

Soviet robot stands mute on Mars

The Soviet Union has landed its third unmanned spacecraft on the planet Mars, but the probe never managed to announce its arrival. Mars 6 touched down on March 12 in an area known as Mare Erythraeum in the southern Martian hemisphere, but, says the Soviet news agency Tass, "radio contact with the descent module broke off when it was almost on the surface."

The only previous craft to have landed there were Mars 2, which apparently crashed, and Mars 3, which stopped transmitting after only 20 seconds on the surface, both in 1971. The United States will make its first attempt next year.

Last summer, Mars 4, 5, 6 and 7 were launched within less than three weeks of one another. In February, Mars 5 went into orbit around the red planet, but Mars 4 suffered a braking-rocket malfunction which caused it to speed right on past (SN: 2/23/74, p. 117). On March 9, Mars 7 jettisoned a probe which flew by the planet at a distance of 1,300 kilometers. One source reports that it was a landing attempt which failed to slow down enough to be captured by Mars' gravitational field, and instead sailed on into an orbit around the sun. Of the four spacecraft launched from earth,

only Mars 6, on March 12, reached the Martian surface.

The reason for the signal cutoff above the surface was not announced. The braking rocket worked properly, the landing craft's descent engine fired, and even the parachutes opened as they were supposed to. The landing site—24 degrees south latitude by 25 degrees west longitude—was not completely unfamiliar, since Soviet space officials had previously requested and obtained detailed data on the area from the United States, as measured from orbit by Mariner 9.

During its descent, Mars 6 provided "an analysis of the planet's radiation in a wide range of wavelengths," according to Tass, as well as "new information about the relief of its surface, the temperature, heat conductivity, the structure and composition of the soil, the chemical composition of the lower layers of the atmosphere and the structure of its upper layers."

It was also discovered, although specific data were not released, "that there was several times more water vapor in the atmosphere of Mars over some areas of its surface than was thought so far." The magnetic field "in the planet's immediate environs" was described as "seven to ten times greater . . . than in interplanetary space." □

Acupuncture: A Chinese puzzle

Acupuncture works, but how? Practitioners and patients across the country report that the ancient Chinese needle cure does what it is supposed to do. It relieves chronic pain and has been used as an analgesic during surgery, dental procedures and childbirth. The Acupuncture Research Project at the University of California in Los Angeles, for instance, reports that acupuncture produces significant improvement in 60 percent of the cases that do not respond to anything that conventional Western medicine can offer. So even if medical insurance won't pay for acupuncture treatments, there is a growing agreement that the treatments are effective. But there is not much agreement on how acupuncture produces its effects.

The gate theory suggests that stimulation of one part of the nervous system closes a gate at the spinal column and keeps pain sensations from another part of the body from reaching the brain. But this theory is not proved and is not as widely accepted as it was five years ago. Some researchers have suggested that the hypnotic effect of the needling and the sometimes exotic rites

that often go along with it might keep a patient's mind off the pain. Others say it is the placebo effect—it's all in the mind. Patients who think they are getting an effective treatment sometimes behave as if they were, no matter what they are getting. But there are other explanations.

The Research Group of Acupuncture Anesthesia at Peking Medical College has been working on a brain-chemical theory. They note that acupuncture seems to work like a drug. It produces an elevation of the pain threshold when first administered, then this effect slowly wears off after acupuncture has stopped. The most likely drugs or chemicals in such a reaction are neurotransmitters. The researchers therefore investigated the possible roles of the monoamines and acetylcholine (ACh). The results are reported in the February SCIENTIA SINICA (a bimonthly science journal from Peking).

A bright, pain-causing light was focused on the noses and around the mouths of rabbits. The elapsed time between the onset of the light and the withdrawal of the head of the rabbit was measured as the pain threshold.

In normal rabbits it was about seven minutes. The animals were given acupuncture for ten minutes and then retested. The pain threshold more than doubled during acupuncture and fell back to normal after about 50 minutes.

The Chinese physicians stimulated the acupuncture point *quenlun*, just above the Achilles tendon. Finger acupuncture (massage) was used instead of the more common metallic needling. Finger acupuncture is a much older method but is almost as effective, and it avoids unnecessary tissue damage to the animals.

If acupuncture does lead to the production of brain chemicals, then it should be possible to withdraw the cerebrospinal fluid from the brain of a treated animal and inject it into another animal and get a similar increase in pain threshold. The scientists gave the rabbits finger acupuncture for 30 minutes, during which time cerebrospinal fluid was withdrawn and transferred to nontreated animals. There was an average 82 percent elevation in pain threshold in the recipient animals. With these results, the Chinese researchers say it seems likely that analgesic chemicals may be produced in the brain during acupuncture.

But what chemicals? Morphine is thought to produce its analgesic effect by increasing the amount of monoamines in the brain. Reserpine, for instance, depletes the brain's monoamines and blocks the effect of morphine. If acupuncture analgesia is similar to morphine analgesia, reserpine should block its effects also. But it did not. Reserpine actually increased the effectiveness of acupuncture.

Besides the monoamines, ACh is one of the most important neurotransmitters in the brain. Since its effects can be blocked with atropine, morphine with atropine and acupuncture with atropine were tested. The analgesic effect of morphine was not affected, but the analgesic effect of acupuncture dropped drastically when atropine was given. This, say the researchers, implies that ACh may play an important role in the mechanism of finger acupuncture. They say that the balance between the relative amounts of ACh and monoamines in the brain may in some way be responsible for the analgesic effects of acupuncture and that shifting this balance may be useful in raising the effect of acupuncture.

The Chinese researchers caution that the pharmacological effects of drugs like reserpine and atropine are complicated. "We are now in an attempt," they say, "to use drugs of higher specificity and lesser side effects . . . in order to elucidate the exact interrelationship between the acupuncture analgesia and the central neurotransmitters." □