaxy

The motions of the stars in our galaxy yield information relevant to many astrophysical and cosmological questions, particularly those involving the structure and evolution of the galaxy itself. In astronomers' long history of studying such motions, the latest entry is a particularly large one, the just completed Lick Northern Proper Motion (NPM) program of the University of California's Lick Observatory (headquartered on the university's Santa Cruz campus). The NPM will catalog the proper motions of thousands of stars, intending to provide an abundant statistical basis for studying a wide range of questions.

Already the first study done with information from the NPM has found anomalies in the rates at which certain faint blue stars rotate around the center of the galaxy; this in turn raises questions about astronomers' conventional view of the kinematics and evolution of the galaxy.

Proper motion is a star's motion across the sky as viewed from earth. To determine proper motions, astronomers photograph the same part of the sky at intervals of years and compare the photos to see what has moved and by how much. The NPM, which is currently directed by Burton F. Jones and Arnold R. Klemola, consists of two sets of photographs of the northern sky. C. Donald Shane of the Lick Observatory took the first set between 1947 and 1954; the second series began in 1971 and is now 97 percent complete. The more recent observers used the same photographic emulsion Shane used 40 years ago to ensure comparability of the plates. A companion study of the southern sky is being done by Yale University Observatory and the National University of San Juan, Argentina.

Traditionally, two plates of the same field of the sky – from different years – are put into a machine called a blink comparator, which shifts a human observer's vision rapidly between them. The observer notes which images "move" and marks them down for measurement. Although a blink comparator is still used to select objects for study, the measuring is done by an automatic machine developed by Stanislavs Vasilevskis of Lick. Motions of the stars are measured against a background of distant galaxies, 40,000 galaxies being used as a reference for the motions of 300,000 stars. The final catalog will list stars according to many classes of interest to astrophysicists. Klemola reads the literature to determine such interest and enters the appropriate classes into the program.

In what he calls "a first scratching of the surface" of the information, Lick Associate Research Astronomer Robert B. Hanson used the proper motions of 60,000 stars to study the rotation of the galaxy. The sun rotates around the center of the galaxy, and so do other stars in the flat disk of the galaxy. As the sun moves along, the proper motions of nearby stars show a streaming effect: They move toward us from the direction to which the sun is going and away from us in the direction from which the sun has come. Hanson found that for a group of 16th-magnitude blue stars lying somewhat above and below the disk, the streaming effect seems wrong: Either the sun is not going where astronomers think it is going or these stars are lagging behind the general rotation. Because the sun's motion is confirmed by other studies, Hanson concludes that these blue stars are lagging.

Astronomers have believed that the galaxy consists of two main components, the central sphere or bulge and a flat disk outside it. The stars in the sphere are old and do not rotate – presumably they formed before the galaxy began to rotate. The stars in the plane do rotate. Hanson suggests that either something happened to the blue stars during their development that altered their kinematics, or they are a third component between the other two, and the simple two-component model of the galaxy needs adjustment.

– D. E. Thomsen

Animal patent debate heats up

In a hearing that presaged a confrontation between Congress and the patent office, a congressional subcommittee last week heard testimony on a controversial decision to allow patents on genetically engineered higher organisms (SN: 4/25/87, p.263). Rep. Charles Rose (D-N.C.) announced that he would soon introduce legislation to put a moratorium on the granting of such patents until the economic and ethical implications could be considered by Congress. Sen. Mark O. Hatfield (R-Ore.) is planning to introduce similar legislation in the Senate.

The debate centers on the U.S. Patent and Trademark Office's decision, effective last April 21, to consider all genetically engineered multicellular organisms – including all animals except human beings – patentable. Developers would thus be eligible for the 17-year monopoly on the sale and use of those animals as provided by U.S. patent law. (The board ruled that genetically altered humans could not be patented because ownership of humans is prohibited by the Thirteenth Amendment to the Constitution, which forbids slavery.)

The patent office has delayed processing the first applications for patents on higher animals, but barring any definitive word from Congress the process may begin Oct. 1. Fifteen such patents are already pending.

"While the new patent policy will affect almost every sector of the economy, the most dramatic impact may well be felt in the agricultural community," Rose testified to the committee. "This new policy places major chemical, biotechnological and pharmaceutical companies in the position to virtually take over animal husbandry in America."

Many farmers are concerned that the granting of patents for genetically altered farm animals will result in a new kind of tenant farming, in which farmers will no longer own the animals they use Cy Carpenter, president of the National Farmers Union, which represents more than 250,000 U.S. farm families, said patenting would likely lead to a corporate consolidation of the livestock industry, with farmers having to pay royalties to patent owners. "Five major corporations now control 120 seed companies that were formerly independent prior to seed patenting," he said. Seed patents have been allowed since 1970.

Others, however, noted at the hearing that the patent system provides financial incentive to develop new ideas into commercially available forms. The patent system is "the engine and the machinery driving the investment in biotechnology," said William H. Duffey, a patent attorney for St. Louis-based Monsanto Corp. He