



TIMES PAST

1942

THE MANHATTAN PROJECT

How a secret U.S. plan to build a powerful new weapon
70 years ago forever changed the world

BY SAM ROBERTS

The world's first
atomic bomb test,
in Alamogordo, New Mexico,
July 16, 1945

On Sept. 22, 1942, in the middle of World War II, *The New York Times* reported the promotion of 104 members of the armed forces. Few readers likely noticed the name of Colonel Leslie R. Groves of the Corps of Engineers, who was bumped up to brigadier general. His new assignment wasn't announced, but the next day, he took command of a top-secret mission: to transform the principles of theoretical physics into a devastating new weapon that could be delivered by plane against Nazi Germany and Japan.

What would later become known as the Manhattan Project would employ 130,000 people at secret sites in New York; Oak Ridge, Tennessee; Hanford, Washington; and Los Alamos, New Mexico—where the bombs the U.S.

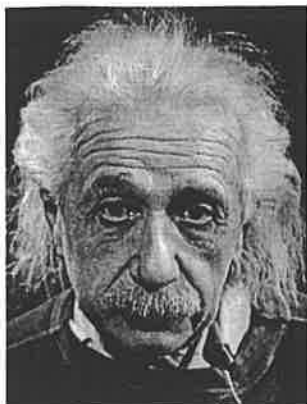
dropped on Hiroshima and Nagasaki in 1945 to end the war with Japan were made.

The Atomic Age, ushered in by the Manhattan Project, literally changed the world. The race for nuclear supremacy became a driving force in the Cold War—the decades-long confrontation between the U.S. and the Soviet Union after World War II—and raised the specter of nuclear annihilation for the entire world.

"Nuclear weapons put in pretty substantial doubt the long-term survival of civilization," says James G. Hershberg, a history professor at George Washington University.

The Manhattan Project was rooted in a letter signed by the physicist Albert Einstein and sent to President Franklin D. Roosevelt in August 1939, a month before Germany's invasion of Poland set off World War II. Drawing

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Albert Einstein (above) provided a theoretical basis for the atomic bomb with his famous formula $E=mc^2$; (right) atomic scientists, including J. Robert Oppenheimer (wearing hat) measuring radioactivity at a nuclear testing site in Alamogordo, New Mexico, in September 1945.



on his famous equation $E=mc^2$ (see timeline, p. 20), Einstein and other scientists told FDR about research in Europe and at American universities that demonstrated how a chain reaction involving uranium could unleash tremendous power that could be harnessed in "extremely powerful bombs." (For a copy of the letter, go to www.upfrontmagazine.com.)

"The letter expresses the threat of the Germans succeeding," says Cynthia C. Kelly, president of the Atomic Heritage Foundation. "Everyone knew that Hitler, if he had an atomic bomb, would not hesitate to use it on London or Washington."

Pearl Harbor

As early as 1919, a scientist in Britain had found a way to transform atoms of nitrogen into oxygen. Further research over the next two decades revealed that when an atom's nucleus is split (fission) or combined with other atoms (fusion), vast amounts of energy are released. That touches off a chain reaction as the process repeats itself. Scientists thought uranium and the newly discovered element of plutonium were most likely to produce that reaction—in theory, anyway.

Roosevelt heeded Einstein's warning and appointed a panel of scientists to pursue atomic research and

development. A year and a half later, on Dec. 7, 1941, the Japanese bombed Pearl Harbor, the U.S. naval base in Hawaii. That brought the U.S. into the war in both Europe and Asia and added urgency to the race for nuclear weapons.

The name Manhattan Project came from the mission's first headquarters in New York City. (Manhattan is one of the five boroughs of New York.) In addition to a strong military presence, New York at the time was home to many scientists who had fled Hitler, and its vast harbor could receive uranium ore and other precious cargo.

The project recruited leading physicists, including refugees from fascist Europe like Niels Bohr of Denmark and Enrico Fermi of Italy. The physicist J. Robert Oppenheimer was in charge of designing and building the bomb in collaboration with British scientists. Oppenheimer told his colleagues that this megaweapon might prevent future world wars.

Supplies of uranium were secured, and secret factories were built to process it. Speed was essential. Scientists were hopeful but couldn't guarantee that they'd produce a bomb in time to affect the war.

As it turned out, as Richard Rhodes wrote in *The Making of the Atomic Bomb*, the U.S. was racing against an imaginary clock. Lacking America's industrial might and critical mass of scientific talent, Germany's nuclear research had faltered. Japan was even further behind.

The Nuclear Club

Who has the bomb and when they got it*

COUNTRY	YEAR
U.S.	1945
SOVIET UNION**	1949
U.K.	1952
FRANCE	1960
CHINA	1964
ISRAEL	1967
INDIA	1974
PAKISTAN	1998
NORTH KOREA	2006

*India, Pakistan, and Israel never signed the Non-Proliferation Treaty. North Korea did but later withdrew. Israel has never admitted to having nuclear weapons.
**Russia now controls the Soviet arsenal.

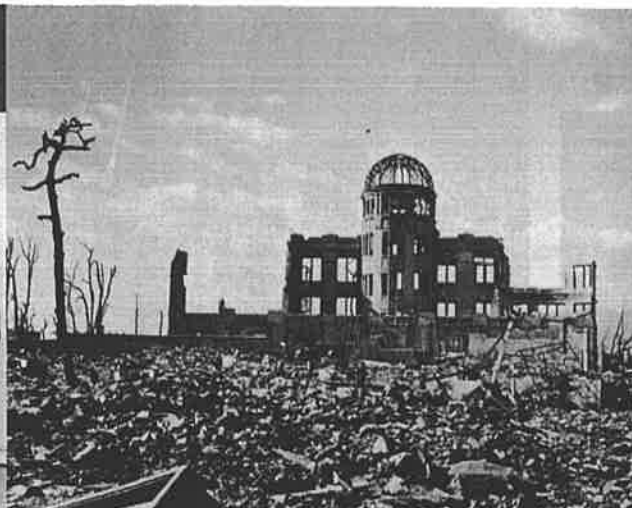
SOURCE: ARMS CONTROL ASSOCIATION; DATES FOR ISRAEL, INDIA, PAKISTAN, AND NORTH KOREA ARE APPROXIMATE.

Sam Roberts is the urban affairs correspondent for *The New York Times*.

TIMELINE THE ATOMIC AGE



A replica of the "Little Boy" bomb dropped on Hiroshima.



1905 $E=mc^2$

Albert Einstein publishes modern science's most famous equation: $E=mc^2$. It says that vast amounts of energy can be unleashed from tiny amounts of matter. The equation becomes the starting point for the development of nuclear weapons during World War II.

1942 The Manhattan Project

1945 Hiroshima & Nagasaki

The U.S. drops atomic bombs on the Japanese cities of Hiroshima and Nagasaki, killing 200,000 people (half immediately and half from radiation sickness later). Japan quickly surrenders.

1949 Soviet Bomb

A U.S. spy plane learns that the Soviet Union has tested an atomic bomb. Schools begin holding "duck and cover" drills, with children practicing huddling under their desks in case of a Soviet nuclear attack.

1951 Homegrown Spies

During the Cold War, Americans Julius and Ethel Rosenberg are convicted of conspiring to steal designs for America's atomic bomb and deliver them to the Soviet Union. They are executed two years later.

The only country close to keeping pace—surreptitiously—was the Soviet Union, a U.S. ally against Germany during WWII.

Falcon. It was 10 feet long, 5 feet in diameter, and weighed 10,000 pounds. Another version, called "Little Boy," was 10 feet long, 28 inches in diameter, and 9,700 pounds.

Fat Man & Little Boy

The project continued in secret as the war began to turn in the Allies' favor. President Roosevelt died on April 12, 1945, and the fate of the still-untested bomb now rested with his successor, Harry S. Truman. Incredibly, Roosevelt had kept Truman in the dark about the Manhattan Project during his brief time as FDR's vice president.

On July 16, 1945, three months after Truman became president, the world's first atomic bomb was tested in the New Mexico desert. "As I lay there in the final seconds," General Groves later wrote, "I thought only of what I would do if the countdown got to zero and nothing happened."

But something did happen. Just before dawn, a giant fireball exploded with the force of 20,000 tons of dynamite. A cloud of desert dust and gaseous iron soared into the atmosphere, forming the mushroom-shape cloud that would become the terrifying symbol of the Atomic Age.

The bomb tested in New Mexico was nicknamed "Fat Man" after a character in the Humphrey Bogart movie *The Maltese*

**Einstein
later called
his letter to
Roosevelt
the "one
great mistake
in my life."**

DOWNLOAD
Einstein's letter
www.upfrontmagazine.com

With Germany having already surrendered in the spring, Truman faced a momentous decision about the war in Asia: whether to risk an invasion of Japan that was expected to result in the loss of hundreds of thousands of American lives or to shorten the war by dropping the atomic bomb.

Truman decided to use the bomb. On Aug. 6, 1945, a converted American B-29 bomber called the *Enola Gay* (named for the pilot's mother) released the "Little Boy" bomb over Hiroshima. Buildings within a quarter mile were vaporized. An estimated 70,000 people were killed instantly. Three days later, after an American warning but with no sign of a Japanese surrender, a second atomic bomb was dropped, on Nagasaki, killing about 40,000 people immediately. Tens of thousands more were injured, and countless survivors would later suffer the effects of radiation, like cancer and birth defects. Six days later, on August 15, Japan surrendered.

Within two years, the Manhattan Project would be replaced by a civilian-controlled Atomic Energy Commission. But



1962 Cuban Missile Crisis

U.S. spy planes discover Soviet-built nuclear missile sites in Cuba, just 90 miles from Florida. After a 13-day standoff with the U.S., the Soviets remove the missiles, ending a crisis that took the world to the brink of nuclear war. (See the 9/17/12 Issue of *Upfront*.)

1968 U.N. Treaty

The U.N. approves the Non-Proliferation Treaty to halt the spread of nuclear arms. Nuclear nations agree to help other countries use the technology for electricity and other peaceful purposes. The treaty has been signed by 189 countries.

1969-1991 SALT

The Strategic Arms Limitation Treaty (SALT) between the U.S. and the Soviet Union in 1969 is the first of several agreements between the two superpowers to reduce their nuclear arsenals.

2006-2011 North Korea

In 2006, North Korea joins the nuclear club. Since Kim Jong Il (left) died in 2011, his young son Kim Jong Un (right) has taken charge. North Korea is on track to develop a nuclear warhead that could target the U.S. within a few years.

TODAY Iran

The U.S. and Europe have imposed sanctions on Iran because of its suspected nuclear weapons program. Israel has threatened military action on Iran if sanctions fail to curb Iran's nuclear ambitions. (Above center: Iranian President Mahmoud Ahmadinejad.)

atomic weaponry would figure in American military policy for decades to come. Though the U.S. knew its nuclear monopoly would not last, Washington was nonetheless stunned when, on Sept. 23, 1949, President Truman announced that the Soviet Union had successfully tested an atomic bomb. Americans subsequently learned that it was built largely with secrets passed to the Soviets by a British physicist, an American scientist, and a U.S. Army engineer named David Greenglass.*

MAD: Mutually Assured Destruction

The Soviet test touched off a nuclear arms race. With the development of intercontinental ballistic missiles in the 1950s, any place on Earth was vulnerable to annihilation. The superpowers also pursued expensive defensive strategies and finally settled, in effect, on a policy of "mutually assured destruction" (MAD), meaning that both would refrain from striking first because each could be obliterated by the other. In 1962, the Soviets installed missiles in Cuba, provoking a 13-day crisis, probably the closest the world has ever come to a nuclear conflict. (See the Sept. 17 issue at www.upfrontmagazine.com.)

Treaties between the U.S. and the Soviet Union to reduce the number of weapons and curb their spread to other countries were made beginning in the 1960s. But today, at least nine countries are believed to have nuclear weapons

(see chart, p. 19). Though U.S. and Russian stockpiles have shrunk, the Manhattan Project's legacy, according to the Federation of American Scientists, includes more than 19,000 nuclear weapons worldwide today. And the threat that Iran is developing a nuclear weapon capable of hitting Israel and much of Europe, or that terrorists may get hold of nuclear weapons, is making headlines in 2012.

Weapons research also led to peaceful applications for nuclear technology, like nuclear power generation and medical diagnostics and treatments. But questions about the safety of nuclear power plants and the long-term effects of radiation exposure fueled an international "No Nukes" movement beginning in the 1970s. Had he lived, Einstein might have joined in. A decade after he helped usher in the nuclear age, Einstein, a pacifist, said he regretted his letter to Roosevelt, calling it the "one great mistake in my life," though he added that "there was some justification—the danger that the Germans would make [nuclear weapons]."

In New York, one of the few visible reminders of the Manhattan Project's legacy is a statue on Riverside Drive of a 13th-century Buddhist monk that survived the bombing of Hiroshima. A plaque on the statue describes it as "a testimonial to the atomic bomb devastation and a symbol of lasting hope for world peace." •

*Greenglass was arrested in 1950 and later testified against his sister and brother-in-law, Ethel and Julius Rosenberg, dooming them to the electric chair.