

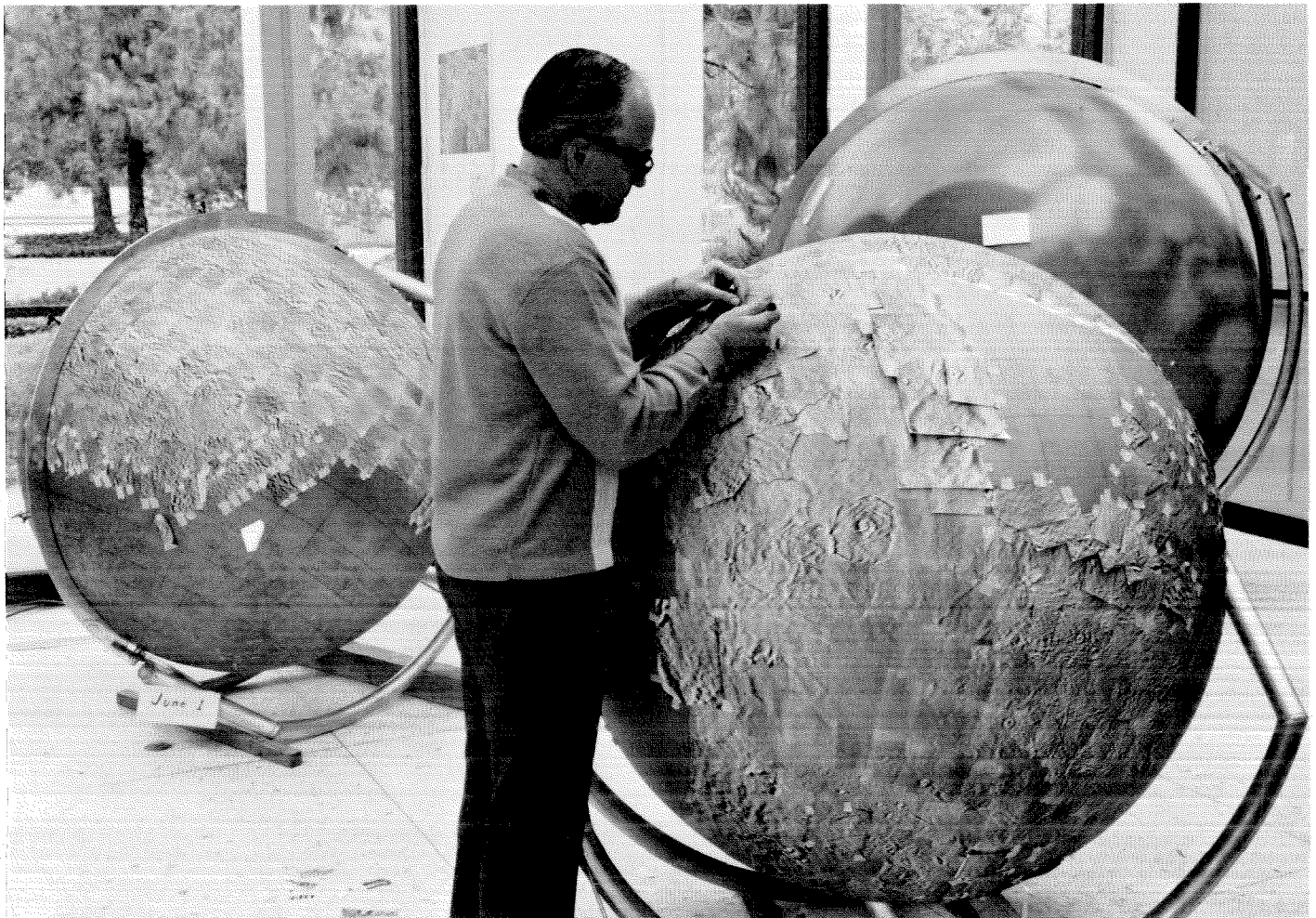
# Martian Map Makers

Everyone knows Mariner 9 did a remarkable job of photographing the whole surface of Mars—and nobody knows it better than the scientists at Caltech's Jet Propulsion Laboratory. So, even before the end of the Mariner 9 mission, they began to think about the best way to display their spectacular pictures.

The result is a photomosaic—a detailed spherical map constructed from Mariner's photographs of the Martian surface. In fact, there three of these photomosaics—two

4-foot ones now completed and a 6-foot sphere still being worked on.

Making a photomosaic may sound easy, but this was not a simple matter of gluing black-and-white photographs on an aluminum sphere. In the first place, the photographs returned by the spacecraft could not be used directly because they were almost all shot at an angle—and for this purpose views from straight overhead were required. So each photograph had to be altered by a computer process



It took Earl Zimmerman and his co-workers eight months to complete the first photomosaic globe of Mars at the left. Work went faster on the second one; after photomosaics were positioned on

the first globe, they were photographed and copies were put on the second. Photographs of the second globe are now being enlarged for use on the third globe in the background.

to an overhead view. Also, all the photographs required to cover a globe—1,500 of them—had to have the same scale, contrast, and shading. The originals varied enormously, of course, so once more the computer had to work them over. Finally, it turned out that rectangular photographs were useless because they couldn't be fitted properly to a spherical surface. The computer couldn't help with this part of the project; so the irregular pieces needed for actual gluing on the globes were laboriously cut by hand from the large photos.

Most of the work on the globes was done by the project scientist, Elmer Christensen, aided by mathematician Sally Rubsamen, photomosaicist Earl Zimmerman, and photographer Duane Patterson. The team started to work late in 1971, after the Mariner 9 mission was completed. One of their 4-foot spheres will be on display at the National Aeronautics and Space Administration headquarters in Washington, D.C. The other goes to NASA's Lewis Research Center in Cleveland, Ohio. The 6-foot globe will be on exhibit at JPL. And although they were originally prepared for display only, the globes are so accurate in their geological and geographical relationships that scientists are using them as references for current studies and for the planning of future missions to Mars.



Gluing down a section is perhaps the most delicate step in the whole process. To do exact matching, a scalpel-like blade is used to trim overlapping sections along feature lines, so that each blends imperceptibly with the others around it.



Because each section of the global photo-mosaic has to be oriented precisely in longitude and latitude, Elmer Christensen, right, and Earl Zimmerman, take great pains in positioning the photographs. Outsize photo sections are first taped into place so that orientations and shading can be adjusted. Final positioning is done by matching the images on overlapping portions of each photograph.