. . . And now, back to Viking

So much for recess. The sun is out of the way, and Project Viking rides again. As the motions of Mars and the earth moved Viking's radio path away from the sun's disturbing influence, mission officials last week set about waking up their four spacecraft to begin the so-called "extended mission," scheduled to last through May of 1978 with a possible additional year for the orbiters. The staff is smaller, the budget is lower, and three rounds of scientific papers have already appeared in print. But numerous scientific goals remain.

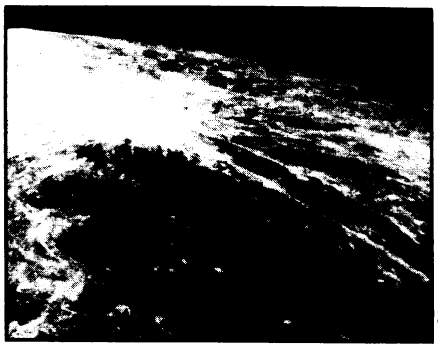
The two orbiters were the first to be reactivated. Since before solar conjunction they had been collecting no scientific data, providing only a trickle of engineering information to the earth. On Dec. 13 and 14, commands from Jet Propulsion Laboratory in Pasadena instructed the orbiters to switch to their higher data-transmission rate and to turn on their scientific instruments—cameras, heat mappers and water sensors.

The landers followed on Dec. 16 and 17. The landers had been gathering scientific data throughout conjunction, but storing it on their tape recorders rather than trying to radio it back through the sun's interference. The only transmissions to earth were engineering status reports from lander 1. Lander 2 stood mute. The stored science would be sent home on Dec. 20 and 21, by preprogrammed command.

Although there were only about three days, centered on conjunction, when the sun completely obliterated Viking's messages to home, project engineers were a bit tense while waiting out their programmed weeks of one-way communications. Only one significant problem has grown during the period: a fifth faulty "bit location" in the portion of orbiter 1's computer processor devoted to the sun sensor that helps the spacecraft maintain its orientation in space. Earlier in the mission, four known faulty bit locations had caused the orbiter to behave erratically for a time, so controllers switched to the alternate processor. The problem is that the backup processor—the one with the faults—has built-in instructions to take over from the primary system if the primary exhibits any strange behavior. Thus, the backup was "put to sleep," to be activated only if the primary develops a worse problem than the backup. The only other new "glitch" is a problem with getting one of lander 2's two receivers to lock onto incoming messages, but lander 1 has survived for months with a similar woe.

Viking's scientists, meanwhile, have their own diverse work to do. Orbiter 2 was shifted on Dec. 20 so that its orbit would carry it within 800 kilometers of the Martian surface, providing close-up photos and gravity data. On about Jan. 15, lander 2 will use its scoop to take the mission's first postconjunction surface sample, with the prime objective of finding some solid-rock pebbles for inorganic chemical analysis. A scoopful of supposed pebbles a few months ago turned out to be congealed fine material. This time the scoop will collect four loads of what look like pebbles, shake them up and deposit the results back on the ground. By the fourth load, says Broome, there should be either "a little pile of rocks or a little pile of sand." In mid-February, orbiter 1 will be aimed to fly within as little as 50 kilometers of Phobos, later lowering its orbital low point to within 300 kilometers of Mars. And the search for life continues. □

A gift from the moon—via Moscow



NASA

Crater Giordano Bruno: Young splatter?

The six successful Apollo moon-landing missions brought back a total of about 383 kilograms of lunar material to the earth, more than 80 percent of which remains to be studied. The material provided by the three unmanned Soviet sample-return missions totals perhaps 650 *grams.* Yet when the U.S. was recently offered a tiny portion of the latest Soviet sample, collected in August by the Luna 24 spacecraft (SN: 8/28/76, p. 134), there was nothing ho-hum about the response. Last week, a U.S. delegation jetted to Moscow to accept.

"The Luna 24 sample is unique in two ways," says Noel Hinners, associate administrator of the National Aeronautics and Space Administration's Office of Space Science. "First, it comes from a small, circular basin which has a mass anomaly, and we may now get some direct chemical information about how these anomalies are formed." The mass anomalies, also known as mass concentrations or "mascons," were charted by the U.S. Lunar Orbiters that preceded Apollo, and are presumably due to deposits of atypically dense material such as the remains of meteorites beneath the surface.

"Second," says Hinners, "Luna 24 obtained a complete core down to a depth of 2 meters, so we have a slice of lunar history that may go back several hundred million years." There has been some concern among U.S. scientists about how much the Soviet spacecraft's drilling apparatus may have churned up the rock strata within the sample tube, thus making accurate dating difficult, but a Pravda article shortly after the sample's arrival on earth declared that the drilling had proceeded "like a knife through butter." The U.S. team picking up the sample-of-the-sample reported well-developed stratigraphy in the lower part of the core, with somewhat less-clear layering on top.

It is possible that there is also a third reason for interest in Luna 24's sample—perhaps the most important of all. "This sample," says Michael Duke, curator of lunar samples at the NASA Johnson Space Center near Houston, "could contain the first material ever returned that is directly relatable to a feature on the moon's far side." Luna 24 collected its sample from the southern part of Mare Chrysium, a region close enough to the edge of the moon's visible face that it may have been bombarded in the past with material thrown out by the meteorite impacts that formed craters over the lunar horizon in the area never seen from earth. A possible candidate, says Duke, is a crater named Giordano Bruno, about 20 kilometers in diameter and surrounded by clearly visible "rays" of ejecta that can be seen (in photos taken from lunar orbit) to extend for hundreds of kilometers.

One of Bruno's rays clearly crosses the Luna 24 site, says Patrick Butler of JSC, but there's a caveat. The spacecraft is about 1,200 kilometers from the crater, and only a tiny amount of ejecta, moving very quickly, would have gotten that far. Although it would have been enough to create the light-colored ray that can be seen on the surface, Butler says, it may be too little to separate from the rest of the sample. Duke reports, however, that the U.S. portion includes a section of very uniform, whitish, friable material that could be ejecta. Time will tell.

If everything works out, having a piece of Giordano Bruno could make a lot of moon-studiers very happy indeed. A recent paper by Jack Hartung of the State University of New York at Stony Brook (METEORITICS, 11:187) suggests that Bruno may be the most recently formed large crater on the moon, dating back less than *800 years!* (See NATURE, 264:212.)

Hartung cites an account from the medieval chronicles of Gervase of Canterbury, taken under oath and describing the observations of five men who had been looking at the moon on the early evening of July 18, 1178. Only a day and a half past "new," the moon would have appeared as a thin crescent with two distinct horns. ". . . Suddenly," goes the account, "the upper horn split in two. From the midpoint of this division a flaming