Preparing for missions to Mars and Venus

U.S. and Soviet scientists are looking at each other's maps these days—maps of Mars and Venus, that is. NASA has announced the results of its January meeting with Soviet planetary scientists about future cooperation in the exploration of Mars and Venus (SN: 3/10/73, p. 156). The main purpose of the meeting was to discuss landing sites on Mars. NASA was interested in seeing what information the Soviet scientists had on certain regions of Mars that would aid NASA in its decision about the Viking landing sites. The U.S. unmanned landing will take place in 1976.

The Soviets, it seems, have similar interests. NASA agreed to provide the Academy of Sciences of the U.S.S.R. with maps and photos of two possible landing regions on Mars of interest to the Soviets. In exchange, the Soviets agreed to give NASA the information they got from Mars 2 and 3 landers and orbiters. This includes information about the candidate Viking landing sites.

NASA will provide the Soviets with an atmospheric model of Mars plus Mars ephemerides data from ground-based radar obtained for the first half of 1974. In return the Soviet scientists agreed to give NASA their materials on atmospheric measurements as well as surface features on Mars, including the estimate of the structure of the atmosphere they made from the Mars 3 lander entry.

Venus was also on the agenda. NASA plans to launch a Mariner Mercury-Venus flyby in October or November of this year. The craft will fly within 5,000 kilometers of Venus in February 1974 and then on to within 1,000 kilometers of Mercury in March. The Soviets will get results of the mission. In exchange, the Soviets will give NASA their information obtained from Venera 8 on the atmosphere and surface of Venus as well as results of radar measurements of Venus. □

Winds of gas against the early evolving moon

Deciphering the origin of the moon has turned out to be harder than scientists expected. They have discovered that the moon is similar, in one aspect at least, to the earth: much of its early history from 4.6 billion years to 4.0 billion years has been largely eradicated. Of the three theories of the moon's origin, only fission—the moon splitting away from the earth—has been largely discarded. There is a toss-up still between the other two: the moon could have accreted somewhere else in the solar system and then been captured by the earth; or the moon could have accreted in the same neighborhood of the earth.

Scientists would like to form the moon near the earth. But the extreme differences in the composition of the two planets make this difficult. For example, the moon is enriched in refractories (materials capable of enduring high temperature) and depleted in volatiles (substances that readily vaporize) compared with the earth. How to make two planets very different in the same neighborhood has become a major challenge. One hypothesis is that the moon formed off the ecliptic (SN: 10/14/72, p. 246).

Now Fred L. Whipple of the Smithsonian Astrophysical Observatory has come up with another model to account for the differences. He suggests that the earth and moon became a binary system very early in their accretional development when both planets were about one-tenth their current size. At this time the solar nebula was still hot enough so that both the earth and moon then consisted largely of refractory, low-density elements. During the subsequent condensation and accretion of iron and similar metals, as well as more volatile elements, the earth grew faster than the moon and thus got more of these elements.

How did this happen? The main reason, says Whipple, was the behavior of the moon. The gas nebula and the earth were both orbiting the sun at about the same speed, so the earth experienced no relative motion in the gas. But the moon was orbiting the earth and did experience a relative motion which had the effect of the gas blowing against the moon. This wind aerodynamically prevented the moon from capturing the dust and smaller debris. At the same time the wind blew off the volatiles. This process, which Whipple calls impact differentiation, favored the moon's retention of the more refractory elements.

Meanwhile the steady accretion by the earth of the higher density material maintained the earth's rapid rotation. This rotation plus the tidal coupling between the earth and moon counter-balanced the drag of the nebula on the moon.

Interferon in the running again against flu, colds

In 1957 interferon, a protein made by human white blood cells, was found to be a natural defense against viruses. Scientists hoped that interferon might be used to treat flu and cold infections. But efforts to develop a treatment did not pan out, largely because natural human interferon was difficult and costly to obtain. During the past several years, however, techniques for harvesting human interferon have improved, and interferon again looks promising as a cold and flu treatment.

In 1968, for example, Soviet scientists reported they had successfully treated flu infections in some volunteers by giving them small doses of human interferon. American and European investigators could not duplicate their results at first, but now they have done so by using larger doses of interferon. The American and European scientists have also gone a step further and shown that interferon treatment can halt several cold viruses. The advances are reported in the March 17 LANCET by Thomas C. Merigan of the Stanford University School of Medicine, and by Sylvia E. Reed, Thomas S. Hall and David A. J. Tyrrell of Harvard Hospital in Salisbury, Wiltshire, England.

Merigan and his British colleagues infected human volunteers with several strains of flu and cold viruses. They obtained purified and concentrated interferon from laboratories in Philadelphia and Helsinki and gave volunteers either interferon or a placebo by spray injections through the nose. They found that a single day of intranasal interferon only slightly delayed the onset of infection, and did not prevent illness or reduce its severity. But a larger daily dosage of interferon, administered for four days, resulted in significant protection from flu and cold symptoms. Nearly all the volunteers who received a placebo came down with flu or colds after exposure to a virus.

"Interferon holds promise as a broad-spectrum antiviral agent for respiratory disease," Merigan predicts. The most significant aspect of the studies he and his British co-workers have conducted, he believes, is in better defining the amount of interferon that is needed to provide protection. Until interferon can be synthesized and mass produced in the laboratory, though, it will not become available to the general public as a flu and cold treatment. Researchers at the National Institutes of Health are attempting to define the molecular structure of the interferon protein. If they succeed, scientists might then be able to synthesize interferon. □