Works of j robert oppenheimer philosophy essay

Thought of as one of the most genius minds of his time, J. Robert Oppenheimer was an influential figure in 20th century physics, nuclear energy, and political controversy. Before directing the most famous atomic bomb project in history, he made many discoveries and contributions to physics. He was also a symbol of the persecution of the communist scare of the 1950s. He was noted for being one of the most intelligent people in his field, with a remarkable understanding of any problem.

J. Robert Oppenheimer was born on April 22, 1904 in New York, NY. In 1927, he earned a Ph. D from a German university. Throughout his life, he was very involved in education and science. From 1927 to 1947, he was a professor at University of California at Berkeley. He was very influential there, establishing a research center for theoretical physics. He also taught at the California Institute of Technology. Oppenheimer served as director of the Institute for Advanced Study in Princeton, NJ from 1947 to 1966 (Stanley 812).

Oppenheimer is probably most well known for his work on the atomic bomb. From 1942 to 1945, he directed the Manhattan Project, the United States' development of the first nuclear weapons. From 1947 to 1952, Oppenheimer headed the advisory committee for the United States Atomic Energy Commission (Stanley 812). On February 18, 1967, Oppenheimer passed away due to throat cancer (" Oppenheimer, J. Robert" 573).

Oppenheimer made many important contributions to the study and research of physics. He spent much of his time researching the energy processes of subatomic particles, and studied quantum theory (" Oppenheimer, J. Robert"

573). He worked with physicist Max Born on subatomic particle research in 1927. They together developed the Born-Oppenheimer Approximation. This theory states that in calculations, the vibration and spin of protons can be ignored. This is because the mass of a proton is so much greater in comparison to the mass of the electron that the effects of the electron are negligible (Carnes 747).

Another of his discoveries was the Oppenheimer-Phillips Process. This was published by Oppenheimer and physicist Melba Phillips in 1935. Also called strip reaction, this process is a deuteron-induced nuclear reaction. A deuteron is a hydrogen isotope with one proton and one electron. In the process, a deuteron fuses with a target nucleus to make a heavier isotope and eject a proton. This works because as the deuteron approaches the positively charged target nucleus, a process called charge polarization causes the neutron to face the target nucleus and the proton to face away. The process occurs when the binding energy between the neutron and the target nucleus is greater than the binding energy of the deuteron. The left over proton is then repelled from the nucleus. This process allows for nuclear interactions at lower energies (“ Oppenheimer-Phillips Process” 2010).

Oppenheimer also contributed to quantum physics and the study of space. He collaborated with other physicists to create the Tolman-Oppenheimer-Volkoff limit. This limit is an upper bound to the mass of neutron stars, which are stars made of neutron-degenerate matter. They estimated this limit to be approximately 3 to 5 solar masses. The actual limit is uncertain because the equations of state for this type of matter are not known very accurately, and to find a numerical solution is extremely difficult. They discovered that above

this limit, the star would either collapse into a black hole, or change into some other type of matter (“ Tolman-oppenheimer-volkoff limit” n. d.).

Oppenheimer made many other discoveries in physics. One of the many things Oppenheimer studied was quantum tunneling. Quantum tunneling is when an electron can tunnel through an electric field even if its energy is lower than that of the field. For this to happen, the electron must be considered as an electron wave. When the electron would usually be repelled by the electric field, the wave has a chance of making it through the field. The process of quantum tunneling has many applications in nuclear physics and radioactive decay (“ Quantum tunneling” n. d.). He also researched quantum theories on molecules and their spectra. He did studies on the process of transitions in the continuous spectrum and showed a quantum-mechanic method of the photoelectric effect. He did a lot of work on subatomic particles, including processes of electron capture and exchange, and collisions between electron and atoms. He also studied particles called mesons, which are subatomic particles made of one quark and one antiquark, and their effects on nuclear forces. Oppenheimer’s other work on quantum physics included his study of cosmic-ray showers and quantum electrodynamics (“ J. Robert Oppenheimer” 1998).

Some of his discoveries were ahead of many other scientists. In the early 1930s, he proved the existence of a high-energy particle which was the complement to the electron, years before the positron was discovered in 1932. In 1939, he wrote a paper called “ On Continued Gravitational Contraction.” This paper predicted the existence of black holes, dying stars whose gravitational pull exceeds their energy production (Carnes 748).

Oppenheimer is famous for being a huge influence on the development of the atomic bomb. In 1942, General Leslie Groves offered Oppenheimer the job of directing the bomb design unit of the Manhattan Project. Oppenheimer immediately began making the project a success. He recruited scientist from all over to work on the project, and eventually supervised over 1500 people. It was said that he knew everything that was going on during the project, and easily understood all aspects of the development of the bomb (Carnes 749).

The type of atomic bomb that Oppenheimer worked on was called the “ gun-assembly” model. This worked by firing two sub-critical pieces of enriched uranium toward each other. On impact, they would attain their critical mass and start a chain reaction which would set of the nuclear explosion. However, Oppenheimer’s team faced a few problems in the development of this bomb. The first problem was that there was not enough fissionable uranium in the United States to make a bomb. Plutonium was the alternate material to make the bomb, but it is was very unstable and there was a chance that it would pre-detonate with the design they had developed, which would be disastrous. However, Oppenheimer and his team quickly came up with solutions (Carnes 749).

The solution that Oppenheimer worked to develop was to create a bomb that could bring sub-critical masses of plutonium together within a fraction of a second, so they could not pre-detonate. His team developed ways to do this, such as making a hollow sphere of plutonium coated with high explosives. Another idea was a high-explosive lens that would focus the shock wave and squeeze the plutonium to critical mass, which was about 1. 5 inches.

Oppenheimer and his team’s years of hard work was a success in 1945. In August, the “ gun-assembly” uranium bomb “ Little Boy” was dropped on Hiroshima, Japan. Two days later, the “ gun-assembly” plutonium bomb “ Fat Man” was dropped on Nagasaki, Japan, which was a turning point in World War II (Carnes 750).

Oppenheimer is also famous for being a figure of the persecution and rampant fear that was prevalent in the 1950s. Because of the Communist scare, although he had devoted years of work to helping the United States Government, in 1954, Oppenheimer was accused of being disloyal to the United States. He was investigated and conspired against because he was thought to be treasonous and thought to have communist ties. He was cleared of the charges, but because he had been investigated, his access to secret information was denied, meaning he could not work on any more top-secret government project (Stanley 812). Many years later, in 1963, President Lyndon Johnson reinstated his secret clearance (“ Oppenheimer, J. Robert” 573). Also in 1963, The United States Atomic Energy Commission awarded him the prestigious Enrico Fermi Award for his contributions (Stanley 812).

Oppenheimer’s many contributions have left an impact on the 20th and 21st centuries. His most obvious legacy is his influential role in developing the atomic bomb. His work was the basis for the invention of even more powerful weapons, like the hydrogen bomb, and contributed to the Cold War and nuclear arms race. He also had a great impact on science. His discoveries spanned many different fields of physics, including sub-atomic mechanics, astrophysics, quantum mechanics, and nuclear physics. His work was the

basis for many other scientists' achievements, and he was regarded as one of the most brilliant minds in his time. It was thought odd that he never won a Nobel Prize, but it may have been because his work was in so many different fields that he did not have a specific concentration. He also left a legacy in education. Oppenheimer established a graduate program at Berkeley, which was the first opportunity for American students to study physics. He also greatly improved the Institute for Advanced Study in Princeton in a similar way (" Oppenheimer's legacy" 2010).

J. Robert Oppenheimer was one of the most important figures in American physics during the 20th century. His research across several aspects of physics paved the way for many other scientists, as well as earning him fame and respect for his work. He also left his mark in many other facets of history, including nuclear war, politics, education, and the intellectual community in general. His charisma, intellect, and impressive genius inspired thousands of Americans and many others around the world. Oppenheimer's great achievements and lasting legacy have made him one of the most recognized influences on the 20th century.