

# **Albert Einstein and Wernher von Braun – the two great German-American Physicists seen in a Historical Perspective**

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## **Abstract**

It was Albert Einstein who changed our view of the universe to be a non-Euclidean curved space-time. And it was Wernher von Braun who showed how to make the first step to take us into this universe, leaving the gravitational field of our planet earth, with the landing a man on the moon the greatest event in human history. Both these great physicists did this on the shoulders of giants. Albert Einstein on the shoulders of his German landsman Bernhard Riemann, and Wernher von Braun on the shoulders of Goddard and Oberth. Both Einstein and von Braun made a Faustian pact with the devil, von Braun by accepting research funds from Hitler, and Einstein by urging Roosevelt to build the atom bomb (against Hitler). Both of these great men later regretted the use of their work for the killing of innocent bystanders, even though in the end the invention of nuclear energy and space flight is for the benefit of man. Their example serves as a warning for all of us. It can be formulated as follows: "Can I in good conscience accept research funds from the military to advance scientific knowledge, for weapons developed against an abstract enemy I never have met in person?" Weapons if used do not differentiate between the scientist, who invented these weapons, and the non-scientist.

In this short essay I will show that there are many surprising parallels in the life of Albert Einstein and Wernher von Braun, the two great German-American physicists who had a decisive influence on the history of the 20<sup>th</sup> century.

I will begin with the controversy: The making of a Faustian pact with the devil, by Wernher von Braun in accepting research funds from Hitler for the development of space rockets, and by Albert Einstein in urging President Roosevelt to build the atom bomb. This example shows how the devil can appear in different forms: Either in Hitler as a person, or in the atom bomb as a thing. But in whatever way the devil appears, he ultimately demands his due: In the about 20,000 concentration camp inmates who died in making the tunnels into which the factory to build the V2 rocket was later installed, and in the 200,000 Japanese civilians killed by the atomic bombs dropped on Hiroshima and Nagasaki. Neither von Braun nor Albert Einstein can be made personally responsible for this outcome, von Braun did not command the building of the tunnels and Einstein did not order the dropping of the bombs. But in later years Einstein and von Braun repressed this entire problem in the sense of Freud. That is all I can say about this controversy.

Einstein's masterpiece is the general theory of relativity and gravitation, and Wernher von Braun's masterpiece the moon rocket. One may think that only rockets and atom bombs can have evil applications, but not the general theory of relativity. Unfortunately, this is not true. It is the Global Positioning System (GPS), which depends for its accuracy on the general theory of relativity, the only known practical application of general relativity. It is of great non-military importance, but it can also be used to guide missiles. In general, almost every scientific

discovery may have an evil application, and the scientist is always confronted with a Faustian bargain. But even though we must give the devil its due, we demand from him our piece of the action for good purposes as well.

The devil, of course, is only a metaphor for an evil force. To make it easier for this force to act, it offers us a mechanism to indirectly kill a perceived enemy we never have met in person, by pushing a button to fire a rocket or drop a bomb.

From a cultural perspective Albert Einstein and Wernher von Braun have many things in common. Both were highly educated and shared the German culture. I must only think about Einstein's masterful command of the German language in his autobiographical notes. They show his in-depth reading of the German classics, like Goethe, Schiller and Kant. His scientific writings are distinguished by their great clarity. And both Einstein and von Braun were excellent writers in popularizing their ideas. Einstein and von Braun had a brief contact around 1930 at the time von Braun was 18 years old and a member of the German Space Flight Society in Berlin. In a letter to this Society, Einstein acknowledged the potential of liquid fuel rockets for space flight. It is regrettable that von Braun never met Einstein in later years. Von Braun was an accomplished amateur musician who could play from memory Beethoven and Bach, and Einstein played the violin. Von Braun who at an early age learned to play the Cello and the piano, wanted to become a composer and took lessons from Paul Hindemith, the famous German composer, whose modern music was denounced by Goebbels, not only because Hindemith's wife was Jewish. A few pieces of von Braun's youthful compositions still exist, and probably have the imprimatur of Hindemith's style.

For von Braun all that changed at the age of 13 with the book "The Rocket into Planetary Space" by Hermann Oberth. Von Braun realized that flying to the moon would be the greatest event in human history, and he decided to dedicate his life to reach this goal.

For Albert Einstein the great moment in his life came in 1915, when he realized that gravity could be understood as a physical manifestation of a curved space-time. The mathematics to describe curved spaces was invented by his landsman the mathematician Bernhard Riemann, and by Einstein replacing the formerly used letter K with the letter R for the Riemann curvature tensor, Einstein recognized Riemann as his spiritual father. The great moment for Wernher von Braun came in the month of October 1942, when at its 3<sup>rd</sup> test, his large A4 rocket worked with perfection, reaching for the first time in history outer space. He now was certain that the flight to the moon would be possible; one just would have to make the rocket bigger. And from that moment on he was a different person, as was Einstein following the observed bending of light by the gravitational field of the sun during the 1918 eclipse, confirming the general theory of relativity.

In 1969, von Braun's efforts culminated in the landing of a man on the moon, a feat achieved together with President Kennedy, who shared von Braun's vision, and the American people, with about 400,000 engineers and ordinary workers, all of them contributing to the Apollo moon landing project. The landing on the moon, not only was the greatest event in human history but also the greatest victory for America: A victory in peace by the good, hard working church-going taxpaying Americans. For a few days they united mankind, with all men praying for the safe return of the courageous astronauts walking on the moon.

At the time I was a 10 year old, it was believed that the planet Venus might resemble the Earth during the Jurassic period. When it was discovered that Venus is more like Dante's hell and Mars a cold barren planet, the romantic idea of man emigrating to other planets was gone. With robotic space craft we can explore all the strange worlds of our solar system, but there is

something much more important, and it is this something which brings together Einstein and von Braun. As our knowledge of atomic and nuclear physics was obtained by experiments done in terrestrial laboratories, gravity must likewise be explored by experiments within the solar system. It is here where the extraordinary potential of space flight to explore Einstein's theory of gravity enters. One of the most outstanding unsolved problems of physics is quantum gravity. It raises the question, if quantum theory or general relativity may have to be replaced by a theory shedding light on a deeper level of reality. One mystery of quantum theory, first fully recognized by Einstein, Rosen and Podolski, are the strange superluminal correlations for entangled states. According to the Copenhagen interpretation they should be preserved over arbitrary large (even intergalactic) distances. Experiments have proven their existence over at least 10 meters. But suppose we discover that they are broken at distances accessible by interplanetary space flight missions, this not only would invalidate quantum mechanics, but if this breakdown should be anisotropic, with the anisotropy depending on the velocity against some cosmic reference frame, this would establish the existence of a preferred inertial reference system in which this dependence is isotropic, invalidating both the theory of relativity and quantum theory.

Einstein unified mankind with his vision of the Universe. Von Braun unified mankind in making its first step to enter Einstein's universe. Von Braun must have felt that space-flight – the fulfillment of the age old dream of the flight to the stars – can overcome the age old hostility between man, ultimately overcoming war.

The history of Western civilization began with the age of the artist, represented by individuals like Michelangelo and Mozart, followed by the age of the scientist, represented by individuals like Newton and Einstein, finally, there is the age of the engineer, represented by individuals like the Wright brothers and Wernher von Braun.

## **Appendix**

Following my lecture there were a few questions from the audience. I will try to answer these questions as I remember them:

1. One question was if some of von Braun's musical compositions still exist. This question I could not answer, but in the meantime I have learned that a few pieces still exist.
2. The question was raised how could von Braun be compared with Einstein, since von Braun was a member of Hitler's SS, and that concentration camp inmates were used in the production of the V2.

My answer to this question has of two parts. First: it is true that von Braun was given an honorary membership in the SS, which in a totalitarian state he could not refuse to accept, but he never commanded any SS troops. The father of the past German President Richard von Weizsaecker and of the physicist Carl Friedrich von Weizsaecker, was also forced to accept such an honorary SS- membership. The difference is that the Gestapo had arrested von Braun and put him into jail, when he failed to accept Himmler's demands. He was only set free by the intervention of Speer who had the ear of Hitler.

The question of von Braun's membership in the SS can also be answered by the following question: Was Sakharov a Stalinist, because he had accepted the Stalin prize?

Second: With regard to the concentration camp inmates who worked in the V2 factory, these were selected individuals who had technical skills. Because it is impossible to build a high-tech

device with half-dead people, these individuals had to be treated comparatively well and could in this way be saved. The same happened with Gulag prisoners in Sakharov's H-bomb factory. One can speak of a von Braun list, very much as one speaks of Schindler's list. In fact, one of the former concentration camp inmates who after the war emigrated to Australia thanked Arthur Rudolph in a letter for his survival. It was Rudolph, von Braun's top engineer who designed for von Braun the large Saturn V moon rocket booster. He was the technical director of the underground factory where the V2 was mass-produced with the help of concentration camp inmates. Nobody in his right mind can deny the crimes by Hitler, but nobody should make the German workers and engineers, working side by side with the inmates, responsible for these crimes. In a large war crimes trial after the war, in Essen, about 200 former inmates appeared as witnesses, but not one of them accused the German workers and engineers of any crimes.