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On the 50th Anniversary of the Atomic Bomb

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Trinity [Atomic Test] Site
by the National Atomic Museum

June, 1995 [Etext #277]

The 50th Anniversary of the Atomic Bomb

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TRINITY SITE
by the U.S. Department of Energy
National Atomic Museum,
Albuquerque, New Mexico

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The First Atomic Test

On Monday morning July 16, 1945, the world was changed forever when the first atomic bomb was tested in an isolated area of the New Mexico desert. Conducted in the final month of World War II by the top-secret Manhattan Engineer District, this test was code named Trinity. The Trinity test took place on the Alamogordo Bombing and Gunnery Range, about 230 miles south of the Manhattan Project's headquarters at Los Alamos, New Mexico. Today this 3,200 square mile range, partly located in the desolate Jornada del Muerto Valley, is named the White Sands Missile Range and is actively used for non-nuclear weapons testing.

Before the war the range was mostly public and private grazing land that had always been sparsely populated. During the war it was even more lonely and deserted because the ranchers had agreed to vacate their homes in January 1942. They left because the War Department wanted the land to use as an artillery and bombing practice area. In September 1944, a remote 18 by 24 square mile portion of the north-east corner of the Bombing Range was set aside for the Manhattan Project and the Trinity test by the military.

The selection of this remote location in the Jornada del Muerto Valley for the Trinity test was from an initial list of eight possible test sites. Besides the Jornada, three of the other seven sites were also located in New Mexico: the Tularosa Basin near Alamogordo, the lava beds (now the El Malpais National Monument) south of Grants, and an area southwest of Cuba and north of Thoreau. Other possible sites not located in New Mexico were: an Army training area north of Blythe, California, in the Mojave Desert; San Nicolas Island (one of the Channel Islands) off the coast of Southern California; and on Padre Island south of Corpus Christi, Texas, in the Gulf of Mexico. The last choice for the test was in the beautiful San Luis Valley of south-central Colorado, near today's Great Sand Dunes National Monument.

Based on a number of criteria that included availability, distance from Los Alamos, good weather, few or no settlements, and that no Indian land would be used, the choices for the test site were narrowed down to two in the summer of 1944. First choice was the military training area in southern California. The second choice, was the Jornada del Muerto Valley in New Mexico. The final site selection was made in late August 1944 by Major General Leslie R. Groves, the military head of the Manhattan Project. When General Groves discovered that in order to use the California location he would need the permission of its commander, General George Patton, Groves quickly decided on the second choice, the Jornada del Muerto. This was because General Groves did not want anything to do with the flamboyant

Patton, who Groves had once described as "the most disagreeable man I had ever met."^[1] Despite being second choice the remote Jornada was a good location for the test, because it provided isolation for secrecy and safety, was only 230 miles south of Los Alamos, and was already under military control. Plus, the Jornada enjoyed relatively good weather.

The history of the Jornada is in itself quite fascinating, since it was given its name by the Spanish conquerors of New Mexico. The Jornada was a short cut on the Camino Real, the King's Highway that linked old Mexico to Santa Fe, the capital of New Mexico. The Camino Real went north from Mexico City till it joined the Rio Grande near present day El Paso, Texas. Then the trail followed the river valley further north to a point where the river curved to the west, and its valley narrowed and became impassable for the supply wagons. To avoid this obstacle, the wagons took the dubious detour north across the Jornada del Muerto. Sixty miles of desert, very little water, and numerous hostile Apaches. Hence the name Jornada del Muerto, which is often translated as the journey of death or as the route of the dead man. It is also interesting to note that in the late 16th century, the Spanish considered their province of New Mexico to include most of North America west of the Mississippi!

The origin of the code name Trinity for the test site is also interesting, but the true source is unknown. One popular account attributes the name to J. Robert Oppenheimer, the scientific head of the Manhattan Project. According to this version, the well read Oppenheimer based the name Trinity on the fourteenth Holy Sonnet by John Donne, a 16th century English poet and sermon writer. The sonnet started, "Batter my heart, three-personed God."^[2] Another version of the name's origin comes from University of New Mexico historian Ferenc M. Szasz. In his 1984 book, *The Day the Sun Rose Twice*, Szasz quotes Robert W. Henderson head of the Engineering Group in the Explosives Division of the Manhattan Project. Henderson told Szasz that the name Trinity came from Major W. A. (Lex) Stevens. According to Henderson, he and Stevens were at the test site discussing the best way to haul Jumbo (see below) the thirty miles from the closest railway siding to the test site. "A devout Roman Catholic, Stevens observed that the railroad siding was called 'Pope's Siding.' He [then] remarked that the Pope had special access to the Trinity, and that the scientists would need all the help they could get to move the 214 ton Jumbo to its proper spot."^[3]

The Trinity test was originally set for July 4, 1945. However, final preparations for the test, which included the assembly of the bomb's plutonium core, did not begin in earnest until Thursday, July 12. The abandoned George McDonald ranch house located two miles south of the test site served as the assembly point for the device's core. After assembly, the plutonium core was transported to Trinity Site to be inserted into the thing or gadget as the atomic device was called. But, on the first attempt to insert the core it stuck! After letting the temperatures of the core and the gadget equalize, the core fit perfectly to the great relief of all present. The completed device

was raised to the top of a 100-foot steel tower on Saturday, July 14. During this process workers piled up mattresses beneath the gadget to cushion a possible fall. When the bomb reached the top of the tower without mishap, installation of the explosive detonators began. The 100-foot tower (a surplus Forest Service fire-watch tower) was designated Point Zero. Ground Zero was at the base of the tower.

As a result of all the anxiety surrounding the possibility of a failure of the test, a verse by an unknown author circulated around Los Alamos. It read:

From this crude lab that spawned a dud,
Their necks to Truman's ax uncurled
Lo, the embattled savants stood,
and fired the flop heard round the world.[4]

A betting pool was also started by scientists at Los Alamos on the possible yield of the Trinity test. Yields from 45,000 tons of TNT to zero were selected by the various bettors. The Nobel Prize-winning (1938) physicist Enrico Fermi was willing to bet anyone that the test would wipe out all life on Earth, with special odds on the mere destruction of the entire State of New Mexico!

Meanwhile back at the test site, technicians installed seismographic and photographic equipment at varying distances from the tower. Other instruments were set up for recording radioactivity, temperature, air pressure, and similar data needed by the project scientists.

According to Lansing Lamont in his 1965 book *Day of Trinity*, life at Trinity could at times be very exciting. One afternoon while scientists were busily setting up test instruments in the desert, the tail gunner of a low flying B-29 bomber spotted some grazing antelopes and opened up with his twin .50-caliber machine guns. "A dozen scientists, ... under the plane and out of the gunner's line of vision, dropped their instruments and hugged the ground in terror as the bullets thudded about them." [5] Later a number of these scientists threatened to quit the project.

Workers built three observation points 5.68 miles (10,000 yards), north, south, and west of Ground Zero. Code named Able, Baker, and Pittsburgh, these heavily-built wooden bunkers were reinforced with concrete, and covered with earth. The bunker designated Baker or South 10,000 served as the control center for the test. This is where head scientist J. Robert Oppenheimer would be for the test.

A fourth observation point was the test's Base Camp, (the abandoned Dave McDonald ranch) located about ten miles southwest of Ground Zero. The primary observation point was on Compania Hill, located about 20 miles to the northwest of Trinity near today's Stallion Range Gate, off NM 380.

The test was originally scheduled for 4 a.m., Monday July 16, but was postponed to 5:30 due to a severe thunderstorm that would have

increased the amount of radioactive fallout, and have interfered with the test results. The rain finally stopped and at 5:29:45 a.m.

Mountain War Time, the device exploded successfully and the Atomic Age was born. The nuclear blast created a flash of light brighter than a dozen suns. The light was seen over the entire state of New Mexico and in parts of Arizona, Texas, and Mexico. The resultant mushroom cloud rose to over 38,000 feet within minutes, and the heat of the explosion was 10,000 times hotter than the surface of the sun! At ten miles away, this heat was described as like standing directly in front of a roaring fireplace. Every living thing within a mile of the tower was obliterated. The power of the bomb was estimated to be equal to 20,000 tons of TNT, or equivalent to the bomb load of 2,000 B-29, Superfortresses!

After witnessing the awesome blast, Oppenheimer quoted a line from a sacred Hindu text, the Bhagavad-Gita: He said: "I am become death, the shatterer of worlds." [6] In Los Alamos 230 miles to the north, a group of scientists' wives who had stayed up all night for the not so secret test, saw the light and heard the distant sound. One wife, Jane Wilson, described it this way, "Then it came. The blinding light [no] one had ever seen. The trees, illuminated, leaping out. The mountains flashing into life. Later, the long slow rumble. Something had happened, all right, for good or ill." [7]

General Groves' deputy commander, Brigadier General T. F. Farrell, described the explosion in great detail: "The effects could well be called unprecedented, magnificent, beautiful, stupendous, and terrifying. No man-made phenomenon of such tremendous power had ever occurred before. The lighting effects beggared description. The whole country was lighted by a searing light with the intensity many times that of the midday sun. It was golden, purple, violet, gray, and blue. It lighted every peak, crevasse and ridge of the nearby mountain range with a clarity and beauty that cannot be described but must be seen to be imagined..." [8]

Immediately after the test a Sherman M-4 tank, equipped with its own air supply, and lined with two inches of lead went out to explore the site. The lead lining added 12 tons to the tank's weight, but was necessary to protect its occupants from the radiation levels at ground zero. The tank's passengers found that the 100-foot steel tower had virtually disappeared, with only the metal and concrete stumps of its four legs remaining. Surrounding ground zero was a crater almost 2,400 feet across and about ten feet deep in places. Desert sand around the tower had been fused by the intense heat of the blast into a jade colored glass. This atomic glass was given the name Atomsite, but the name was later changed to Trinitite.

Due to the intense secrecy surrounding the test, no accurate information of what happened was released to the public until after the second atomic bomb had been dropped on Japan. However, many people in New Mexico were well aware that something extraordinary had happened the morning of July 16, 1945. The blinding flash of light, followed by the shock wave had made a vivid impression on people who

lived within a radius of 160 miles of ground zero. Windows were shattered 120 miles away in Silver City, and residents of Albuquerque saw the bright light of the explosion on the southern horizon and felt the tremor of the shock waves moments later.

The true story of the Trinity test first became known to the public on August 6, 1945. This is when the world's second nuclear bomb, nicknamed Little Boy, exploded 1,850 feet over Hiroshima, Japan, destroying a large portion of the city and killing an estimated 70,000 to 130,000 of its inhabitants. Three days later on August 9, a third atomic bomb devastated the city of Nagasaki and killed approximately 45,000 more Japanese. The Nagasaki weapon was a plutonium bomb, similar to the Trinity device, and it was nicknamed Fat Man. On Tuesday August 14, at 7 p.m. Eastern War Time, President Truman made a brief formal announcement that Japan had finally surrendered and World War II was over after almost six years and 60 million deaths!

On Sunday, September 9, 1945, Trinity Site was opened to the press for the first time. This was mainly to dispel rumors of lingering high radiation levels there, as well as in Hiroshima and Nagasaki. Led by General Groves and Oppenheimer, this widely publicized visit made Trinity front page news all over the country.

Trinity Site was later encircled with more than a mile of chain link fencing and posted with signs warning of radioactivity. In the early 1950s most of the remaining Trinitite in the crater was bulldozed into an underground concrete bunker near Trinity. Also at this time the crater was back filled with new soil. In 1963 the Trinitite was removed from the bunker, packed into 55-gallon drums, and loaded into trucks belonging to the Atomic Energy Commission (the successor of the Manhattan Project). Trinity site remained off-limits to military and civilian personnel of the range and closed to the public for many years, despite attempts immediately after the war to turn Trinity into a national monument.

In 1953 about 700 people attended the first Trinity Site open house sponsored by the Alamogordo Chamber of Commerce and the Missile Range. Two years later, a small group from Tularosa, NM visited the site on the 10th anniversary of the explosion to conduct a religious service and pray for peace.

Regular visits have been made annually in recent years on the first Saturday in October instead of the anniversary date of July 16, to avoid the desert heat. Later Trinity Site was opened one additional day on the first Saturday in April. The Site remains closed to the public except for these two days, because it lies within the impact areas for missiles fired into the northern part of the Range.

In 1965, Range officials erected a modest monument at Ground Zero. Built of black lava rock, this monument serves as a permanent marker for the site and as a reminder of the momentous event that occurred there. On the monument is a plain metal plaque with this simple inscription: "Trinity Site Where the World's First Nuclear Device Was

Exploded on July 16, 1945."

During the annual tour in 1975, a second plaque was added below the first by The National Park Service, designating Trinity Site a National Historic Landmark. This plaque reads, "This site possesses national significance in commemorating the history of the U.S.A."

JUMBO

Lying next to the entrance of the chain link fence that still surrounds Trinity Site are the rusty remains of Jumbo. Jumbo was the code name for the 214-ton Thermos shaped steel and concrete container designed to hold the precious plutonium core of the Trinity device in case of a nuclear mis-fire. Built by the Babcock and Wilcox Company of Barberton, Ohio, Jumbo was 28 feet long, 12 feet, 8 inches in diameter, and with steel walls up to 16 inches thick.

The idea of using some kind of container for the Trinity device was based on the fact that plutonium was extremely expensive and very difficult to produce. So, much thought went into a way of containing the 15 lb. plutonium core of the bomb, in case the 5,300 lbs. of conventional high explosives surrounding the core exploded without setting off a nuclear blast, and in the process scattering the costly plutonium (about 250 million dollars worth) across the desert. After extensive research and testing of other potential containment ideas, the concept of Jumbo was decided on in the late summer of 1944.

However, by the spring of 1945, after Jumbo had already been built and transported (with great difficulty) to the Trinity Site by the Eichleay Corporation of Pittsburgh, it was decided not to explode the Trinity device inside of Jumbo after all. There were several reasons for this new decision: first, plutonium had become more readily (relatively) available; second, the Project scientists decided that the Trinity device would probably work as planned; and last, the scientists realized that if Jumbo were used it would adversely affect the test results, and add 214 tons of highly radioactive material to the atmosphere.

Not knowing what else to do with the massive 12 million dollar Jumbo, it was decided to suspend it from a steel tower 800 yards from Ground Zero to see how it would withstand the Trinity test. Jumbo survived the approximately 20 kiloton Trinity blast undamaged, but its supporting 70-foot tall steel tower was flattened.

Two years later, in an attempt to destroy the unused Jumbo before it and its 12 million dollar cost came to the attention of a congressional investigating committee, Manhattan Project Director General Groves ordered two junior officers from the Special Weapons Division at Sandia Army Base in Albuquerque to test Jumbo. The Army officers placed eight 500-pound conventional bombs in the bottom of

Jumbo. Since the bombs were on the bottom of Jumbo, and not the center (the correct position), the resultant explosion blew both ends off Jumbo. Unable to totally destroy Jumbo, the Army then buried it in the desert near Trinity Site. It was not until the early 1970s that the impressive remains of Jumbo, still weighing over 180 tons, were moved to their present location.

SCHMIDT-McDONALD RANCH HOUSE

The Schmidt-McDonald ranch house is located two miles south of Ground Zero. The property encompasses about three acres and consists of the main house and assorted outbuildings. The house, surrounded by a low stone wall, was built in 1913 by Franz Schmidt, a German immigrant and homesteader. In the 1920s Schmidt sold the ranch to George McDonald and moved to Florida.

The ranch house is a one-story, 1,750 square-foot adobe (mud bricks) building. An ice house is located on the west side along with an 9'-4" deep underground cistern. A 14 by 18.5 foot stone addition, which included a modern bathroom, was added onto the north side in the 1930s. East of the house there is a large, divided concrete water storage tank and a windmill. South of the windmill are the remains of a bunkhouse, and a barn which also served as a garage. Further to the east are corrals and holding pens for livestock.

The McDonalds vacated their ranch house and their thousands of acres of marginal range land in early 1942 when it became part of the Alamogordo Bombing and Gunnery Range. The old house remained empty until Manhattan Project personnel arrived in 1945. Then a spacious room in the northeast corner of the house was selected by the Project personnel for the assembly of the plutonium core of the Trinity device. Workmen installed work benches, tables, and other equipment in this large room. To keep the desert dust and sand out, the room's windows and cracks were covered with plastic and sealed with tape. The core of the bomb consisted of two hemispheres of plutonium, (Pu-239), and an initiator. According to reports, while scientists assembled the initiator and the Pu-239 hemispheres, jeeps were positioned outside with their engines running for a quick getaway if needed. Detection devices were used to monitor radiation levels in the room, and when fully assembled the core was warm to the touch. The completed core was later transported the two miles to Ground Zero, inserted into the bomb assembly, and raised to the top of the tower.

The Trinity explosion on Monday morning, July 16, did not significantly damage the McDonald house. Even though most of the windows were blown out, and the chimney was blown over, the main structure survived intact. Years of rain water dripping through holes in the metal roof did much more damage to the mud brick walls than the bomb did. The nearby barn did not fare as well. The Trinity test blew part of its roof off, and the roof has since totally collapsed.

The ranch house stood empty and deteriorating for 37 years until 1982 when the US Army stabilized it to prevent any further damage. The next year, the Department of Energy and the Army provided funds for the National Park Service to completely restore the house to the way it appeared in July, 1945. When the work was completed, the house with many photo displays on Trinity was opened to the public for the first time in October 1984 during the semi-annual tour. The Schmidt-McDonald ranch house is part of the Trinity National Historic Landmark.

Notes

[1] Szasz, Ferenc. *The Day the Sun Rose Twice*. Albuquerque: University of New Mexico Press, 1984. p. 28.

[2] Hayward, John, ed. *John Donne: Complete Poetry and Selected Prose*. New York: Random House, Inc., 1949. p. 285.

[3] Szasz, *The Day the Sun Rose Twice*, p. 40.

[4] Wyden, Peter. *Day One: Before Hiroshima and After*. New York: Simon and Schuster, 1984. p. 204.

[5] Lamont, Lansing. *Day of Trinity*. New York: Atheneum, 1965. p. 123-124.

[6] Kunetka, James W. *City of Fire: Los Alamos and the Atomic Age, 1943-1945*. Albuquerque: University of New Mexico Press, 1978. p. 170.

[7] Wilson, Jane S. and Charlotte Serber, eds. *Standing By and Making Do: Women in Wartime Los Alamos*. Los Alamos: Los Alamos Historical Society, 1988. p. x, xi.

[8] Brown, Anthony Cave, and Charles B. MacDonald. *The Secret History of the Atomic Bomb*. New York: Dell, 1977. p. 516.

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Kirtland Air Force Base,
Albuquerque, New Mexico

Since its opening in 1969, the objective of the National Atomic museum has been to provide a readily accessible repository of educational materials, and information on the Atomic Age. In addition, the museum's goal is to preserve, interpret, and exhibit to the public memorabilia of this Age. In late 1991 the museum was chartered by Congress as the United States' only official Atomic museum.

Prominently featured in the museum's high bay is the story of the Manhattan Engineer District, the unprecedented 2.2 billion dollar scientific-engineering project that was centered in New Mexico during World War II. The Manhattan Project as it was more commonly called, developed, built, and tested the world's first Atomic bomb in New Mexico. This display also includes casings similar to the only Atomic bombs ever used in warfare. Dropped on the Japanese cities of Hiroshima and Nagasaki, these two bombs helped bring World War II to an end in mid-August 1945. The story of the Manhattan Project's three secret cities, Hanford, Washington, Los Alamos, New Mexico, and Oak Ridge, Tennessee, is also presented in this area.

A portion of the museum, the low bay, is devoted to exhibits on the research, development, and use of various forms of nuclear energy. Historical and other traveling exhibits are also displayed in this area. Also found in the low bay is the museum's store, which is operated by the museum's foundation.

Adjacent to the low bay is the theater. The featured film is David Wolpers classic 1963 production, Ten Seconds That Shook The World. This excellent film is a 53-minute documentary on the Manhattan Project. Other films relating to the history of the Atomic Age are available for viewing and checkout from the library.

Next to the theater is the library/Department of Energy public reading room, containing government documents that are available to the public for in-library research. The library also has many nuclear related books available for reference and checkout.

Located around the outside of the museum are a number of large exhibits. These include the Boeing B-52B jet bomber that dropped the United States' last air burst H-bomb in 1962, and a 280-mm (11 inches) Atomic cannon, once America's most powerful field artillery. Also found in this area is a Navy TA-7C (a modified A-7B) Corsair II fighter-bomber, a veteran of the Vietnam War. Many other nuclear weapons systems, rockets, and missiles are found in this area.

In front of the museum are a pair of Navy Terrier missiles. The Terrier was the Navy's first operational surface to air missile. To the south of the museum, next to the visitors parking lot, is a Republic F-105D Thunderchief fighter-bomber. Further south is a World War II Boeing B-29 Superfortress. This plane is similar to the B-29's, Enola Gay and Bockscar that dropped the Atomic bombs on Japan.

The National Atomic Museum, is open 9 a.m. to 5 p.m. daily, except for

New Years Day, Easter, Thanksgiving, and Christmas. The museum is located at 20358 Wyoming Blvd. SE, on Kirtland Air Force Base, Albuquerque, New Mexico. Guided tours for groups are available by calling (505)845-4636 in advance. Admission and tours are free, and cameras are always welcome!

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