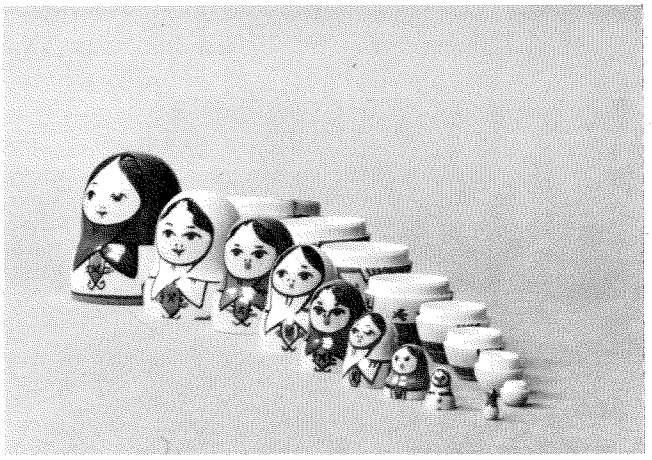
Souvenirs from Russia

ONE OF the central tenets of the search for scientific truth is that knowledge is to be shared — a fairly complicated process when moon rocks and international boundaries are involved. Take transmitting samples from the Soviet Luna missions to the moon to Caltech's surgically clean laboratory known as the Lunatic Asylum, for example.

Wasserburg demonstrates the technique for picking up a piece of moon rock (and for breathing out of the side of his mouth so he won't blow it away), but this tiny pellet is NOT the real thing. In fact, neither of the real Luna 20 samples was this large. One was an anorthosite particle that weighed approximately 42.6 milligrams, and the other was a piece of basalt that tipped the scales at 36.8 milligrams. "This is really at the bottom of the line in size," says Wasserburg. "If you make one slip, you can lose everything. It's not impossible technically; it's just very, very difficult."

For the group of geologists, geophysicists, geochemists, and planetary scientists of the Lunatic Asylum, working with lunar rocks began several years ago with the acquisition of samples from the American Apollo missions. Their work on those stones made them known as one of the world's prime laboratories for the analysis and age-dating of lunar materials. And in the eyes of NASA's Lunar Sample Analysis Planning Team (LSAPT), it also made them logical recipients for the prime "boulder" samples (see far right) from the two Soviet missions to the moon—Lunas 16 and 20—which were obtained via the USA-USSR exchange agreement.

In September 1970, Luna 16 brought back to the earth from the northeastern section of the moon's Sea of Fertility about 100 grams (3½ ounces) of lunar regolith (surface rock fragments and soil). The Lunatic Asylum's share was a basalt pebble that weighed about 62 milligrams, and two small pinches of soil. Using their own special skills and techniques, the Lunatic Asylum inmates were able to determine both the age and the composition of the samples, relate their findings from this very different lunar locality to those from earlier Apollo missions, and add a few more pieces to the lunar jigsaw puzzle. Their results pleased and impressed the Russians enough to have the reports translated and reprinted in a book along with some of their own findings.



Each of these *matreshki* nests inside the next larger one, and each represents a separate generation. A traditional Russian toy, this set is a souvenir of G. J. Wasserburg from a trip to the USSR in September 1973, when a group of Caltech faculty, President Harold Brown, and members of the Board of Trustees and their wives visited the Soviet Union as guests of the Soviet Academy of Sciences of the USSR. Wasserburg now has a modern version of the *matreshki* (right).

This series of containers once held souvenirs of another kind of Russian trip — moon rocks from the Luna 20 mission. A member of the USSR Academy of Sciences handed the assembled package to a representative of the U.S. Embassy in Moscow. From there, it was hand-carried to Houston and placed in the care of Caltech alumnus Michael Duke, curator of lunar samples for NASA. Duke brought the unopened container to Caltech.

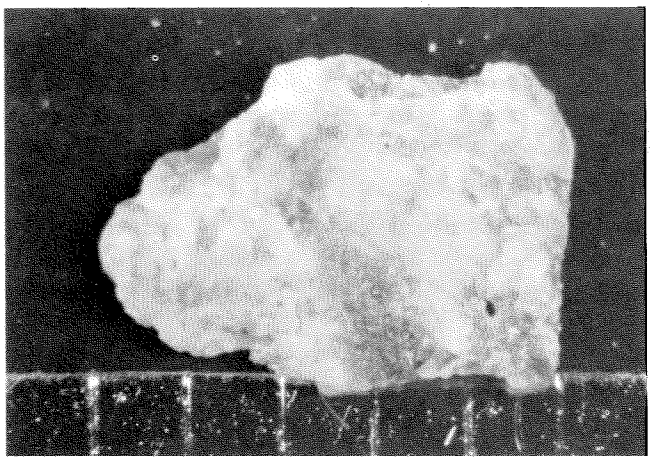
After Luna 20 returned from the moon in February 1972, the Caltech group received a small portion of the 50-gram core from its landing site in the highlands to the north of the Luna 16 site and some distance from the mare basins, which are flooded with basalts. The highland areas represent the largest fraction of the lunar surface, but so far have not been extensively sampled.

This first Luna 20 sample was dated by John C. Huneke, senior research fellow in planetary science, and co-workers at close to 4 billion years (3.90 AE). Study of that material, which was mostly moon dust and only a few pebbles, whetted scientific appetites for another generation of experiments, preferably with bigger rock samples. Recently, after more than a year of negotiation, two additional fragments were transmitted to the Lunatic Asylum.

Once the rock samples actually reached Caltech, a series of painstaking steps were followed. Michael Duke, curator of lunar samples for NASA, Gerald Wasserburg, professor of geology and geophysics, and D. A. Papanastassiou, senior research fellow in planetary science, opened the plastic bottle, that enclosed the aluminum case, that held a glass-weighing vial, that cradled two gelatin pill capsules, which contained smaller gelatin pill capsules, in each of which rested a fragment of lunar rock.

Each capsule was carefully slit with a razor blade, and the rocks were lifted out, weighed, inspected under a binocular microscope, photographed, cleaned of moon dust, photographed again, and chipped. Joseph Brown, associate research engineer, made a polished thin section. A grain mount was made of dust washed from fragments.

A preliminary chemical investigation was then made over a period of several weeks. Finally, a detailed experimental plan was submitted to Michael Duke and LSAPT. It was approved in mid-February. Since then the rocks have been further divided and subjected to scores of tests, including analyses of micro-thin sections by Arden L. Albee, professor of geology. All these investigations have almost totally destroyed the material — but they are expanding our understanding of the moon.□



Lined up against a millimeter scale, a piece of lunar anorthosite measures just about 2½ millimeters — about half the size of a grain of rice. This is the larger of the two Luna 20 rock samples, each of which has now undergone analysis and age-dating procedures by a consortium of scientists at Caltech, Oregon State University, and the University of Chicago.