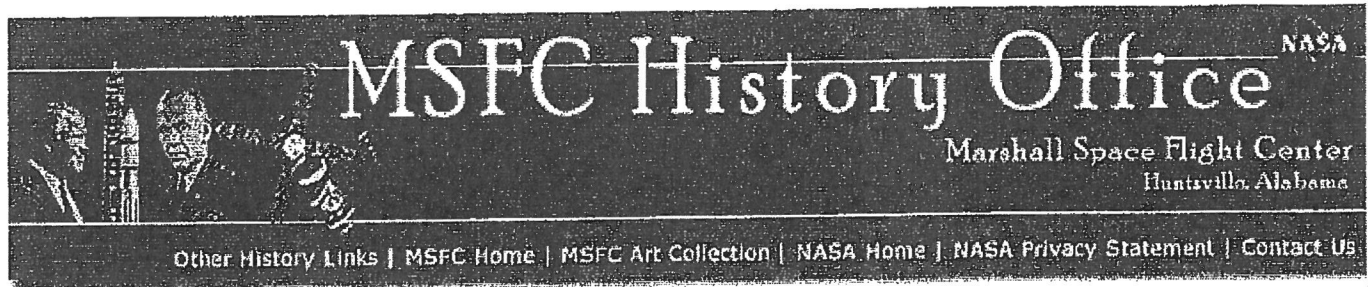


Wernher von Braun Research Articles





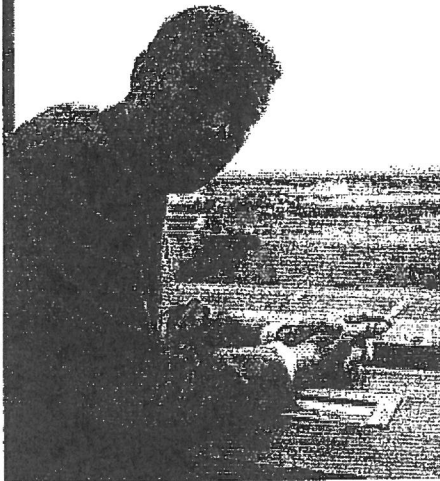
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Article #1

Dr. Wernher von Braun First Center Director, July 1, 1960 - Jan. 27, 1970

Paragraph

(01)



Wernher von Braun: 1912 - 1977

Wernher von Braun (1912–1977) was one of the most important rocket developers and champions of space exploration during the period between the 1930s and the 1970s. As a youth he became enamored with the possibilities of space exploration by reading the science fiction of Jules Verne and H.G. Wells, and from the science fact writings of Hermann Oberth, whose 1923 classic study, *Die Rakete zu den Planetenräumen* (By Rocket to Space), prompted young von Braun to master calculus and trigonometry so he could understand the physics of rocketry. From his teenage years, von Braun had held a keen interest in space flight, becoming involved in the German rocket society, Verein für Raumschiffahrt (VfR), as early as 1929. As a means of furthering his desire to build large and capable rockets, in 1932 he went to work for the German army to develop ballistic missiles. While engaged in this work, von Braun received a Ph.D. in physics on July 27, 1934.

(02)

Von Braun is well known as the leader of what has been called the "rocket team" which developed the V-2 ballistic missile for the Nazis during World War II. The V-2s were manufactured at a forced labor factory called Mittelwerk. Scholars are still reassessing his role in these controversial activities. [Click for details.](#)

(03)

The brainchild of von Braun's rocket team operating at a secret laboratory at Peenemünde on the Baltic coast, the V-2 rocket was the immediate antecedent of those used in space exploration programs in the United States and the Soviet Union. A liquid propellant missile extending some 46 feet in length and weighing 27,000 pounds, the V-2 flew at speeds in excess of 3,500 miles per hour and delivered a 2,200-pound warhead to a target 500 miles away. First flown in October 1942, it was employed against targets in Europe beginning in September 1944. By the beginning of 1945, it was obvious to von Braun that Germany would not achieve victory against the Allies, and he began planning for the postwar era.



Suiting up prior to entering Marshall's neutral buoyancy tank in 1967.

(04)

Before the Allied capture of the V-2 rocket complex, von Braun engineered the surrender of 500 of his top rocket scientists, along with plans and test vehicles, to the Americans. For fifteen years after World War II, von Braun worked with the U.S. Army in the development of ballistic missiles. As part of a military operation called Project Paperclip, he and his rocket team were scooped up from defeated Germany and sent to America where they were installed at Fort Bliss, Texas. There they worked on rockets for the U.S. Army, launching them at White Sands Proving Ground, New Mexico. In 1950 von Braun's team moved to the Redstone Arsenal near Huntsville, Ala., where they built the Army's Jupiter ballistic missile.

(05)

In 1960, his rocket development center transferred from the Army to the newly established NASA and received a mandate to build the giant Saturn rockets. Accordingly, von Braun became director of NASA's Marshall Space Flight Center and the chief

architect of the Saturn V launch vehicle, the superbooster that would propel Americans to the Moon.

(06) Von Braun also became one of the most prominent spokesmen of space exploration in the United States during the 1950s. In 1970, NASA leadership asked von Braun to move to Washington, D.C., to head up the strategic planning effort for the agency. He left his home in Huntsville, Ala., but in 1972 he decided to retire from NASA and work for Fairchild Industries of Germantown, Md. He died in Alexandria, Va., on June 16, 1977.

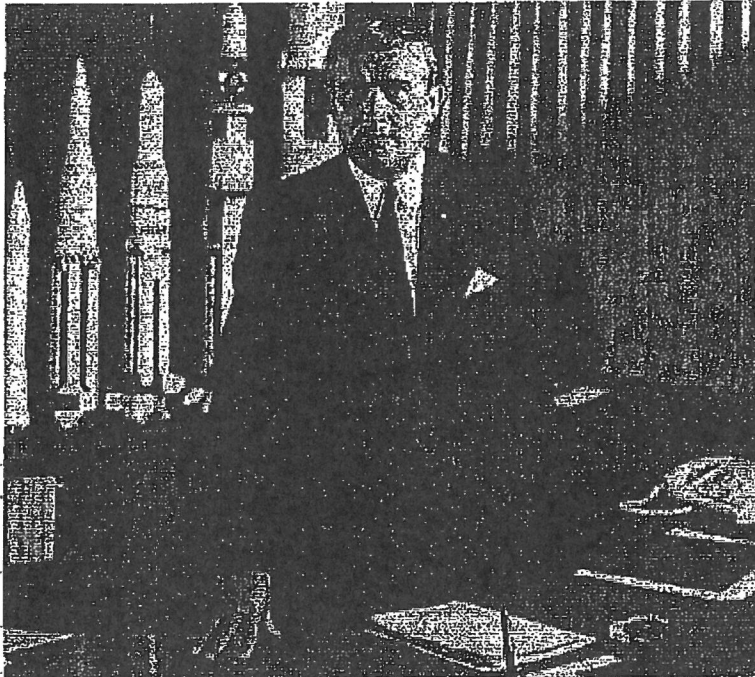
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Article #2



Wernher von Braun in his MSFC office, with models of the rockets he helped develop in the background. (credit: NASA)

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Paragraphs

Remembering Wernher von Braun

by Anthony Young
Monday, July 10, 2006

01

June 16th passed with virtually no mention of one of the greatest names in the exploration of space. On that date in 1977, Dr. Wernher von Braun passed away. He was admired and loved by many he worked with during projects Mercury, Gemini, and Apollo, yet vilified by others because of his wartime efforts developing the V-2 for the Third Reich. He profoundly influenced the course of history in Europe and America, and was instrumental in the United States achieving the greatest engineering, scientific and geopolitical accomplishment of the 20th century.

02

For many Americans, their memories of Wernher von Braun are and will remain profoundly positive. I am one of them. Like many other children of the 1950s, I first



02 learned of Dr. von Braun on the Walt Disney TV series devoted to space exploration. The first of these was "Man In Space" first broadcast on March 9, 1955. This was followed later that year with "Man and the Moon." The last of the three memorable programs was "Mars and Beyond" broadcast in 1957. It was estimated over 40 million viewers saw these shows. Von Braun was already familiar to the many readers of *Collier's* magazine which published a fascinating series on space exploration several years before. With the launch of Sputnik on October 4, 1957, von Braun stood on the real threshold of space exploration he had dreamed of pursuing since his youth.

03 America suddenly found itself in a space race with Russia. Were it not for Wernher von Braun's rational persuasion and quick actions to surrender his group to American forces in 1945 at the close of World War 2, there might have been no space race at all. The culturally illiterate can be forgiven if they believe the group of German engineers and scientists who came to America as part of Operation Paperclip comprised the entire braintrust behind the V-2 rocket. It did not. While over 120 Germans were eventually brought to the United States under that secret program, it is a little known fact that more than 270 members of that rocket team were taken, both voluntarily and involuntarily, to Russia. Had the entire German rocket team been captured by the Soviet Army, it would not have been the America flag planted on the Moon, but instead a red flag with the hammer and sickle.

He was admired and loved by many he worked with during projects Mercury, Gemini, and Apollo, yet vilified by others because of his wartime efforts developing the V-2 for the Third Reich.

04 While von Braun was still at Ft. Bliss, Texas with his team of engineers and scientists, he seriously considered the possibility of one day working in private American industry. However, rocket development was being driven by the US Army, and it was there he and his fellow Germans had the best chance of advancing rocket technology, not the commercial sector which was non-existent. He and the others on his team held out the hope that one day they could work on rocket development for peaceful purposes, including launching satellites and

04 pursuing the dream of manned spaceflight. The German rocket team chose to stay together, although some did accept offers from US businesses. Eventually, all the German rocket team members became US citizens.

05 Sputnik, of course, changed the direction and speed of American rocket development. Once again, von Braun was in the right place at the right time. In October 1949, the Secretary of the Army approved the transfer of von Braun and his team from Ft. Bliss to Redstone Arsenal, Alabama the following year—a move welcomed by practically all the Germans. Von Braun and his family settled in Huntsville. He became technical director of the Guided Missile Development Group, then Chief of Guided Missile Development Division. Von Braun was encouraged by the formation of NASA in 1958. Two years later, von Braun and his team received another transfer, this time to the newly formed Marshall Space Flight Center in Huntsville. Von Braun was appointed its first director.

The golden era of Apollo, and eclipse

06 The decision for the German rocket team to stick together was paying off. Their first big booster, the Saturn 1, built on the industry liaisons the team had established during development of the Redstone and Jupiter-C. With President Kennedy's historic decision to send American astronauts to the Moon and return them safely, Huntsville became a boomtown. The decade of the 1960s was the golden era of rocket development and the thousands of government and contractor personnel working at Marshall knew they were in a pivotal moment in history. Von Braun's responsibilities were immense but he was a superb NASA Center Director. Dr. Arthur Rudolph was director of the Saturn 5 Program Office at MSFC, and he handpicked the men responsible for the largest, most complex and powerful rocket ever conceived by man.

07 The first Saturn 5 launched was SA-501, Apollo 4, on November 9, 1967. This flight and the next, Apollo 6, were unmanned. In one of the boldest decisions of the Apollo program, Von Braun signed off on the NASA request to send the Apollo 8 crew of Frank Borman,

07 William Anders, and Jim Lovell to the Moon. Apollo 8 lifted off from Kennedy Space Center on December 21, 1968. The mission was a complete success. Von Braun remained director of MSFC until March 1970.

08 In a surprising move, he chose to accept the newly created position of Deputy Associate Administrator of Planning at NASA Headquarters. It was an extremely difficult decision for von Braun to make, and it turned out to be the first big mistake of his career. His struggles and humiliation at NASA Headquarters have been recounted by Bob Ward in his recent book *Dr. Space*. Von Braun left the space agency in June 1972 to accept a position as vice president of Fairchild Industries. Several years later, the world's most famous rocket scientist learned he had contracted cancer. His health began to decline in 1976 and was finally hospitalized later that year. He resigned from Fairchild Industries in January 1977 and was confined to his bed, growing weaker by the month. He died on June 16, 1977, only 65 years old. He was buried at Ivy Hill Cemetery in Alexandria, Virginia.

The ability of Earth to sustain intelligent life, which in turn was capable of creating machines designed to explore the Moon and the planets was clear evidence to von Braun that man and his universe were the creation of God.

Von Braun's faith

09 Von Braun, a life-long Lutheran, was a believer in intelligent design in the Universe long before it became a catch phrase and a lightning rod of debate.

10 "For me, the idea of a creation is not conceivable without invoking the necessity of design," he wrote in a letter to the California State Board of Education in September 1972. He added, "It is in scientific honesty that I endorse the presentation of alternative theories for the origin of the universe, life and man in the science classroom. It would be an error to overlook the possibility that the universe was planned rather than happening by chance."

11 While von Braun was careful to use the word theory with regard to the creation of the universe, in his mind there was no conflict or debate. The ability of Earth to sustain

11

intelligent life, which in turn was capable of creating machines designed to explore the Moon and the planets was clear evidence to von Braun that man and his universe were the creation of God.

12

It was for that reason von Braun chose, with his advancing terminal illness, a modest gravestone to cite one of his favorite passages of scripture. His gravestone reads: WERNHER VON BRAUN 1912-1977 Psalms 19:1. That scripture is: "The heavens are telling the glory of God and the firmament proclaims his handiwork."



Anthony Young's next book, Lunar and Planetary Rovers: The Wheels of Apollo and the Quest for Mars, will be published by Springer-Praxis this fall.

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Wernher von Braun

Article 3

Wernher von Braun

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Wernher von Braun

The German-born American space scientist Wernher von Braun (1912-1977), the "father of space travel," developed the first practical space rockets and launch vehicles.

Par 01 Born March 23, 1912, in Wirsitz, Posen (Germany), his father, Baron Magnus von Braun, was a founder of the German Savings Bank, a member of the Weimar Republic Cabinet and minister of agriculture. His mother, the former Emmy von Quistorp, an excellent musician and outstanding amateur astronomer, exerted a strong influence on her son.

Par 02 At the French Gymnasium, Wernher excelled in languages but failed physics and mathematics. He then attended the Hermann Lietz School at Eppersburg Castle, a school famous for its advanced teaching methods and emphasis on practical trades. He soon developed an intense interest in astronomy. Fascination with the theories of space flight then prompted him to study mathematics and physics with renewed interest. Before he graduated, he was teaching mathematics and tutoring deficient students.

Par 03 Von Braun enrolled in the Charlottenburg Institute of Technology in Berlin. He became an active member of the VfR (Verein für Raumschiffahrt, or Society for Space Travel) and an associate of Hermann Oberth, Willy Ley and other leading German rocket enthusiasts.

Par 04 Soon afterward Oberth came to Berlin at the request of the VfR, and von Braun became his student assistant. Together they developed a small rocket engine which was a technical success. Funding for the project, however, ended and Oberth returned to his native Romania. Von Braun and his associates continued their work at an abandoned field outside Berlin and used the old buildings for laboratories and living quarters.

Par 05 For a time von Braun attended the Institute of Technology in Zurich, Switzerland. There he began the study of the physiological effects of space flight, conducting crude experiments with mice in a centrifuge. The experiments convinced him that man could withstand the rapid acceleration and deceleration of space flight. He then returned to reenter Charlottenburg Institute and work at the rocket field.

Par 06 German Army Rocket Program

Adolf Hitler manipulated his way to power during the Weimar Republic and became chancellor of Germany on January 30, 1933. He then maneuvered a parliamentary coup, suspended the constitution and began rule by decree. Still smarting from the restrictions imposed by the Treaty of Versailles that ended World War I, the German army yearned to rebuild. The treaty had forbidden Germany to have any gun, cannon, or weapon with a bore exceeding three inches. But the Nazis saw a loophole. The treaty did not envision rockets and made no mention of them. So German military planners hoped to develop rockets as weapons. German army ordnance experts then began frequent visits to the rocket field and monitored the rocket development work. Impressed with the knowledge and scope of von Braun's imagination, they invited him to continue his research at the army's new Kummersdorf facilities. On Oct. 1, 1932, he officially joined the German Army Ordnance Office rocket program. He subsequently received his doctorate in physics from the University of Berlin in 1934. By that time, he was technical director at Kummersdorf with a staff of 80 scientists and technicians.

Par 07 Rocket Development at Peenemünde

The Nazis moved the rocket center to Peenemünde, on Germany's Baltic coast, in 1937 and made von Braun technical director. When World War II began, Germany gave rocket development assumed highest priority. Work was well under way on a rocket 46 feet long with a thrust of 55,000 pounds, the largest in the world at that time. (By contrast, Oberth's first rocket had a thrust of 20 pounds; the Saturn V booster stage generated a thrust of 7.5 million pounds.) This rocket, later to be known as the V-2, was an enormous technical challenge. It required significant advances in aerodynamics, propulsion and guidance. Von Braun's team attacked the problems, and despite initial setbacks, persevered. They successfully produced V-2. The Nazis wanted it as a weapon of war. Von Braun had a different vision: space travel.

Par 08 His interest in space exploration rather than military application led to his arrest and imprisonment by the German secret police. The Nazis released him only after they realized the implication of jailing their lead rocket scientist. The program lurched backward without his leadership. It disrupted Hitler's timetable for the war.

Par 09 By 1943 the rocket complex at Peenemünde was a priority Allied target. When Germany was near collapse, von Braun evacuated his staff to an area where they might be captured by the Americans. He reasoned that the United States was the nation most likely to use its resources for space exploration. He led more than 5,000 of his associates and their families to the southwest just before the Russians advanced into the abandoned rocket development center. The rocket team surrendered to U.S. Forces on May 2, 1945.

Par 10 Early U.S. Rocket Experiments

During interrogation by Allied intelligence officers, von Braun prepared a report on rocket development and applications in which he forecast trips to the moon, orbiting satellites and space stations. Recognizing the scope of von Braun's work, the U.S. Army authorized the transfer of von Braun, 112 of his engineers and scientists, 100 V-2 rockets and the rocket technical data to the United States.

Par 11 Von Braun and his advance group arrived in the United States as "wards of the Army" on Sept. 29, 1945. They arrived at Ft. Bliss, Tex. with a mandate to re-assemble and further develop A-4 rockets, the German successor to the V-2. There they taught what they knew to what was then a limited audience. The team moved what is now White Sands Proving Grounds in New Mexico in 1946 and then to Redstone Arsenal in Huntsville, Alabama in 1950 where von Braun remained for the next twenty years. He used his free time to write about space travel and to correspond with his family and his cousin, Maria von Quistorp. In early 1947 he obtained permission to return to Germany to marry Maria. They had three children.

Par 12 Von Braun continued work on V-2 launchings, conducting some of the earliest experiments in recording atmospheric conditions, photographing the earth from high altitudes, perfecting guidance systems, and conducting medical experiments with animals in space. He also completed his book, *The Mars Project*, an account of planetary exploration, but he was unable to interest a publisher until much later.

Par 13 The U.S. Army gave von Braun the job of developing the Redstone rocket, which was to play a significant role in America's early space program. On April 15, 1955, von Braun and 40 of his associates became naturalized citizens.

Par 14 The Russian space program outstripped that of the United States in the 1950s. Von Braun warned American officials of this repeatedly, in official communications and in public speeches, but his numerous requests for permission to orbit a satellite were denied. When the Russians successfully orbited *Sputnik I* and the U.S. Navy's Vanguard program failed, the United States finally unleashed von Braun's group. Within 90 days, using a modified Redstone rocket (the Jupiter C), and with the cooperation of the Jet Propulsion Laboratory of the California Institute of Technology, the team launched into orbit the free world's first satellite *Explorer I* on January 31, 1958.

Par 15 U.S. Space Program

After creation of the National Aeronautics and Space Administration, they appointed von Braun director of the George C. Marshall Space Flight Center at Huntsville on July 1, 1960. For the first time, von Braun found his efforts directed to the development of launch vehicles solely to explore space. The space agency sought his advice about techniques later used in the landing on the moon. On Oct. 27, 1961, agency launched the first Saturn I vehicle. It was 162 feet long, weighed 460 tons at lift-off, and rose to a height of 85 miles. On Nov. 9, 1967, the newer Saturn V made its debut. It was more than twice as long as the Saturn I. Just before Christmas, 1968, a Saturn V launch vehicle, developed under von Braun's direction, launched *Apollo 8*, the world's first spacecraft to travel to the moon. In March 1970, the National Aeronautics and Space Administration (NASA) transferred von Braun to its headquarters in Washington, D.C., where he became Deputy Associate Administrator.

Par 16 Von Braun resigned from NASA in July, 1972, to become vice president for engineering and development with Fairchild Industries of Germantown, Maryland. Besides his work for that aerospace firm, he continued his efforts to promote human space flight, helping to found the National Space Institute in 1975 and serving as its first president. On June 16, 1977, he died of cancer at a hospital in Alexandria, Virginia.

Par 17 Von Braun was always a firm believer in personal experience as a teacher, and often took part in experiments conducted to determine the physiological aspects of space flight. Long before the acceptance of the feasibility of space flight, he subjected himself to experiments in weightlessness and high acceleration.

Par 18 Considered one of the world's great scientists, von Braun was a profoundly religious man. On one occasion he remarked: "We should remember that science exists only because there are people, and its concepts exist only in the minds of men. Behind these concepts lies the reality which is being revealed to us, but only by the grace of God."

Further Reading

Erik Bergaust, *Reaching for the Stars* (1960); Helen B. Walters, *Wernher von Braun: Rocket Engineer* (1964); Heather M. David, *Wernher von Braun* (1967); and John Goodrum, *Wernher von Braun: Space Pioneer* (1969). The most detailed accounts of German rocket development under Von Braun and the experiences of the German rocket team are in Walter Dornberger, *V-2* (1952; trans. 1954), and Dieter K. Huzel, *Peenemünde to Canaveral* (1962). An excellent account of the U.S. Army's rocket development efforts under Von Braun and the launching of *Explorer I* is given in John B. Medaris, *Countdown for Decision* (1960). For additional background see Wernher von Braun and Frederick I. Ordway, *History of Rocketry and Space Travel* (1967); Edward O. Buckbee, *Biographical Data: Wernher von Braun* (1983); Hunt, Linda, *Secret Agenda: The United States Government, Nazi Scientists, and Project Paperclip* (1991); and Ernst Stulinger and Frederick Ordway, *Wernher von Braun: Crusader for Space* (1994). □