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EXPLORING SPACE WITH A CAMERA

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The Moon's Pale Self and Distant Views

Though Surveyor I's television camera produced black-and-white images, one way existed by which it could transmit color. This was to shoot three separate pictures of the same scene through different-colored filters, send them to Earth, and there reconstitute the picture through similar filters. One result of this complicated process was the photo above, which indicates that the lunar surface appears to be almost colorless.

In explanation of the picture, CLARK GOODMAN, of the University of Houston, said: "Since solar light is essentially white—composed of equal amounts of all wavelengths over the spectral range of the photographic film—the light reflected from the Moon is solar light minus any wavelengths specifically absorbed by the lunar grains. The fact that the reflected light is nearly colorless (nearly white) means that the lunar skin does not selectively absorb any particular wavelengths.

"Hence," said Goodman, "we conclude that the lunar material is not composed of a particular single-colored mineral but instead is either a mixture of many different colored minerals or is a mixture of colorless minerals."

Another color reconstitution, on the opposite page, is a closeup of Surveyor III's footpad 2.

Remarking on it, J. J. RENNILSON, of the Jet Propulsion Laboratory, said: "Visible items of importance, from upper left to lower right, are: a small

portion of lunar soil, placed on the footpad by the surface-sampling instrument; the attitude-control jet, with its gold-tipped nozzle contrasting with the gray of the lunar soil; and, lastly, a photometric target, consisting of several shades of gray as well as three colors.

"One of the major scientific achievements of the color analysis of such pictures as this one was the discovery that very little color differences were detectable between the immediate surroundings of Surveyor I's landing site and those of Surveyor III's landing site. The color of the disturbed soil remained the same as the color of the undisturbed surface."

"The color-reconstituted photograph at top right," said J. J. RENNILSON, of the Jet Propulsion Laboratory, "is the first one in which man has been able to observe an eclipse of the Sun by his own planet. Surveyor III took the view from the Moon with the wide-angle mode of its TV camera.

"Most prominent in the picture is the white cap of light caused by the bending of the Sun's light as it passed through the Earth's atmosphere. The cap is much brighter than the rest because of the Sun's proximity to that limb, causing a greater proportion of sunlight to be refracted. The beaded appearance around the remaining portion of the Earth's atmosphere is due largely to the interruption of the band of light by overcast areas. A small portion at the right of the solar-eclipse photograph was obscured by an edge of the camera's mirror.

"Blue light from the Sun is scattered out of the beam during passage through the Earth's atmosphere, leaving mostly the green, yellow, and red portions of the spectrum. A careful study of this and other lunar photographs of the solar eclipse will enable scientists to understand better the optical properties of our atmosphere."

"The historic color photograph of the crescent Earth [right]," commented ROBERT F. GARBARINI, former Deputy Associate Administrator (Engineering), Office of Space Science and Applications, "was taken from the Moon's surface by Surveyor III on April 30, 1967. Only because of the tilt of the spacecraft and the favorable libration of the Moon was it possible to catch the Earth in the camera's wide-angle field of view."

On a later Surveyor mission, it was possible to command the camera to take narrow-angle photographs of the Earth having much higher resolution.