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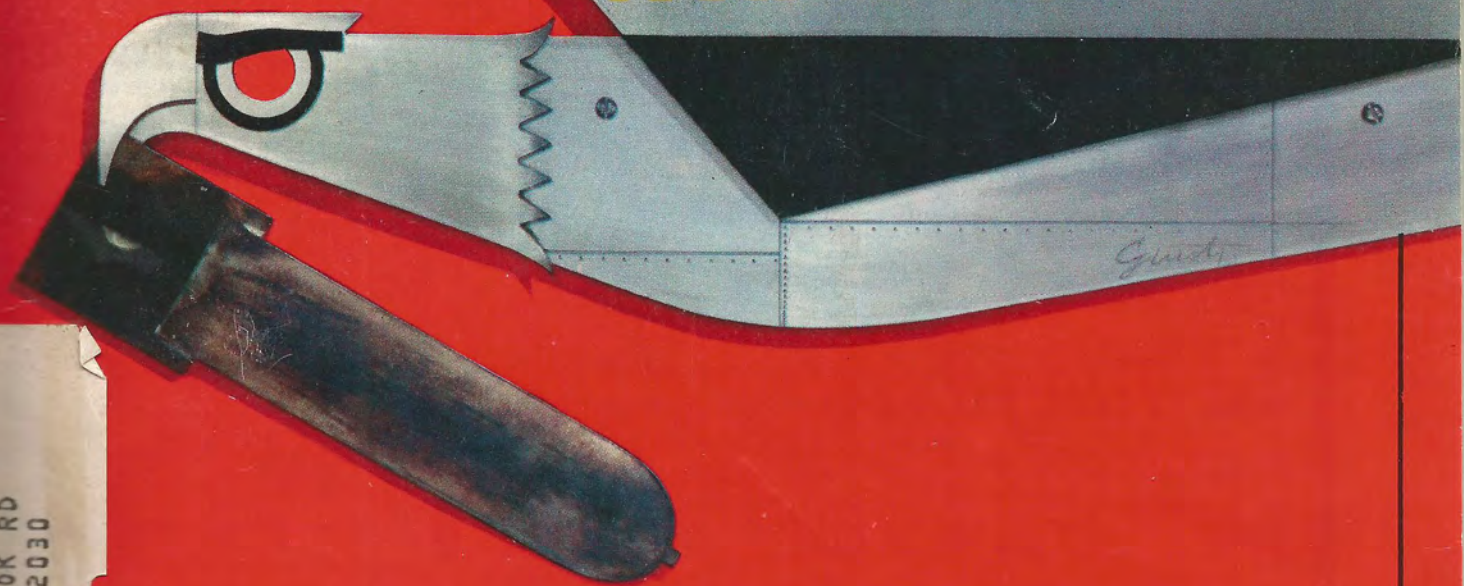
TIME

AFTER THE BOMBS, WHAT PEACE?



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Humanizing the Earth

In recent years, the annual Christmas-week meeting of the American Association for the Advancement of Science has been as much an occasion for acrimony and gloom as for surveys of scientific progress. The proceedings have been repeatedly—and often mindlessly—disrupted by young radicals. They have also been marked by one pessimistic report after another on man's despoliation of his home planet. Last week in Washington, D.C., at the A.A.A.S.'s 139th meeting, scientists were again subjected to dissent and despair, but this time there was also welcome relief in the form of an eloquent defense of prudent technological growth.

The defender was René Dubos, distinguished Rockefeller University microbiologist, elder statesman of science and author *(A God Within, So Human an Animal)*. In a major address entitled "Humanizing the Earth," Dubos, 71, disputed one of the fashionable credos of contemporary environmentalists: that any human interference with nature is in itself undesirable. In other words, Dubos flatly disagreed with Barry Commoner's so-called fourth law of ecology: "Nature knows best." On the contrary, Dubos insisted, nature does not always know best. It is, in fact, often "shortsighted." To prove his point, he cited not only such major natural calamities as droughts, hurricanes and earthquakes, but also the periodic deaths of large populations of animals like lemmings, muskrats and rabbits. Said Dubos: "Only the most starry-eyed Panglossian optimist could claim that nature knows best how to achieve population control."

Equilibrium. A less dramatic but equally pertinent example of nature's shortcomings is its inability to recycle all the wastes it creates. One instance of such a breakdown of "ecological equilibrium" is the accumulation of tons of guano (bird excrement) along the coast of Peru. Indeed, he noted, it is only when man collects the guano for fertilizer that the nitrogen- and phosphate-rich material is eventually returned to the "biological cycle in the form of plant nutrient." Guano is not the only example of nature's garbage. Peat, coal and even oil are all organic materials that have undergone only partial decomposition. Paradoxically, Dubos added, when man burns these fuels (and pollutes the atmosphere) he also helps complete nature's unfinished cycle, "because he thereby makes the carbon and minerals of these fuels once more available for plant growth."

Nature should also be modified in other ways, Dubos believes. "Many richnesses of nature are brought to light only in regions that have been humanized"—that is, transformed by human toil into agricultural lands, gardens and parks. But Dubos warned that for every pound of food produced by these areas there is an enormous expenditure of energy—to make and drive the farmer's tractors, to irrigate the land, to manufacture fertilizers and pesticides. Thus, he took issue with another ecological dogma—that expansion of energy production should be curtailed. The continued well-being of agriculture, he said, is "intimately bound to the development of new sources of energy, as are all other aspects of human life."

Despite such iconoclasm, Dubos is in fact an advocate of cautious ecological management, and is alarmed by man's mountains of garbage. Technological societies, like the primitive societies that preceded them, he says, have been notoriously careless of their wastes. Still, he doubts that the ways of nature offer a solution to the solid-waste disposal problem. "It requires new technological methods and changes in the innate (natural) behavior of man."

Dubos is also worried about the further destruction of the wilderness. "The thunderous silence of deep canyons, the solitude of high mountains, the luminosity of deserts," he said, keeps man in "resonance with cosmic events." But these qualities can be preserved even while man alters nature because "the interplay between man and nature has commonly taken the form of a true symbiosis—namely, a biological relationship that is beneficial to both."

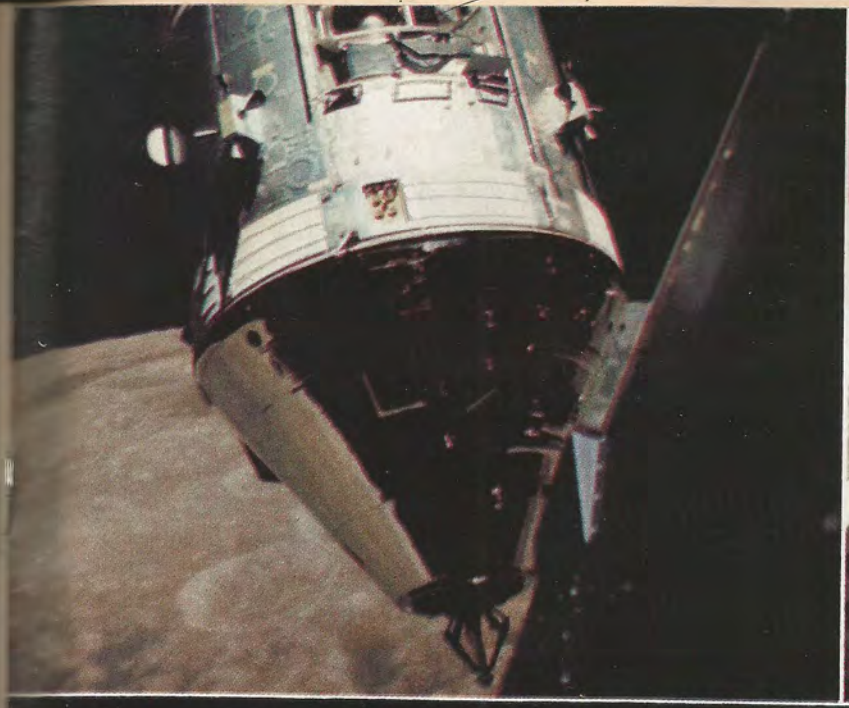
Portfolio from Apollo

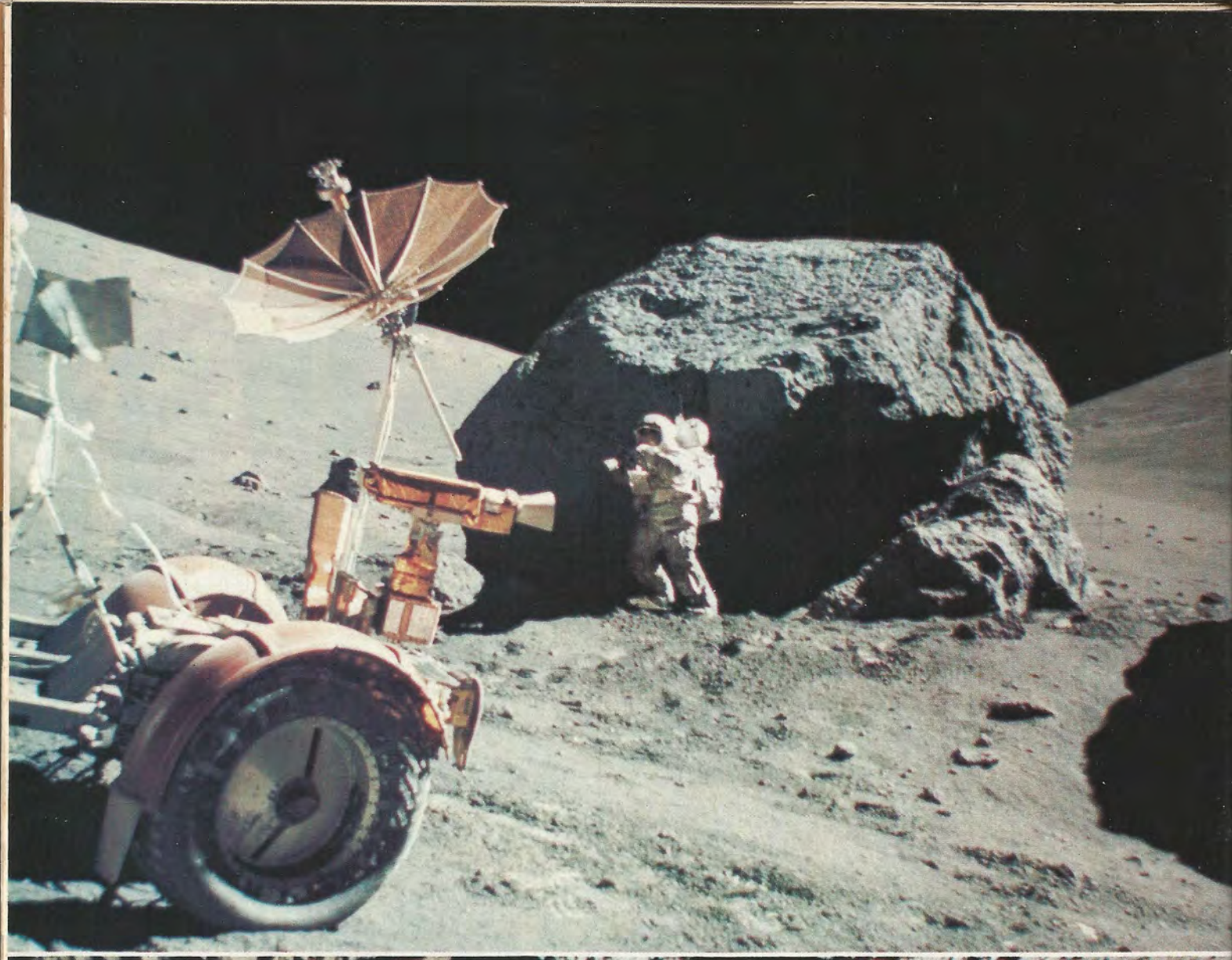
With each mission to the moon, U.S. astronauts have become increasingly skilled as photographers. Apollo 17 proved to be no exception to the rule. Last week, as NASA began releasing pictures shot by the Apollo 17 crew, it became clear that the last lunar mission had produced the best photography of the entire Apollo program: more brilliant in color, sharper in detail and more imaginative in overall composition.

Much of the credit belongs to Gene Cernan, who had special reason for his all-out photographic effort. During the flight of Gemini 9 in 1966, he took a dramatic "walk" in space as his ship circled the earth. But most of the shots taken of Cernan by his fellow astronaut Tom Stafford were lost when a film pack accidently floated out of the open hatch and disappeared in space. Only one space-walk picture—showing a partial view of Cernan—was returned to earth. That made Cernan more determined than ever to come home with a superior and complete photographic record of Apollo 17.

The lengths to which Space Photographer Cernan went to achieve his goal are particularly apparent in one shot. To crowd his fellow moon walker Jack Schmitt, the U.S. flag and the distant earth into one small frame, Cernan had to drop to his knees in his stiff space suit and thrust himself backward so that the chest-mounted camera could be properly aimed. To obtain a view of Schmitt and a giant boulder, Cernan insisted on scrambling up an incline. He also aimed and re-aimed until he was finally able to squeeze into one frame the lunar rover, Schmitt and the startling orange soil that Schmitt had discovered at Shorty Crater. Geologist Schmitt also proved an adept lensman.

Top left color page: Apollo 17's command ship America *and service module (with open scientific instrument bay) photographed from lunar module. Top right: Astronaut Jack Schmitt and flag with earth in background. Bottom: view of earth shot on way to moon, showing Africa* (upper left) *and Antarctica* (bottom). *Below: Schmitt at huge split boulder.*





but as might be expected, he showed more of an eye for lunar rocks than for his fellow astronaut.

Early in the mission, Astronaut Ron Evans made his most notable photographic contribution; he took a picture that will rank among the classics of the space program. As Apollo sped toward the moon after blasting into its translunar trajectory, he pointed his camera back toward home and caught a stunning view of the earth, with the side visible to the astronauts completely illuminated. In crystal-clear detail it shows almost the entire coastline of Africa and the offshore island republic of Malagasy, the Arabian peninsula and an unusually thick cover of swirling clouds over Antarctica and the surrounding region at the bottom of the world.

Gamble. The excellence of the Apollo 17 photographs is also due in part to the quality of the film used by the astronauts. On previous missions, NASA's photographic advisers opted for a fairly sensitive film similar to Ektachrome-EF; because lunar lighting conditions were uncertain, they wanted a fast emulsion. But for Apollo 17, the space agency decided to switch to another Kodak film that is somewhat slower (ASA rating of only 64 *v.* 160 for the earlier film), but has significantly less grain and better color reproduction. The gamble worked. The record 3,800 frames that were shot by the astronauts with their 70-mm. Hasselblads contained hardly a flawed exposure. What is more, even after being exposed to the vacuum of the moon, only a few of the 165 to 170 frames in each film pack were damaged; there were barely visible hairline cracks in their thin chemical emulsion.

The photographic outpouring also pleased scientists at the Lunar Receiving Laboratory, who found the pictures highly useful in initial identification and examination of the freshly arrived lunar rocks last week. Geochemist Paul Gast, the Manned Spacecraft Center's chief lunar scientist, noted, for example, that the closeups of the moon's surface were so clear that the orange soil showed up as a distinct band in the surrounding material. To Gast, those sharp color boundaries were another indication that the orange soil is young by lunar standards and a product of relatively recent volcanism on the moon. If the band of orange soil had been around a long time, he points out, its distinctness would have been blurred by the slow "gardening" of the moon's surface that occurs under the relentless bombardment of particles from deep space.

Top: Schmitt at large boulder that is believed to have rolled down from nearby slopes; lunar rover is parked in foreground. Bottom: close-up view of orange soil that scientists think may be evidence of relatively recent volcanic activity on moon.

PHOTOGRAPHS BY NASA

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America's recycling program

The space shuttle. The most practical and economical way of helping America reap the benefits of what it has sown in space.

One reason is that almost everything used in the program is recyclable. The orbiter itself can be utilized time and time again. It is boosted into space by two giant solid rockets. Mission completed, it lands back on earth like an airplane. (In contrast to today's multimillion dollar space vehicles that can only be used once.)

Even the booster rockets will be re-usable. They will be recovered, refurbished and put back to work.

The shuttle opens up other recycling possibilities, too. Take satellites. Now a small malfunction can turn a $30 million satellite into orbiting junk. The shuttle makes it feasible to send men into space to make repairs and adjustments, with enormous savings.

The shuttle will also make it easy to send men and women into space without rigorous, expensive training. Scientists like chemists, agricultural experts, meteorologists, who will play the greatest role in bringing the benefits of space down to earth.

Benefits like accurate forecasting of crop diseases or plagues of insects. Space manufacturing of ultra-pure vaccines or optical glass that cannot be made under the influence of Earth's gravity. Accurate detection of underground water, oil, and mineral deposits. Even technology to make possible communication breakthroughs like the "two-way wrist radio." And a great deal more.

The space shuttle. America's recycling program in space that will do a lot to help conserve and recycle our resources here on earth.

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in space.