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MARCH 2025 • SMITHSONIANMAG.COM

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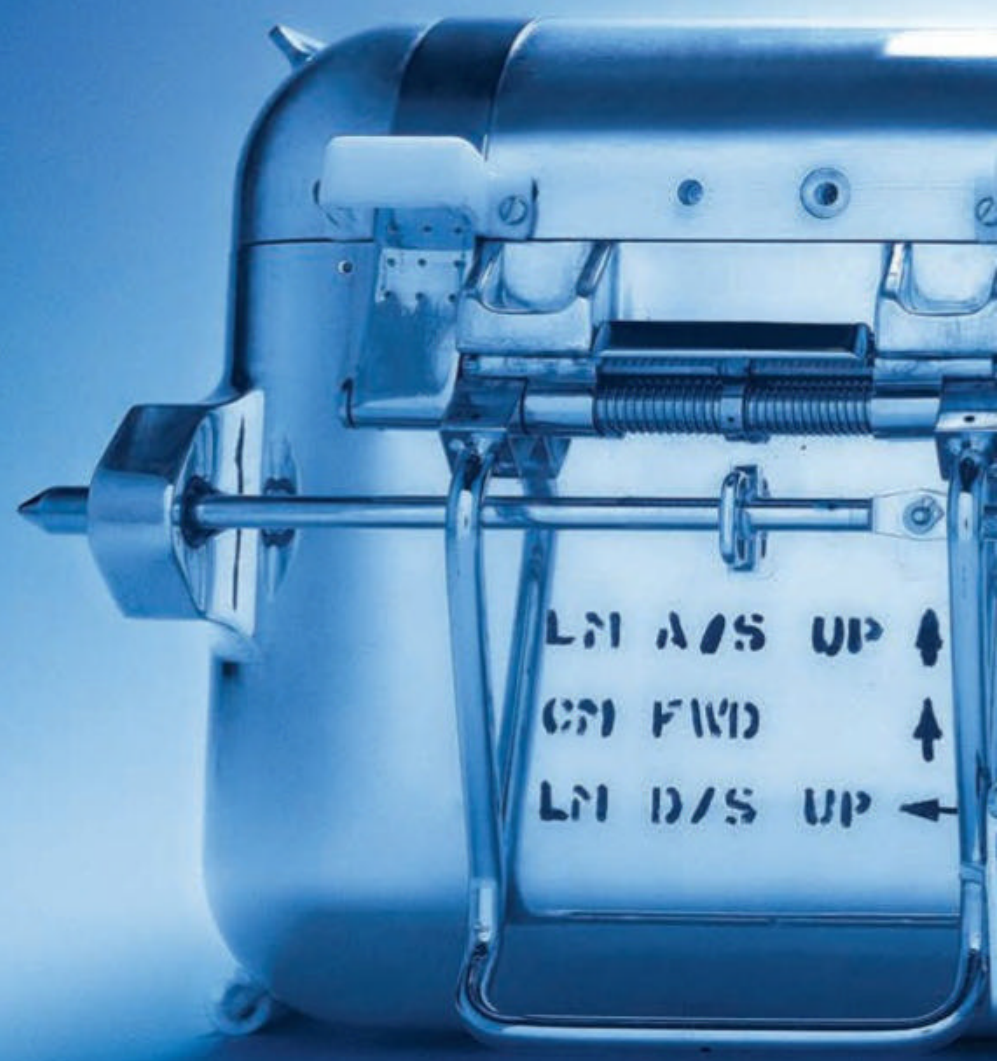
Best-Case Scenario

The cutting-edge design that safeguarded treasures on their way back from the Moon

IT'S ONLY THE SIZE of a suitcase, 8 by 19 by 11.7 inches—perfect for the overhead storage bin on a passenger aircraft. It's even shaped like luggage, with a hinged lid and a side-mounted handle. But instead of being lugged home full of socks and souvenirs, this special carry-on came home with the Apollo astronauts, full of moon.

Its official name is the Apollo Lunar Sample Return Container No. 1008, but everyone, including Teasel Muir-Harmony, curator of the Apollo collection at the Smithsonian's National Air and Space Museum, calls it and its handful of fellows "rock boxes," because of what they do: ferry samples from the lunar surface to a laboratory back on Earth.

The Apollo missions landed on the moon six dif-



WE LEARN A LITTLE MORE FROM EACH MISSION, BRINGING BACK ANSWERS ONE SMALL BOX AT A TIME.

By
Elana Scherr

Photograph by
Cade Martin

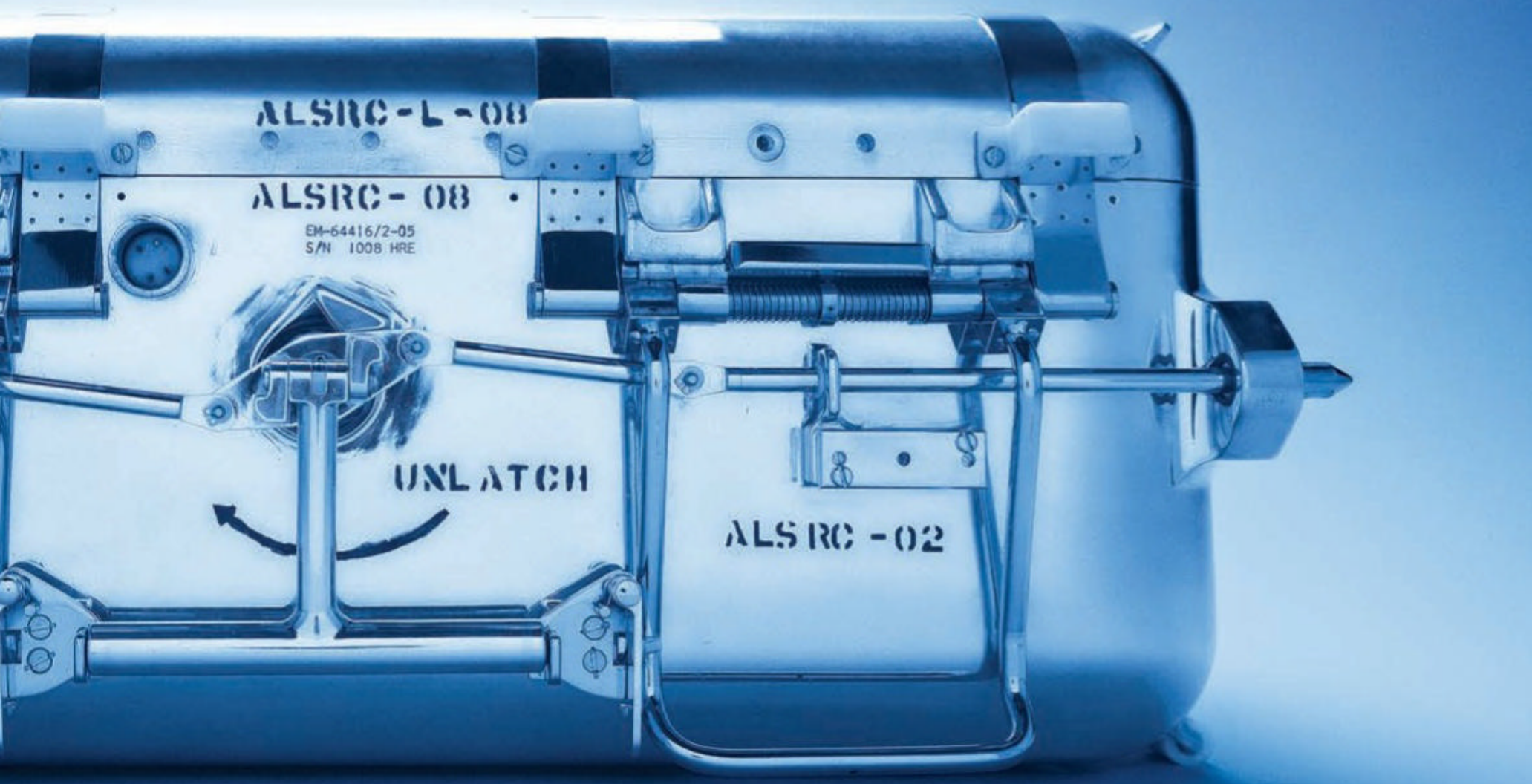
ferent times between 1969 and 1972, and on each occasion, among their other duties, the astronauts were tasked with collecting various bits of the lunar environment: rocks, dust, even core samples. And however humble-looking, these chunks and powders gave scientists on Earth a closer look at some of the deepest mysteries of space: how the universe was formed, how to determine the age of planets, how comets and asteroids can change the composition of a planetary body. "As we go around the center of the galaxy, the local conditions change," says Ryan Zeigler, lunar sample curator at NASA. Zeigler says the weather, tectonics and magnetic field of the Earth make it difficult to measure things like the universe's radiation. "You need to go to one of these airless bodies like the moon and find old rocks from maybe 250 million years ago, and then you can understand how our whole solar system evolves."

And just as those lunar samples have proved crucial to our understanding of the universe, the box design itself offers unparalleled insight into the Apollo program. Every detail on the container, from its polished exterior to the chain-mail-like mesh inside, shows how the Apollo team tapped brilliant minds to solve problems large and small. Looking beyond the program's biggest names, we can learn about lesser-known innovators, such as Yvonne Clark, known as Y.Y. An inventive Black mechanical engineer who worked as a NASA contractor in the mid-1960s, Clark was so proud of her work on the rock boxes and Saturn rockets that she encouraged her family to watch every Apollo launch to see her designs in action.

The box might look simple, but it had a delicate ➔

LEARN *about the unsung heroes of the Apollo program at* ***Smithsonian mag.com/moon***

FROM THE SMITHSONIAN NATIONAL AIR AND SPACE MUSEUM



NATIONAL TREASURE

task. The samples needed to survive huge swings in temperature while being brought aboard the lunar module; on the trip back to Earth, even in the relative safety of the module, the materials would be subject to harsh vibrations. The rock box also needed to hold a vacuum—to protect its contents from Earth contamination, but also to protect Earth, in case there were dangerous elements lurking in the moondust. The astronauts also needed a box they could manipulate while wearing a bulky spacesuit.

To meet these needs, the team designed the case with a T-bar and two big toggle levers, which make it possible to open and latch the box even while wearing insulated gloves. To prevent leaks, the box was fitted with temperature-resistant O-rings and what's called a "knife-edge" seal, where a rigid blade meets a softer metal and cuts into it, providing airtight containment.

NASA had many partners during the development of Project Apollo, and when the time came to manufacture the elegantly designed rock boxes, the team turned to the U.S. Atomic Energy Commission, where containing hazardous materials was a specialty. The boxes were cast, machined and assembled by Union Carbide Corporation's Nuclear Division at Y-12 in Oak Ridge, Tennessee, which was under contract with NASA at the time. The Oak Ridge site created 16 rock boxes for NASA, and No. 1008 was used in November 1969 by Pete Conrad and Alan L. Bean during the Apollo 12 moon landing. Muir-Harmony says that because NASA kept impeccable records, we know that this box was deployed during the second of two moonwalks and that the mission brought home a combined 75 pounds of samples that continue to offer insights for scientists around the world.

"The rock box is a great example of problem solving," says Muir-Harmony, adding that scientists still look to the Apollo program for inspiration in creating tools for space exploration. Zeigler agrees, noting that Mars rovers are now collecting samples in tubes that use a similar knife-edge sealing technology to that of the Apollo boxes. The universe remains full of mystery, but we learn a little more from each mission, bringing back answers one small box at a time. ◆

BOOKS

Dancer, Singer, Actress, Spy

A NEWLY AVAILABLE MEMOIR REVEALS A TENDER, PRIVATE SIDE OF JOSEPHINE BAKER

By **Kayla Randall**

BEFORE SHE WAS a legend, Josephine Baker was a little girl from Missouri who loved to make funny faces. Teachers chided her for this habit; Baker paid them little heed. "Our faces aren't made to sleep," she later said.

Baker's life was so full that it's easy to imagine she never slept. Born in 1906, Baker became one of the 20th century's biggest celebrities, known as "the Black Venus," an enthralling dancer and singer whose career took off when she left the United States as a teenager for France, where she eventually became a citizen. (Left, Baker performs at the Folies Bergère, c. 1925.) She toured the globe and became the first Black woman to star in a major film, *Siren of the Tropics*, in 1927. During World War II, she spied for the French resistance against the Nazis. She was also a fierce fighter for civil rights in America and memorably addressed the crowd at the 1963 March on Washington.

A rare, intimate picture of Baker emerges in her memoir, *Fearless and Free*, originally published in France in 1949 and now translated into English for the first time. The book peels back the myth to bring readers the high-spirited child who grew up poor on Bernard Street in St. Louis, brought home lost animals and made faces in school.

An early and urgent drive, she says, was to help others: "I promised myself that when I was strong," she said, "I would fight everyone who was mean to the poor, whether they were kings or not." ◆

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