

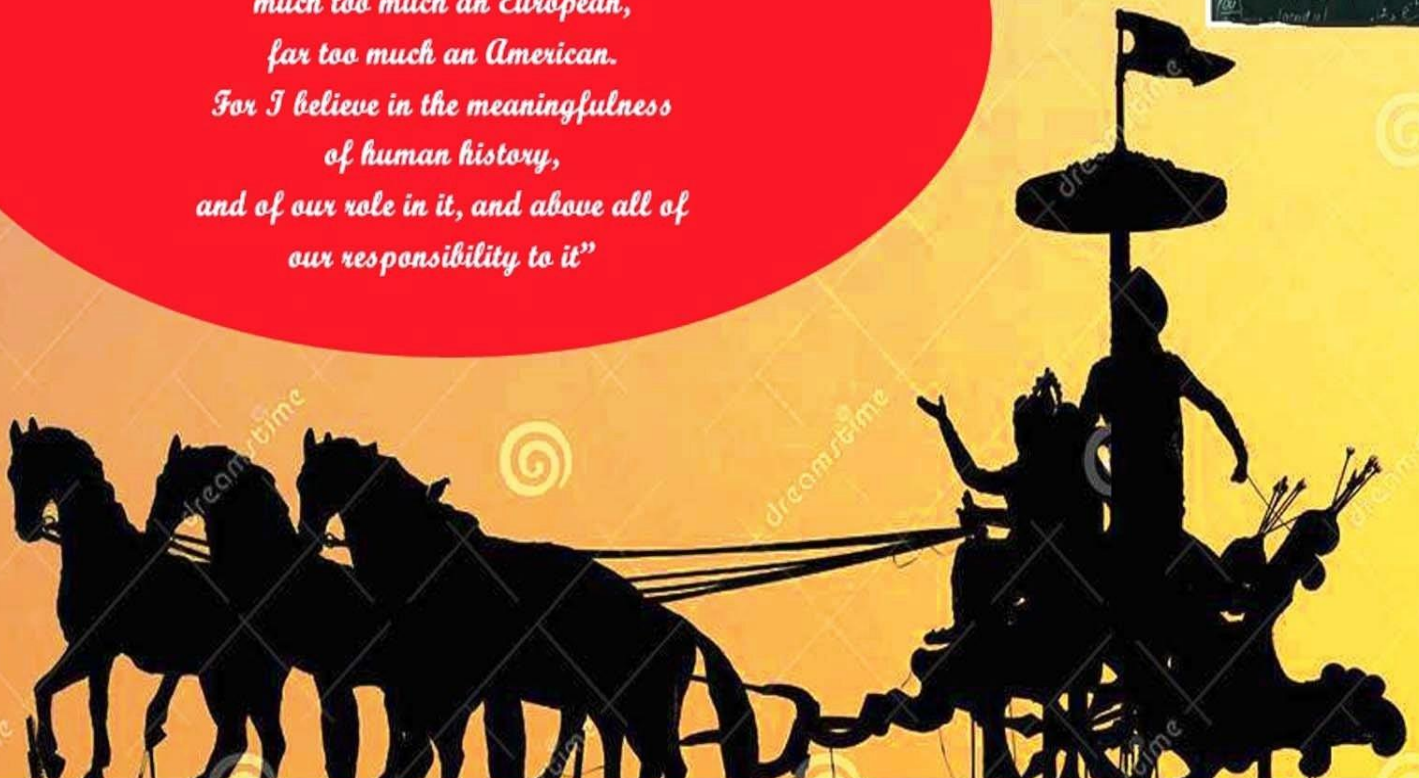
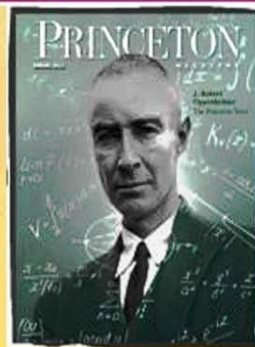


# IAS MAGAZINE

Indian Association of Sedimentologists

## *Bhagavad Gita and J. Robert Oppenheimer*

*"If I cannot be comforted by Vishnu's argument to Arjuna,  
it is because i am too much a Jew,  
much too much a Christian,  
much too much an European,  
far too much an American.  
For I believe in the meaningfulness  
of human history,  
and of our role in it, and above all of  
our responsibility to it"*



*Quote from speech by Oppenheimer in thr summer of 1960 (Source: Monk 2016)*

The "IAS Magazine" is an online "fellowship magazine of the Indian Association of Sedimentologists (IAS) which publishes news about science, people, the society and articles of general interest science and achievements of sedimentologists / allied scientists of international repute and their contributions relevant to the society. The Magazine is being published online biannually in June and December. The authors may submit their articles to the Magazine online at [journal.indiansedimentologists.com](http://journal.indiansedimentologists.com). The guidelines for the format of the articles are given on the same website.

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## Review Article

# The Life and Travails of J. Robert Oppenheimer, the Nuclear Scientist

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### ABSTRACT

‘Oppenheimer’ is a 2023 epic, biographical film about an American theoretical physicist Julius Robert Oppenheimer. He is considered the “father of the atomic bomb”. The film is brilliantly written and directed by Christopher Nolan. The film, based on the 2005 biography “American Prometheus” by Kai Bird and Martin J. Sherwin, chronicles the complex and consequential career of J. Robert Oppenheimer. The story begins with Oppenheimer’s postgraduate studies at the University of Cambridge (England) and at the University of Göttingen (Germany), details his direction of the Manhattan Project during World War II in developing nuclear weapons at the Los Alamos National Laboratory (LANL) in New Mexico (USA), and ends with his eventual fall from grace due to his 1954 security hearing based on the false premise that J. Robert Oppenheimer was a communist spy who was passing secret information on nuclear research to the Soviet Union.

Nolan’s ‘Oppenheimer’ is the pinnacle of movie making. Nolan has delicately interwoven the intricate domains of quantum physics, human ingenuity, cruel politics, morality, legality, and ethics into a timely masterpiece and into an explosive emotional thriller. The four principal cast members (1) Cillian Murphy as J. Robert Oppenheimer, (2) Emily Blunt as Katherine "Kitty" Oppenheimer (wife), (3) Matt Damon as Gen. Leslie Groves, and (4) Robert Downey Jr. as Lewis Strauss perform their role flawlessly. Murphy, in particular, uncannily acts and resembles the real-life J. Robert Oppenheimer. In addition, the performances by Florence Pugh as Jean Tatlock and by Tom Conti as Albert Einstein are superb. The story is told in alternating black and white (Strauss’ version of events) and color (Oppenheimer’s version of events) scenes. The haunting musical score by Ludwig Göransson synchronizes perfectly with the movie plot. When the bomb explodes at the Trinity climax scene, the sound goes totally silent! Oppenheimer’s story is the real-life vindication of the truth after 68 years (1954–2022). A must watch Nolan’s thriller for this Nuclear Age!

Thus, the said movie has triggered me to make an attempt to comprehensively capture the chronology of events covering 153 years of history (1870–2023) associated with J. Robert Oppenheimer, some events not covered in the movie plot is included in this review article with 48 Figures and 8 Appendixes. The purpose is to permanently etch in history the scientific contributions made by J. Robert Oppenheimer and by his colleagues at the Manhattan Project, which not only ended the World War II, but also sprung open a new world of freedom for humanity.

Let there be no doubt that J. Robert Oppenheimer was a genuine patriotic American of our time and therefore, my only fervent hope is that our generation acknowledges, remembers, and admires their contributions and sacrifices, without which the fragile freedom that we enjoy today, even after 80 years later, would not have been possible. His legacy is one of historical greatness.

### KEYWORDS:

J. Robert Oppenheimer, Christopher Nolan, Cillian Murphy, The Manhattan Project, Trinity Test, Atomic Bomb, Los Alamos National Laboratory (LANL), Institute for Advanced Study, *Bhagavad Gita*, Atomic Energy Commission (AEC), World War II, Albert Einstein

### CONTENTS:

Abstract  
Keywords  
Introduction  
Oppenheimer: The Movie

*Birth and his Scientific Rise (1904–1945)*  
Early Years, New York City  
Harvard University, USA  
University of Cambridge, UK  
University of Göttingen, Germany  
Visiting Scientist in the Netherlands and Switzerland  
Teaching at the University of California, Berkeley  
Social Activist  
*Bhagavad Gita*  
The Solvay Physics Conference  
Marriage and Family  
Manhattan Project  
Los Alamos National Laboratory, New Mexico  
A Gracious Host  
An Avid Reader  
A Genius  
Important Scientists and Engineers  
The atomic bombs (1945)  
*Events leading to J. Robert Oppenheimer's Political Fall (1945–1954)*  
Aftermath and Feud with the President  
Institute for Advanced Study, Princeton  
Atomic Energy Commission (AEC)  
Revocation of Security Clearance  
Response to Revocation  
*Events leading to J. Robert Oppenheimer's Vindication (1954 – 2022)*  
John F. Kennedy  
The U. S. Virgin Islands  
Death and Memorial Service in Princeton  
After the Death of J. Robert Oppenheimer  
J. Robert Oppenheimer's Impact and Legacy  
Epilogue  
Memorable Scenes from the Movie  
Acknowledgements  
References  
Appendix A: Table 1. Nobel Laureates  
Appendix B: Table 2. Timeline  
Appendix C: Table 3. Key people  
Appendix D: Table 4. Kennedy Dinner participants  
Appendix E: Table 5. J. Robert Oppenheimer publications  
Appendix F: Table 6. Einstein's Letter to President Roosevelt  
Appendix G: Table 7A and B. Library of Congress Papers  
Appendix H: Original Article. Born–Oppenheimer Approximation.

## INTRODUCTION

My interest in J. Robert Oppenheimer was peaked when I learned that his first love was geology and that he delivered his invited lecture at the New York Mineralogical Club at the age of 12. My interest was doubled when I read his quote from the Bhagavad Gita in expressing his emotions following the first nuclear test. When one combines his phenomenal success as a scientist with his prophetic vision for the current nuclear age, it is important that we understand and appreciate his unique traits. Therefore, this is just not a movie review but more than that; it is a comprehensive compilation of facts

and events that were an integral part of this intellectual giant and recorded as such here in chronological order for better understanding of his persona, his scientific rise, his political fall and finally his vindication, though posthumously.

The specific attributes thus covered in this review are as follows:

- Oppenheimer, the Movie.
- A compendium of 48 Figures and 8 Appendixes related to his life's journey.
- In capturing the great wealth of scientific, political, personal, and cultural intrigues that

surround J. Robert Oppenheimer, I have included many events that are not covered in the movie.

- In documenting his brilliant academic accomplishments, I have emphasized his link /connection to 50 Nobel Laureates / Nobel Prizes (Table 1 in Appendix A).
- Biographical events covering 153 years of history from 1870 to 2023 are chronologically listed (Table 2 in Appendix B).
- There is also a photographic atlas of his life with images of:
  - 1) Academic institutions (University of California at Berkeley, University of Chicago, Columbia University, Harvard University, University of Cambridge, University of Gottingen, University of Leiden, Institute for Advanced Study),
  - 2) Scientists (Einstein, Rutherford, Bohr, Heisenberg, Bethe, Fermi, Lawrence, Dyson, Feynman, among others),
  - 3) The U. S. Presidents (Roosevelt, Truman, Eisenhower, Kennedy, Johnson, and Nixon),
  - 4) Books (Bhagavad Gita),
  - 5) Instruments (Calutron),
  - 6) Atomic bombs (Uranium based Little Boy and Plutonium based Fat Man),
  - 7) Oppenheimer Beach (St. John), and
  - 8) Oppenheimer Crater (Moon).

Some photographs are of poor resolution due to their provenance of 120 years.

- For providing some clarity on related issues, I have included the required details about his younger brother Frank, his son Peter, his mistress' death at 29, his daughter's death at 32, and his wife's death in Panama City.
- In addition to Appendix A and B, I have included a list of Key people and their contributions in Table 3 (Appendix C), a list of 45 out of 49 Nobel Laureates who attended the White House Dinner hosted by President John F. Kennedy in Table 4

(Appendix D), a list of his publications from 1926 to 1979 in Table 5 (Appendix E), Einstein's Letter to President Roosevelt in Table 6 (Appendix F), Library of Congress Oppenheimer Papers in Table 7 (Appendix G), and the original Article in German (first page) of the 1927 Born—Oppenheimer Approximation (Appendix H).

Basic data for this review have been obtained from multiple print and online sources, which include Groueff (1965), NBC News (1965), Losin (1967), Kelly (2002), Bird and Sherwin (2005), Cassidy (2009), BuzzFeed (2013), Monk (2014), McGarth (2019), AHF (2022a, b), Bella (2023), DOE (2023a, b, c, d, e, f, g, h, i), IAS (2023), LANL (2023), Little (2023), Mancini (2023), NPS (2023a, b), New York Times (2023), Rivera (2023), Wikipedia (2023a—z10), and many videos (e.g., Murrow, 1955; A&E Biography, 1995; McMillan, 2014; Monk, 2016; Kean, 2023; NSRC (2023a, b, c; The People Profiles, 2023; Yorston, 2023). In particular, in a recent video by Carr (2023), one can listen to the first-hand account of the Los Alamos National Laboratory as told by Frank Oppenheimer, Hans Bethe, Emilio Segre, Harold Agnew, Stan Ulam, Victor Weisskopf, George Kistiakowsky, Philip Morrison, Priscilla Duffield, Dorothy McKibbin, Isidor Rabi, Robert Wilson, Edwin McMillan, Edward Teller and Robert Bacher in an early 1980s documentary produced by the Los Alamos National Laboratory. Minor redundancy in content between the text and Table 2 is necessary.

I hope that this review would serve as an inspiring lesson on science, culture, and politics for younger generations.

#### **OPPENHEIMER: THE MOVIE (FIG. 1)**

Since the starting point for this review is the Movie on J. Robert Oppenheimer, it will be appropriate to acknowledge and summarize the same as below:



Fig. 1. Theatrical release poster by Universal Pictures. Wikipedia (2023a).

<b>Directed by</b>	Christopher Nolan
<b>Screenplay by</b>	Christopher Nolan
<b>Based on</b>	<i>American Prometheus</i> by Kai Bird Martin J. Sherwin
<b>Produced by</b>	Emma Thomas Charles Roven Christopher Nolan
<b>Cast Members</b>	<ul style="list-style-type: none"> <li>• Cillian Murphy as J. Robert Oppenheimer</li> <li>• Emily Blunt as Katherine "Kitty" Oppenheimer</li> <li>• Matt Damon as Gen. Leslie Groves</li> <li>• Robert Downey Jr. as Lewis Strauss</li> <li>• Florence Pugh as Jean Tatlock</li> <li>• Josh Hartnett as Ernest Lawrence</li> <li>• Casey Affleck as Boris Pash</li> <li>• Rami Malek as David L. Hill</li> <li>• Kenneth Branagh as Niels Bohr</li> <li>• Benny Safdie as Edward Teller</li> <li>• Jason Clarke as Roger Robb</li> <li>• Dylan Arnold as Frank Oppenheimer</li> <li>• Tom Conti as Albert Einstein</li> <li>• James D'Arcy as Patrick Blackett</li> <li>• David Dastmalchian as William L. Borden</li> <li>• Dane DeHaan as Maj Gen. Kenneth Nichols</li> <li>• Alden Ehrenreich as a Senate aide to Lewis Strauss</li> <li>• Tony Goldwyn as Gordon Gray</li> <li>• Jefferson Hall as Haakon Chevalier</li> <li>• David Krumholtz as Isidor Isaac Rabi</li> <li>• Matthew Modine as Vannevar Bush</li> <li>• Gustaf Skarsgård as Hans Bethe</li> <li>• Michael Angarano as Robert Serber</li> </ul>

	<ul style="list-style-type: none"> <li>• Jack Quaid as Richard Feynman</li> <li>• Josh Peck as Kenneth Bainbridge</li> <li>• Olivia Thirlby as Lilli Hornig</li> <li>• Christopher Denham as Klaus Fuchs</li> <li>• David Rysdahl as Donald Hornig</li> <li>• Louise Lombard as Ruth Tolman</li> <li>• Harrison Gilbertson as Philip Morrison</li> <li>• Trond Fausa Aurvåg as George Kistiakowsky</li> <li>• Olli Haaskivi as Edward Condon</li> <li>• Devon Bostick as Seth Neddermeyer</li> <li>• Macon Blair as Lloyd K. Garrison</li> <li>• Kurt Koehler as Thomas A. Morgan</li> <li>• Josh Zuckerman as Giovanni Rossi Lomanitz</li> <li>• Alex Wolff as Luis Walter Alvarez</li> <li>• Guy Burnet as George Eltenton</li> <li>• Emma Dumont as Jackie Oppenheimer</li> <li>• Jack Cutmore–Scott as Security Officer Lyall Johnson</li> <li>• Scott Grimes as Counsel</li> <li>• Gary Oldman as Harry S. Truman</li> <li>• Hap Lawrence as Lyndon B. Johnson</li> <li>• Harry Groener as Sen. Gale W. McGee</li> <li>• Pat Skipper as Secretary of State James F. Byrnes</li> <li>• Gregory Jbara as Chairman Warren Magnuson</li> <li>• Tim DeKay as Sen. John Pastore</li> <li>• James Remar as Secretary of War Henry Stimson</li> <li>• Danny Deferrari as Enrico Fermi</li> <li>• Máté Haumann as Leo Szilard</li> <li>• Matthias Schweighöfer as Werner Heisenberg</li> <li>• James Urbaniak as Kurt Gödel</li> <li>• Rory Keane as Hartland Snyder</li> </ul>
<b>Cinematography</b>	Hoyte van Hoytema
<b>Edited by</b>	Jennifer Lame
<b>Music by</b>	Ludwig Göransson
<b>Production companies</b>	Syncopy Inc. Atlas Entertainment
<b>Distributed by</b>	Universal Pictures
<b>Release dates</b>	July 11, 2023 (Le Grand Rex) July 21 (United States and United Kingdom)
<b>Running time</b>	180 minutes
<b>Countries</b>	United States United Kingdom
<b>Language</b>	English
<b>Budget</b>	\$100 million
<b>Box Office</b>	\$948.6 million (Nov. 7, 2023)
<b>IMAX Filming</b>	'Oppenheimer' was shot entirely on IMAX 65mm and Panavision 65mm film using some of the highest-resolution film cameras known in 2023. The entire movie was shot on analog film, not on digital.
<b>B&amp;W IMAX</b>	First movie shot on B&W IMAX.
<b>Zero CGI</b>	Zero Computer-generated images (CGI) was used, despite the key shot of the movie is spectacular explosion of the atomic bomb.

As noted earlier, the movie is based on the book “American Prometheus” by Bird and Sherwin (2005) (Fig. 2). In Greek mythology, **Prometheus**, referred to as the God of Fire, is best known for defying the Olympian gods by stealing fire from them and giving it to humanity in the form of technology, knowledge, and more generally, civilization. Prometheus is well known for his intelligence and for being a champion of mankind (Hansen, 2005). These attributes perfectly represent J. Robert Oppenheimer because he was primarily responsible for managing the Manhattan Project that developed the nuclear weapons.

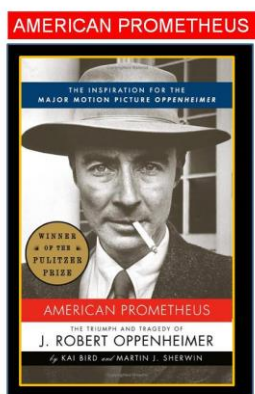


Fig. 2. Book “American Prometheus” cover (Bird and Sherwin, 2005).

## BIRTH AND HIS SCIENTIFIC RISE (1904–1945)

### EARLY YEARS, NEW YORK CITY

Born on April 22, 1904, in New York City, U.S., J. Robert Oppenheimer (Fig.3) grew up in a Manhattan apartment (Fig. 4). His father, Julius Oppenheimer, was a German immigrant who worked in his family’s textile importing business and made a fortune. His mother, Ella Friedman, born in

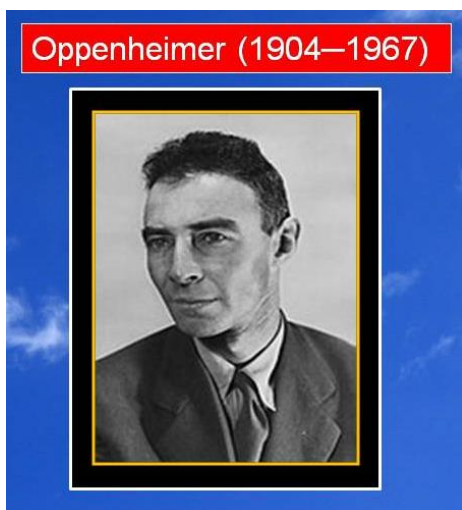


Fig. 3. J. Robert Oppenheimer 1944 (Wikipedia, 2023b).

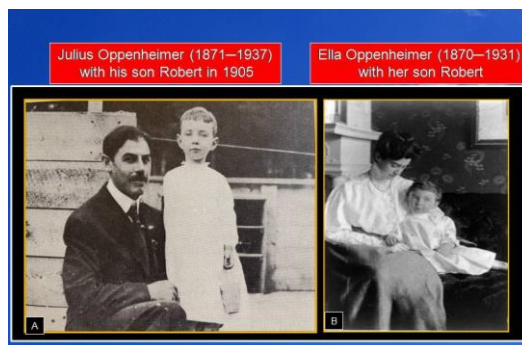


Fig. 4. A. A young Robert stands with his father, Julius Oppenheimer (ca. 1905) (NPS, 2023a). B. Robert with his mother (Jogalker, 2023).

Baltimore, was a painter whose family had been in New York for generations.

J. Robert Oppenheimer graduated from the Ethical Culture School of New York at the top of his class. At School, Robert was precocious and he knew it (Yorston, 2023). At the age of eight, Robert told his cousin, “Ask me a question in Latin, and I shall answer you in Greek.” Such was his claim and confidence in himself! However, he had very few friends. One of them was Francis Ferguson who later had to suffer an attempted killing by J. Robert Oppenheimer! (See below)

After graduating from high school, J. Robert Oppenheimer was at first unable to enroll in Harvard University because he was sick with a severe case of dysentery. His parents sent him to a dude ranch in New Mexico to convalesce for the summer, and it was during his time there that he gained an appreciation for the desert and a love of horseback riding (Little, 2023). This experience would help J. Robert Oppenheimer later in deciding a secret location for the LANL.

J. Robert Oppenheimer wanted to study (1) Science, (2) Architecture, and (3) Poetry. But as a kid, J. Robert Oppenheimer was first and foremost a geologist. Rocks and minerals were his first scientific love. He used to collect rock samples in Manhattan and the Hudson River Palisades as a boy. “By the age of 12, he was using the family typewriter to correspond with a number of well-known geologists about the rock formations he had studied in Central Park. Not aware of his youth, one of these correspondents nominated Robert for membership in the New York Mineralogical Club, and soon thereafter a letter arrived inviting him to deliver a lecture before the club,” write biographers Kai Bird and Martin J. Sherwin (2005) in their book, *American Prometheus: The Triumph and Tragedy of J. Robert Oppenheimer*. Encouraged by his parents, young J. Robert Oppenheimer gave the speech and got a round



of applause for his efforts, though he needed to stand on a box in order to see over the podium!

### HARVARD UNIVERSITY, USA

J. Robert Oppenheimer earned a Bachelor's degree in chemistry from Harvard University in 1925 (Fig. 5). At Harvard, J. Robert Oppenheimer studied mathematics & science, philosophy & Eastern religion, and French & English literature. He was admitted to graduate standing in physics in his first year as an undergraduate on the basis of his independent study. He graduated in three years, which normally require four years, with *summa cum laude*. This Latin phrase represents the most prestigious academic honor that Harvard bestows upon its students reserved for those who displayed exceptional intellectual prowess and academic achievements.

At Harvard, J. Robert Oppenheimer was a solitary student with an astonishing appetite for learning. "I had a real chance to learn," he said. "I loved it. I almost came alive. I took more courses than I was supposed to, lived in the [library] stacks, just raided the place intellectually." Typical of his absorption was this note that he wrote about himself: "It was so hot today the only thing I could do was lie on my bed and read Jeans's *Dynamical Theory of Gases*."

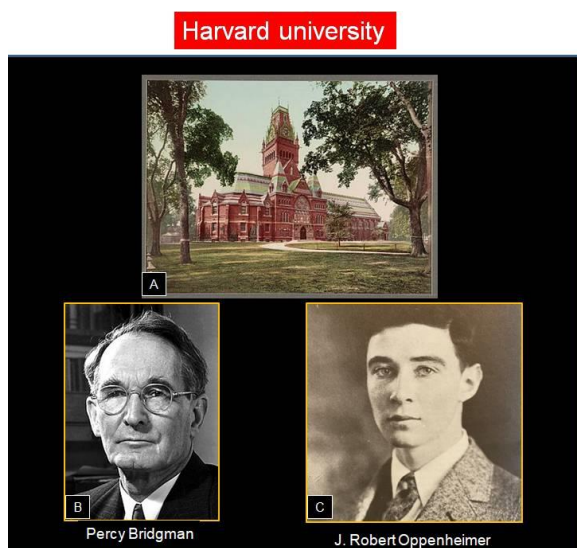


Fig. 5. A. Harvard University (Wikipedia, 2023c). B. Percy Bridgman who taught Physics at Harvard (Wikipedia, 2023d). C. Harvard yearbook photo of J. Robert Oppenheimer in 1925 (NPS, 2023a).

While pursuing a Bachelor degree in Chemistry, he obtained special permission from the Physics Department to attend graduate level courses in Physics. During a course on thermodynamics taught by Percy Bridgman (Fig. 5), Nobel Laureate and Higgins University Professor of Physics at Harvard, J. Robert Oppenheimer was introduced to

experimental physics, which quickly caught his attention. J. Robert Oppenheimer told his younger brother Frank, "I need Physics more than friends". Nonetheless, he wrote poetry. At Harvard, J. Robert Oppenheimer also experienced anti-Semitism.

### UNIVERSITY OF CAMBRIDGE, UK

J. Robert Oppenheimer was given an offer to study at Christ's College, Cambridge, UK in 1924, wherein he wrote to "the father of nuclear physics", Ernest Rutherford, expressing his desire to work at the Cavendish Physics Laboratory, University of Cambridge. However, his clumsiness in the lab did not impress Rutherford (Fig. 6). Rutherford was suspicious of J. Robert Oppenheimer and refused to work with him. This rejection was a huge disappointment for J. Robert Oppenheimer.

Nonetheless, J. Robert Oppenheimer was accepted by the man who discovered the electron, J. J. Thomson, on the precondition that he completed an introductory lab course. He spent only a year in the University after graduating from Harvard. As a 22 year old doctoral student, in 1926, J. Robert Oppenheimer suffered from homesickness and anxiety while studying under the experimental physicist Patrick Blackett at the Cavendish Laboratory in Cambridge. Added to that J. Robert Oppenheimer found Blackett to be difficult, and struggled with his lab work. J. Robert Oppenheimer was a chain smoker and thus appeared to cover up his restlessness by smoking.

J. Robert Oppenheimer was also jealous of his tutor Blackett and his beautiful wife, and so attempted to kill Blackett by injecting an apple with cyanide in 1926. The attempt however failed. Although the university officials were going to file a murder charge against J. Robert Oppenheimer, his father intervened and negotiated a probation deal under the condition that J. Robert Oppenheimer would undergo a psychiatric evaluation.

Other bizarre behaviors in Europe include (a) his attempts to kiss a fellow traveler's wife during a train travel, (b) strangling his school friend Francis Ferguson with a luggage strap when he told J. Robert Oppenheimer the good news that he is engaged to be married, and (c) locking up his own mother in a hotel room. Those events led J. Robert Oppenheimer to be diagnosed with Dementia praecox, the old name for Schizophrenia (Yorston, 2023). In the 1920s, there was no cure for this disease (Black and Boffeli, 1989). Furthermore, some of the behaviors of J. Robert Oppenheimer (e.g., "I need Physics more than

friends”) might have been a sign of autism (Yorston, 2023).

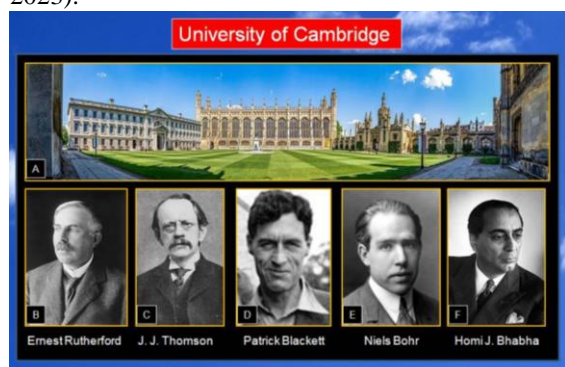


Fig. 6. A. University of Cambridge (Wikipedia, 2023e). B. Ernest Rutherford (Wikipedia, 2023f). C. J. J. Thomson (Wikipedia, 2023g). D. Patrick Blackett (Wikipedia, 2023h). E. Niels Bohr (Wikipedia, 2023i). F. Homi J. Bhabha (Wikipedia, 2023z10).

Thus, at Cambridge, he was under psychiatric care. However, he terminated that practice because he thought he knew more about psychoanalysis through his own reading than his psychiatrist did.

In 1926, J. Robert Oppenheimer left the University of Cambridge for Germany. In 1927, Homi J. Bhabha from India joined the University of Cambridge to study Mechanical Engineering. But Bhabha quickly shifted to study Nuclear Physics and earned a Ph.D. in 1935 (Fig. 6F). In 1932, he visited Copenhagen, Zurich and Utrecht. Niels Bohr's institute at Copenhagen was a major hub of theoretical physics research in Europe. At Zurich, Bhabha wrote his first paper in July 1933 with Wolfgang Pauli (Fig. 7E), which was published in the *Zeitschrift für Physik* in October 1933. Bhabha is widely credited as the "father of the Indian nuclear programme". He was the founding director of the Atomic Energy Establishment, Trombay (AEET) that is an eastern suburb of Mumbai. The AEET was renamed the Bhabha Atomic Research Centre (BARC) in his honour. He died in the crash of Air India Flight 101 in 1966, at the age of 56 (Wikipedia, 2023z10). Today, India is one of eight sovereign nations (i.e., USA, Russia, UK, France, China, India, Pakistan, and North Korea) with nuclear weapons.

#### UNIVERSITY OF GÖTTINGEN, GERMANY

Visiting scientist Niels Bohr at the University of Cambridge was impressed enough by J. Robert Oppenheimer to recommend that he should instead study theoretical physics in Germany. J. Robert Oppenheimer in September 1926 left Cambridge for the University of Göttingen, to study

under physicist Max Born (Fig. 7B). According to Veisdal (2021), the timing of J. Robert Oppenheimer's arrival in Göttingen could not have been more ideal. Heisenberg's breakthrough paper *Über quantentheoretische Umdeutung kinematischer und mechanischer Beziehungen* ("Quantum theoretical re-interpretation of kinematic and mechanical relations") laying the foundations for matrix mechanics had been published in 1925 and Schrödinger's equation describing the wave function of quantum—mechanical systems had been introduced in January with the 1926 publication *Quantisierung als Eigenwertproblem* ("Quantization as an Eigenvalue Problem"). Arriving in September, J. Robert Oppenheimer came to collaborate with Born only months before the third (Born's) monumental paper on quantum mechanics would be published and a year before the 1927 Fifth Solvay International Conference on Electrons and Photons in which Born and Heisenberg would proclaim quantum mechanics to be "*complete and irrevocable*".



Fig. 7. A. Old building of the University in Göttingen, Lower Saxony, Germany. Credit: A. Savin. Wiki commons. (Wikipedia, 2023j). B. Max Born (Wikipedia, 2023k). C. Werner Heisenberg (Wikipedia, 2023l). D. Enrico Fermi (Wikipedia, 2023m). E. Wolfgang Pauli (Wikipedia, 2023n).

J. Robert Oppenheimer completed his Ph.D. in quantum physics in 1927, in less than a year from the University of Göttingen in Germany) (Fig. 7). He wrote his Ph.D. dissertation in German entitled *Zur Quantentheorie kontinuierlicher Spektren* ("On quantum theory of continuous spectra") (Veisdal, 2021). J. Robert Oppenheimer studied under *Max Born*, the structure of molecules, producing the Born—Oppenheimer Approximation in 1927 (Appendix H). It dealt with both quantum chemistry and molecular physics, the combined knowledge that J. Robert Oppenheimer uniquely possessed.

As a student, he developed a reputation for being too loud and over exuberant at seminars. Some fellow students threatened to boycott seminars unless J. Robert Oppenheimer was instructed to calm down.

At Göttingen, he worked with great scientists like Niels Bohr, Enrico Fermi, Werner Heisenberg, Paul Dirac (Fig. 8), and Wolfgang Pauli.

Göttingen, 1927  
Paul Dirac, Yoshikatsu Sugiura, and J. Robert Oppenheimer

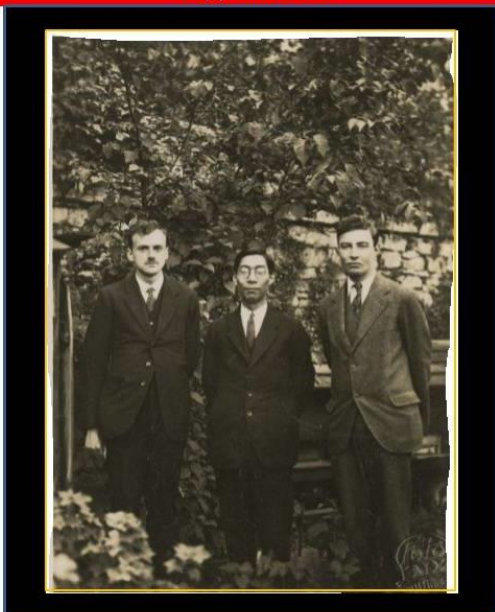


Fig. 8. Paul Dirac, Yoshikatsu Sugiura, and J. Robert Oppenheimer in Göttingen, 1927.

**Credit:**

<https://diginole.lib.fsu.edu/islandora/object/fsu%3A115865>

Retrieved August 21, 2023

## VISITING SCIENTIST IN THE NETHERLANDS AND SWITZERLAND

He later meets theoretical physicist Werner Heisenberg at a conference in Switzerland. Werner Heisenberg was his German counterpart in Nazi Germany for developing an atomic bomb during World War II. But Heisenberg was not successful.

In the autumn of 1928, J. Robert Oppenheimer visited Paul Ehrenfest's institute at the University of Leiden, the Netherlands, where he impressed his students by giving lectures in Dutch, despite having little experience with the Dutch language. He learned the Dutch language in six weeks. This is an example of his extraordinary ability to learn new languages. At Leiden (Fig. 9), he was given the nickname of *Opje*, later anglicized by his students as "Oppie".



Fig. 9. At the University of Leiden in the Netherlands. J. Robert Oppenheimer is standing in the middle row (next to Paul Dirac), second from the left.

**Courtesy:** <https://lorentz.leidenuniv.nl/history/Dirac/Dirac.html>  
Retrieved August 21, 2023.

From Leiden, he continued on to the Swiss Federal Institute of Technology (ETH) in Zurich to work with Wolfgang Pauli on quantum mechanics and the continuous spectrum. J. Robert Oppenheimer respected and liked Pauli and may have emulated his personal style as well as his critical approach to problems.

## TEACHING AT THE UNIVERSITY OF CALIFORNIA, BERKELEY

In 1929, J. Robert Oppenheimer returned to the United States, to expand quantum physics research there. He began teaching both at the University of California, Berkeley and at the California Institute of Technology, starting with one student but soon attracted many more students.



Fig. 10. A. Jean Tatlock (NPS, 2023b). B. Katherine "Kitty" Oppenheimer (NPS, 2023a).

His academic advancements were:

- Assistant Professor (1929–1931),
- Associate Professor (1931–1936), and
- Professor of Theoretical Physics (1936–1947),



J. Robert Oppenheimer split his time between the two, spending only one semester teaching at California Institute of Technology after being promoted to full Professor in 1936, Berkeley (Calif.). He also met, here, his future wife, Katherine Puening, a biologist and an ex—communist (Fig. 10).

As an Associate Professor of Physics. “His lectures were a great experience, for experimental as well as theoretical physicists,” commented the late physicist Hans Bethe (1906–2005), who would later work with J. Robert Oppenheimer at Los Alamos National Laboratory. Bethe also noted that “In addition to a superb literary style, he brought to them a degree of sophistication in physics previously unknown in the United States. Here was a man who obviously understood all the deep secrets of quantum mechanics, and yet made it clear that the most important questions were unanswered. His earnestness and deep involvement gave his research students the same sense of challenge. He never gave his students the easy and superficial answers but trained them to appreciate and work on the deep problems.”

J. Robert Oppenheimer was so immersed in his intellectual pursuit of acquiring knowledge in multiple domains, he was totally detached from the real—world affairs. J. Robert Oppenheimer once described his academic life at Berkeley as follows (Losin, 1967):

“I was not interested in and did not read about economics or politics. I was almost wholly divorced from the contemporary scene in this country. I never read a newspaper or a current magazine like *Time* or *Harper's*; I had no radio, no telephone; I learned of the stock market crash in the fall of 1929 only long after the event; the first time I ever voted was in the Presidential election of 1936.”

Oppenheimer’s lectures were so challenging that students had to repeat his classes. Philip Morrison, a student at Oppenheimer’s class at Berkeley, recalled: “I was impressed by Robert Oppenheimer very very deeply because of his enormous, eloquent speed, rapidity, clarity of thought, incredible knowledge, rich poetic vocabulary, metaphors, and then the equations poured out of the end of his chalk. We worked hard to keep up with it. We worked hard to do the problems.” (A&E Biography, 1995).

This was a time when the world of Physics was buzzing with new ideas of Quantum mechanics and Relativity. J. Robert Oppenheimer was in the center of all this working on everything from subatomic particles to black holes. His tendency to

jump from one topic to the other so rapidly frustrated his colleagues. His mind worked so fast that he would rush through calculations without double checking for errors. He developed a reputation for careless errors in his papers. At Caltech, J. Robert Oppenheimer began to work with Linus Pauling, but their collaboration ended because of his misjudged clumsy pass at Pauling’s wife (Yorston, 2023).

## **SOCIAL ACTIVIST**

While at Berkeley, J. Robert Oppenheimer was introduced to Jean Tatlock (Fig. 10) in 1936, a student at the Stanford Medical School and a member of the Communist Party, USA. They both had a shared love for poetry. She introduced J. Robert Oppenheimer to the poems of John Donne, an English poet and also to the Politics of Social Reform. During the next four years, they came close to marrying, but the relationship ended. She suffered from severe depression and was conflicted about her sexuality (McMillan, 2014). She died in 1944 at the age of 29. Her cause of death was disputed (suicide vs. murder), but the official report was suicide. J. Robert Oppenheimer’s relationship with Tatlock, however, would get him into trouble during the 1954 security hearing.

J. Robert Oppenheimer became interested in communism in 1930s, during the Great Depression (Little, 2023). The Great Depression helped fuel an interest in workers’ rights and communism in the United States. During the late 1930s, J. Robert Oppenheimer attended events supporting leftist causes, donated to the anti—fascist Republicans in the Spanish Civil War and subscribed to the leftist newspaper *People’s World*. Though he never officially joined the U.S. Communist Party, but many people in his life did join the communist party including his brother, Frank Oppenheimer; his girlfriend, Jean Tatlock (Fig. 10); and his wife, Katherine “Kitty” Puening.

Even though the United States joined the side of the Soviet Union when it entered World War II, the conservative U.S. officials were still suspicious of alleged communists. Consequently, during the first Red Scare from 1917 to 1920, the officials persecuted anyone suspected of communism, socialism, anarchism and/or any pro-worker activity.

J. Robert Oppenheimer described his reasons for becoming a social activist as follows (Losin, 1967):

I had had a continuing smoldering fury about the treatment of Jews in Germany. I had



relatives there, and was later to help in extricating them and bringing them to this country. I saw what the Depression was doing to my students. Often they could get no jobs, or jobs which were wholly inadequate. And through them, I began to understand how deeply political and economic events could affect men's lives. I began to feel the need to participate more fully in the life of the community.

Despite his public image, J. Robert Oppenheimer consistently denied that he was ever a member of the Communist party: "I never accepted Communist dogma or theory". Importantly, no substantial evidence was ever documented to refute him.

### BHAGAVAD GITA

As a Full professor of Physics at the University of California, Berkeley, in 1936, J. Robert Oppenheimer had a personal interest in Sanskrit, the sacred language of Hindu scripture. He studied the language while teaching at Berkeley, and read the *Bhagavad Gita* in Sanskrit (Fig. 11) (Little, 2023).

The **BhagavadGita** (Sanskrit: भगवद्गीता, romanized: *bhagavad-gītā*, lit. 'The Song by God'<sup>[al]</sup>), often referred to as the **Gita** (IAST: *gītā*), is a 700—verse Hindu scripture, which is part of the epic *Mahabharata*. It forms the chapters 23–40 of book 6 of the Mahabharata called the Bhishma Parva. The work is dated to the second half of the first millennium BCE. The Bhagavad Gita is set in a narrative framework of dialogue between the Pandava prince Arjuna and his charioteer guide Krishna, an avatar of lord Vishnu. At the start of the Kurukshetra War between the Pandavas and the Kauravas, Arjuna despairs thinking about the violence and death the war will cause in the battle against his kin and becomes emotionally preoccupied with a dilemma. Wondering if he should renounce the war, Arjuna seeks the counsel of Krishna, whose answers and discourse constitute the Bhagavad Gita. Krishna counsels Arjuna to "fulfill his Kshatriya (warrior) duty" for the upholdment of dharma. The Krishna–Arjuna dialogue covers a broad range of spiritual topics, touching upon moral and ethical dilemmas, and philosophical issues that go far beyond the war that Arjuna faces. The setting of the text in a battlefield has been interpreted as an allegory for the struggles of human life. (Wikipedia, 2023z8).

J. Robert Oppenheimer maintained his interest in classics and eastern philosophy throughout his life.

J. Robert Oppenheimer's most famous quote from Gita came from the 1965 documentary *The Decision to Drop the Bomb*. In it, J. Robert Oppenheimer recalled seeing the first nuclear bomb test on July 16, 1945 (see Little, 2023):

*"We knew the world would not be the same. A few people laughed, a few people cried, most people were silent. I remembered the line from the Hindu scripture the Bhagavad Gita: Vishnu is trying to persuade the Prince that he should do his duty, and to impress him, takes on his multiarmed form and says, 'Now I am become Death, the destroyer of worlds.' I suppose we all thought that, one way or another."*

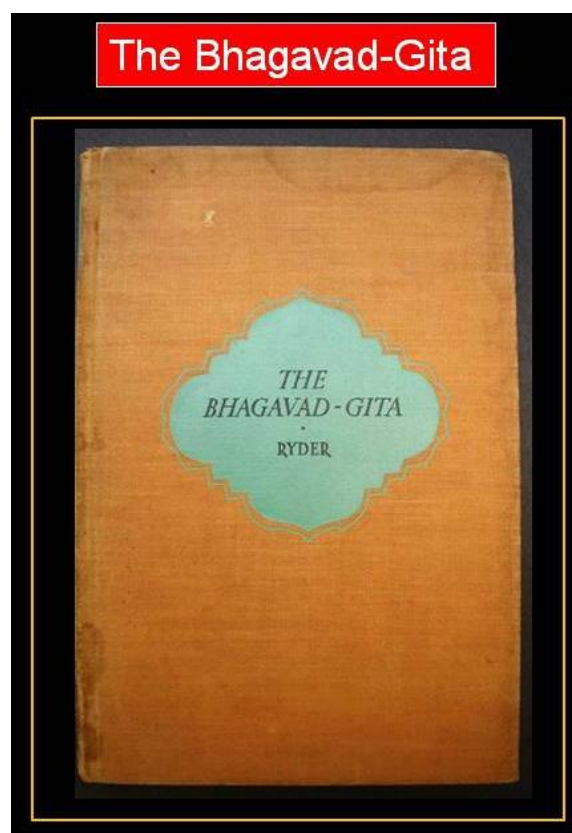


Fig. 11. J. Robert Oppenheimer's personal copy of The Bhagavad Gita (LANL, 2023).

### THE SOLVAY PHYSICS CONFERENCE

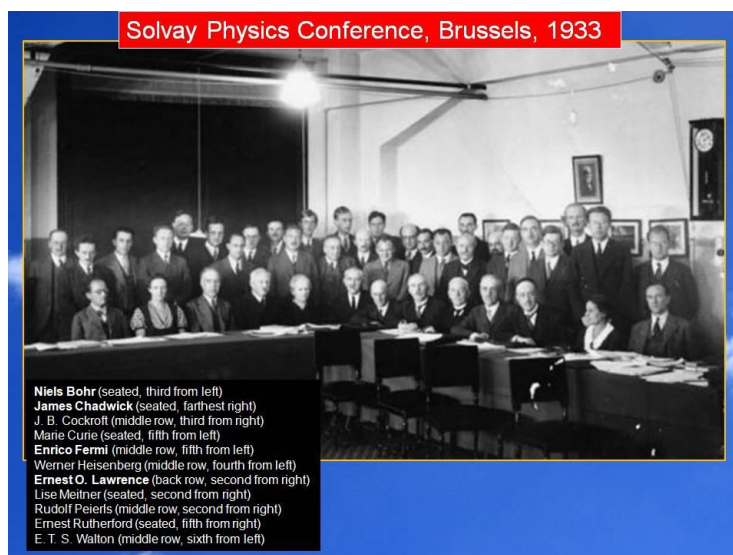
The Solvay Physics Conference, held in Brussels in 1933 (Fig. 12) brought some key scientists who attended the conference, to participate with J. Robert Oppenheimer, later, in the Manhattan Project.

### KEY SCIENTISTS INCLUDED THE FOLLOWING:

Niels Bohr (Manhattan Project)  
James Chadwick (Manhattan Project)  
J. B. Cockroft  
Marie Curie  
Enrico Fermi (Manhattan Project)

Werner Heisenberg  
Ernest O. Lawrence (Manhattan Project)  
Lise Meitner  
Rudolf Peierls  
Ernest Rutherford  
E. T. S. Walton.

Fig. 12. The Solvay Physics Conference, held in Brussels, Belgium, October 22–29, 1933. Attendees included four future key Manhattan Project **scientists** (Bohr, Chadwick, Fermi, and Lawrence), the future head of the Nazi atomic bomb program (Heisenberg), and numerous leading pre-war physicists. The photograph is courtesy Lawrence Berkeley National Laboratory. DOE (2023e).



## MARRIAGE AND FAMILY

When his father Julius Oppenheimer died in 1937, J. Robert Oppenheimer became a wealthy man and in 1940, married Katherine (Kitty) Puening Harrison, a biologist and divorcee whose second husband had been killed during the Spanish Civil War.

The couple had two children, Peter and Katherine “Toni”. Peter Oppenheimer is a carpenter in New Mexico. Peter had three adult children, Dorothy, Charlie, and Ella.

Charles Oppenheimer (1975– ) is the grandson of J. Robert Oppenheimer. Although Charles Oppenheimer never met his grandfather, he is well versed in the family history. His father, Peter Oppenheimer grew up at Los Alamos during the Manhattan Project. He lives in San Francisco.

Dorothy Oppenheimer Vanderford lives in Boulder City and works at the Nevada National Security Site (NNSS) as a technical writer. Working at the former atomic bomb test site almost seems like fate, considering her grandfather is J Robert Oppenheimer, who's known as the “Father of the Atomic Bomb.”Source: Charles Oppenheimer and Dorothy Vanderford’s interview. Voices of the Manhattan Project. Date of interview: June 2, 2015. <https://ahf.nuclearmuseum.org/voices/oral-histories/charles-oppenheimer-and-dorothy-vanderfords-interview/> Retrieved November 4, 2023.

Soon after the death of J. Robert Oppenheimer, Toni Oppenheimer was denied a position as a translator for the United Nations in 1969 because the FBI refused to grant her a security clearance. That process dredged up many of the communist charges that had been leveled at her father fifteen years before. Toni found herself unable to

completely recover from the two events. Soon after losing out on the U.N. position, and after two unsuccessful marriages, Toni permanently relocated to St. John. She became a recluse in her family’s old cottage, with few friends on the remote island. She committed suicide in January, 1977, a month after her 32nd birthday (Bird and Sherwin, 2005).

## MANHATTAN PROJECT

In 1941. J. Robert Oppenheimer became a Fellow of the National Academy of Sciences. And during the same year, on December 7<sup>th</sup>, Japan attacked Pearl Harbor and on December 8<sup>th</sup>, President Roosevelt declared war on Japan (Fig. 13).

The Hungarian émigré theoretical physicists Leo Szilard and Edward Teller convinced Albert Einstein to write his letter to President Franklin Roosevelt in 1939. On Aug. 2, 1939, Albert Einstein signed a letter addressed to President Franklin Delano Roosevelt (Table 6 in Appendix F), warning that the Nazis might be developing nuclear weapons. Einstein urged the United States to stockpile uranium ore and begin work on its own atomic weapons. This event initiated the government—supported research that would lead to the Manhattan Project. Thus, J. Robert Oppenheimer was appointed director (1943 –1945) of the project’s Los Alamos National Laboratory in New Mexico, tasked with developing the first nuclear weapons.

In direct response to Pearl Harbor attack in 1941, Roosevelt also accelerated the research on nuclear weapons through the Manhattan Project.



Fig. 13. A. Attack on Pearl Harbor on December 7, 1941. B. Photograph of Battleship Row taken from a Japanese plane at the beginning of the attack (Wikipedia, 2023z3). The explosion in the center is a torpedo strike on USS West Virginia. Two attacking Japanese planes can be seen: one over USS Neosho and one over the Naval Yard. C. President Franklin Roosevelt speaks to a joint session of U. S. Congress in Washington D.C. on Dec. 8, 1941 after the Japanese attack on Pearl Harbor, Hawaii. Wikipedia (2023w).

Amid World War II, in 1942, U.S. Army General Leslie Groves recruited J. Robert Oppenheimer to lead the Manhattan Project to develop an atomic bomb, after J. Robert Oppenheimer's assurances that he had no communist sympathies.

J. Robert Oppenheimer, as a Jew, was particularly driven by the thought that Nazis were nearly completing their nuclear weapons program headed by Heisenberg, assembled a scientific team including Edward Teller and Isidor Isaac Rabi in Los Alamos, New Mexico to secretly create the bomb. J. Robert Oppenheimer collaborated with scientists Enrico Fermi and David L. Hill in the Project, and at the same time discussed and shared his concerns with Einstein, that how an atomic bomb risked triggering an unstoppable chain reaction that could destroy the world.

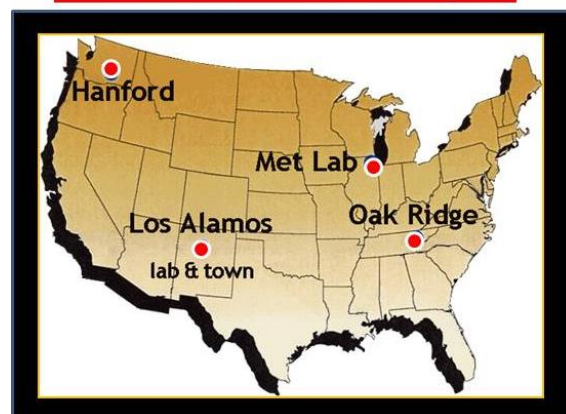
### Los Alamos National Laboratory, New Mexico

Groves and J. Robert Oppenheimer in 1942, chose the Los Alamos Ranch School in New Mexico as the site for the Manhattan Project's secret laboratory. It met many of the requirements needed for the project (for example, it was relatively isolated but still near a train track), and it was also in a part of the country in which had fallen in love with when he was a teenager.

The project involved several laboratories in secret locations across the country (Fig. 14), which included University of California at Berkeley (Fig. 15), University of Chicago (Fig. 16); Columbia

University (Fig. 17), the LANL at Los Alamos (Fig. 18 and 19)), Y-12 Plant with calutrons (Fig. 20) and racetrack for uranium enrichment (Fig. 21) at Oak Ridge, Tennessee; and plutonium production in Hanford, Washington (Fig. 22 and 23) (DOE, 2023a).

### Sites of the Manhattan Project



Met. Lab = Metallurgical Laboratory at University of Chicago

Fig. 14. Important places associated with the Manhattan Project (DOE, 2023b). In addition, Columbia University, Princeton University, and University of California, Berkeley were involved.

### University of California, Berkeley

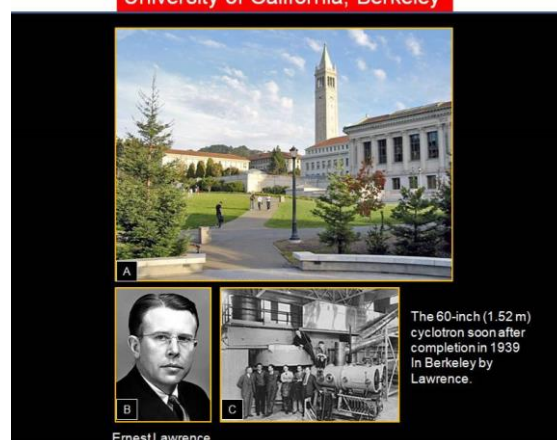


Fig. 15. A. University of California, Berkeley. Wikipedia (2023p). B. Ernest Lawrence (Wikipedia, 2023o). C. The 60-inch (1.52 m) cyclotron soon after completion in 1939. The key figures in its development and use are shown, standing, left to right: D. Cooksey, D. Corson, Lawrence, R. Thornton, J. Backus, Winfield W. Salisbury. In the background are Luis Walter Alvarez and Edwin McMillan. Wikipedia (2023o).





Fig. 16. Alumni of the **Met Lab** pose on the steps of Eckhart Hall on the campus of the **University of Chicago** on December 2, 1946 (the fourth anniversary of **CP-1 first going critical**). The photograph is courtesy the **Argonne National Laboratory**. It is reprinted in Stephanie Groeff, *Manhattan Project: The Untold Story of the Making of the Atomic Bomb* (Boston: Little, Brown, and Company, 1967). DOE (2023g).

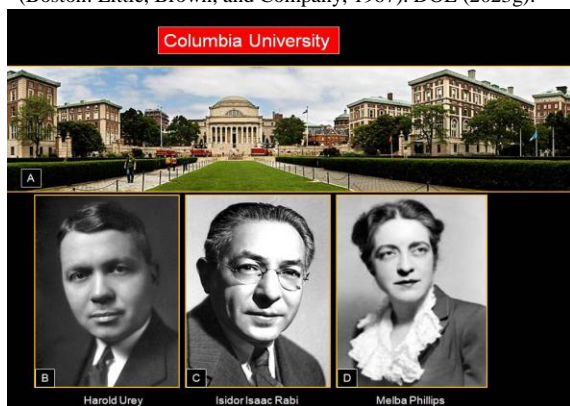


Fig. 17. A. Columbia University (Wikipedia, 2023y). B. Harold Urey (Wikipedia, 2023z). C. Isidor Isaac Rabi (Wikipedia, 2023z1). D. Melba Phillips (Wikipedia, 2023z4).



Fig. 18. Main gate of the Los Alamos Project. Credit: NPS (2023b).

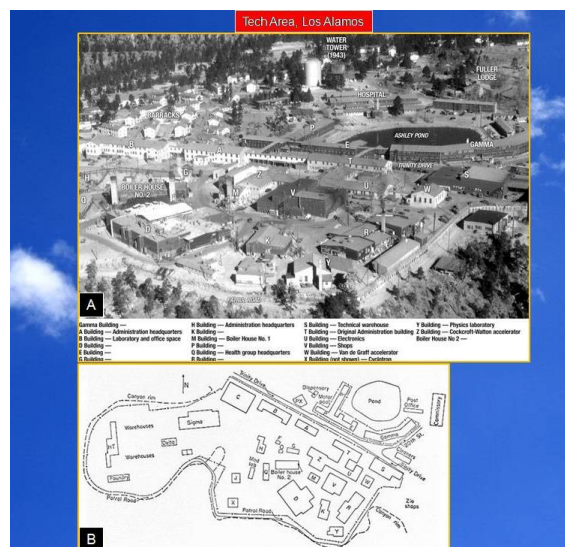


Fig. 19. A. Aerial photograph of Tech Area in Los Alamos Laboratory. DOE (2023d). B. Map.

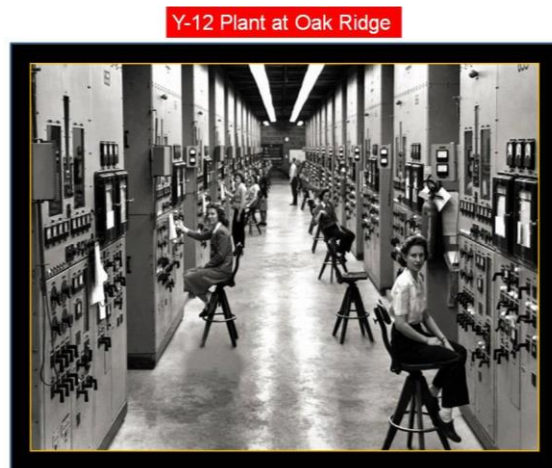


Fig. 20. Calutron operators at their panels, in the Y-12 plant at Oak Ridge in Tennessee during World War II, 1944. The calutrons were used to refine uranium ore into fissile material. During the Manhattan Project effort to construct an atomic explosive, workers toiled in secrecy, with no idea of what end their labors were directed. Ed Westcott/US Department of Energy. Courtesy> McGarth (2019).

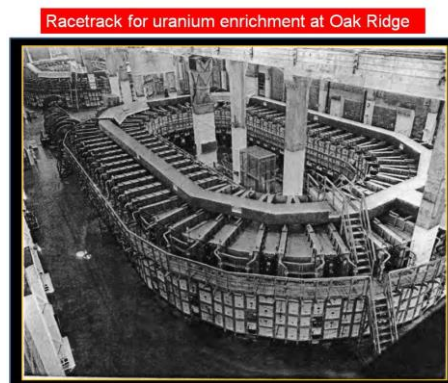


Fig. 21. Giant electromagnet Alpha I racetrack for uranium enrichment at Y-12 plant, Oak Ridge, Tennessee, circa 1944–45. The **calutrons** that Ernest Lawrence developed are located around the ring. Wikipedia, 2023o).



Hanford Trailer Camp 1944



Fig. 22. Hanford Trailer Camp in Washington. This site was used for production of plutonium that was used in the nuclear weapon. At its peak population in July 1944, the Hanford camp housed about 50,000 people. These workers did not know the mission of their work until after the bombs were dropped on Japan.

<https://www.flickr.com/photos/idyllopuspress/3430340279>

Retrieved August 21, 2023

Plutonium Production Complex, Hanford

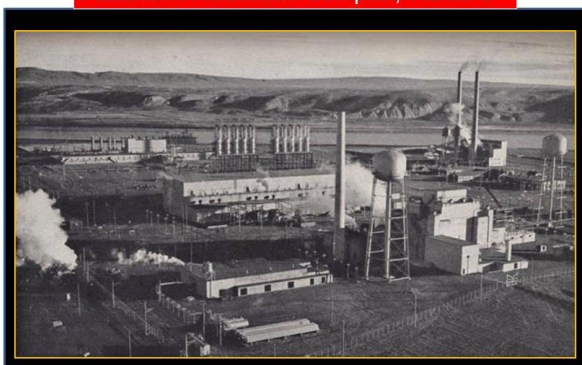


Fig. 23. The F Reactor plutonium production complex at Hanford. The "boxy" building between the two water towers on the right is the plutonium production reactor; the long building in the center of the photograph is the water treatment plant. DOE (2023i).

J. Robert Oppenheimer oversaw the construction of the Los Alamos laboratory, where he gathered the best minds in physics to work on the problem of creating an atomic bomb. J. Robert Oppenheimer was not only a brilliant scientist, but also an amazing administrator. He managed Physicists, Chemists, Engineers, Military Experts, and civilians; all 6,000 workers at Los Alamos alone. They led a normal life in Los Alamos (Figs. 24, 25, 26).

Fig.26. From Left to right: Emilio Segrè, Enrico Fermi, Hans Bethe, H.H. Staub, Victor Weisskopf, Erika Staub and Elfriede Segrè on a Sunday Hike Source: BuzzFeed (2013).

J. Robert Oppenheimer's House in Los Alamos



Fig. 24. J. Robert Oppenheimer, metallurgist Eric Jette and others in J. Robert Oppenheimer's house in Los Alamos campus (LANL, 2023).

Oppenheimer, Fermi, and Lawrence

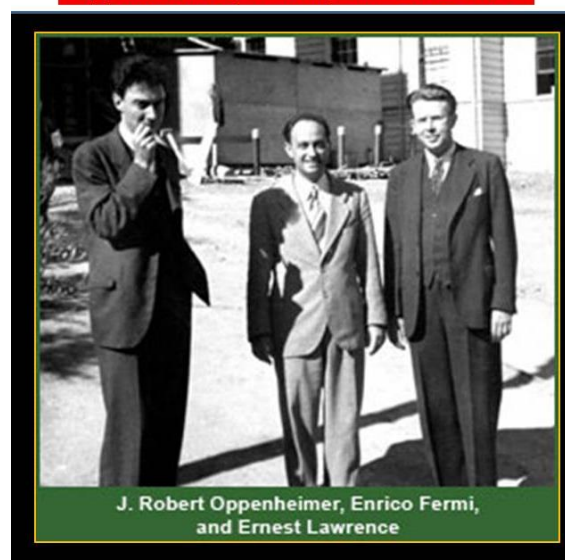
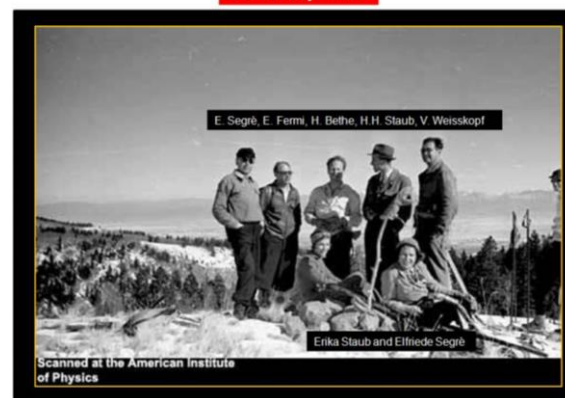


Fig. 25. J. Robert Oppenheimer, Fermi, and Lawrence. Manhattan Project. 1945.

**Credit:**

[https://www.osti.gov/opennet/manhattan-project-history/images/oppenheimer\\_fermi\\_lawrence\\_image.htm](https://www.osti.gov/opennet/manhattan-project-history/images/oppenheimer_fermi_lawrence_image.htm)

A Sunday Hike



### A GRACIOUS HOST

J. Robert Oppenheimer was an energetic man at parties (Fig. 24), where he was usually the center of attention. He was gracious as a host and the maker of fine and potent martinis. He was full of droll stories (Losin, 1967).

### AN AVID READER

J. Robert Oppenheimer was an avid reader since childhood. According to Losin (1967), knowledge came easily to J. Robert Oppenheimer. As a young man he learned enough Dutch in six weeks to deliver a technical lecture while on a visit to the Netherlands. At the age of 30 he learned Sanskrit, and he used to enjoy passing notes to other savants in that language. On a train trip from San Francisco to the East Coast he read Edward Gibbon's seven-volume *The History of the Decline and Fall of the Roman Empire*. On another such trip he read the four volumes of Karl Marx's *Das Kapital* in German. On a short summer holiday in Corsica he read in French Marcel Proust's massive *A La Recherche du Temps Perdu*, which he later said was one of the great experiences of his life.

### A GENIUS

His single most important contribution was to form a cohesive group in Los Alamos where scientists of different research groups can interact and share ideas with each other. He was able to accomplish this task despite objections from the U.S. Military. Although the bomb was the culmination of collective work by the thousands, it was the genius of J. Robert Oppenheimer which not only engineered it but also took it to the finish line successfully!

Accolades include (Losin, 1967):

1. **Mr. Lilienthal:**  
"Robert is the only authentic genius I know."
2. **Secretary of War Henry L. Stimson:**  
"The development of the bomb itself has been largely due to his genius and the inspiration and leadership he has given to his colleagues."
3. **Charles Lauritsen, a former colleague at the California Institute of Technology:**  
"The man was unbelievable! He always gave you the right answer before you formulated the question."
4. **New York Times Obituary:**  
"He was Oppy, Oppie or Opje to hundreds of persons who were captivated by his charm, eloquence and sharp, subtle humor and who were awed by the scope of his erudition, the incisiveness of his mind, the chill of his

sarcasm and his arrogance toward those he thought were slow or shoddy thinkers."

### IMPORTANT SCIENTISTS AND ENGINEERS

Important scientists who contributed to the Manhattan Project were the following (DOE, 2023b, This Review, Table 3 in Appendix C):

- Alvarez, Luis Walter
- Bainbridge, Kenneth
- Bethe, Hans
- Bohr, Niels
- Bush, Vannevar
- Chadwick, James
- Compton, Arthur H.
- Conant, James B.
- Einstein, Albert
- Fermi, Enrico
- Feynman, Richard
- Franck, James
- Fuchs, Klaus
- Groves, Leslie R.
- Lawrence, Ernest O.
- Manley, John
- Neumann, Von
- Neddermeyer, Seth
- Oppenheimer, J. Robert
- Oppenheimer, Frank
- Phillips, Melba
- Rotblat, Joseph
- Seaborg, Glenn T.
- Segrè, Emilio
- Serber, Robert
- Szilard, Leo
- Teller, Edward
- Urey, Harold
- Wilson, Robert
- Wigner, Eugene
- York, Herbert

Further, many scientists played pivotal roles throughout the Manhattan Project and are as such acknowledged (Table 3 in Appendix C).

It is worth noting that the Manhattan Project grew rapidly and employed nearly 130,000 people nationwide at its peak and cost nearly US\$2 billion (equivalent to about \$24 billion in 2021). Over 90 percent of the cost was for building factories and to produce fissile material, with less than 10 percent for development and production of the weapons.

### THE ATOMIC BOMBS (1945)

During the two tension-filled years it took to construct the bombs at Los Alamos (1943–1945),

Oppenheimer displayed a special genius for administration, for handling the sensitive prima—donna scientific staff from America and European (often he spent as much time on personal as on professional problems) and for coordinating its work. He drove himself at breakneck speed, and at one time his weight dropped under the whiplash of the war to 115 pounds. But he always managed to surmount whatever problem arose, and it was for this enormous all—around task that he was acclaimed as "the father of the atomic bomb."

Following is the Timeline of the Atomic Bomb (AHF, 2022a):

- 1895 – 1937: Early Nuclear Science.
- 1938 – 1939: Discovering Fission.
- 1939 – 1941: Investigating Nuclear Weapons.
- 1941 – 1942: Getting Organized.
- 1942 – 1943: Early Manhattan Project.
- 1944: Developing the Bomb.
- 1945: Building and detonating the Bomb.

J. Robert Oppenheimer's leadership and scientific expertise were instrumental in the Manhattan Project's success. Scientists developed two types of bombs (Fig. 27). The theoretical nuclear fission chain reaction was the basis (Fig. 28). On July 16, 1945, he was present at the first test of the atomic bomb called "Gadget", at Trinity (Fig. 29 and 30). J. Robert Oppenheimer chose to name this the "Trinity" test, a name inspired by the poems of John Donne mentioned earlier. The site chosen was a remote corner on the Alamogordo Bombing Range known as the "Jornada del Muertos," or "Journey of Death," 210 miles south of Los Alamos in New Mexico.

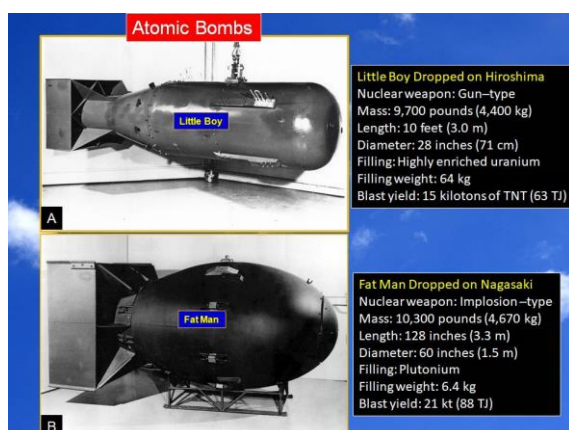


Fig. 27. Replica atomic bombs designed by the Los Alamos National Laboratory. A. Little Boy (Wikipedia, 2023s). B. Fat Man (Wikipedia, 2023t).

After the success of the Trinity Test, he was exuberant in visiting the test site (Fig. 31). At Potsdam Conference in Germany, President Truman

ordered bombing of Japan that ended World War II (Fig. 32). These atomic bombs also began the Nuclear Age.

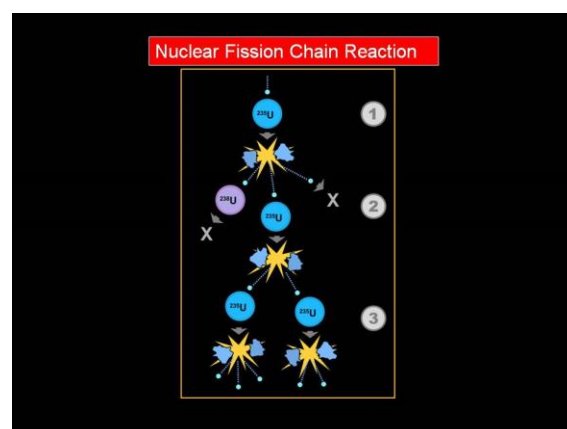


Fig. 28. Nuclear Fission Chain Reaction. Wikipedia (2023z2).

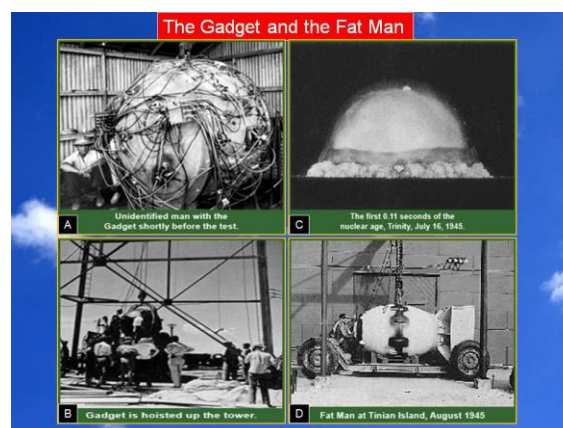


Fig. 29. The Gadget. DOE (2023c).

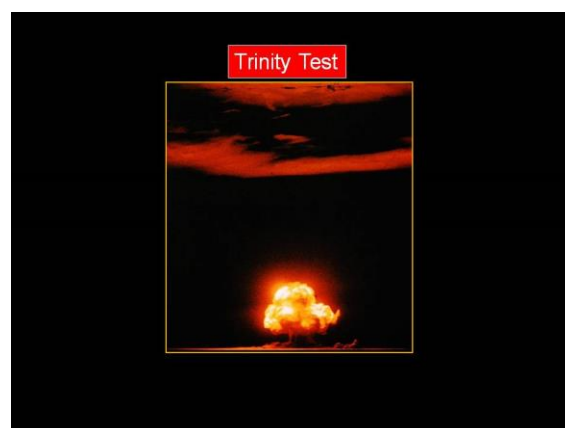


Fig. 30. A photograph of the "Trinity" test with a yield of 25,000 tons of TNT, the first nuclear test explosion, by Jack W. Aebly, July 16, 1945.

Courtesy: LIFE and Wikipedia.

[https://commons.wikimedia.org/wiki/File:Trinity\\_shot\\_color.jpg](https://commons.wikimedia.org/wiki/File:Trinity_shot_color.jpg) Retrieved August 9, 2023



J. Robert Oppenheimer and General Leslie Groves



Fig.31. Following the successful Trinity Test, exuberant J. Robert Oppenheimer, left, stands next to Gen. Leslie R. Groves as they inspect the base of a tower at the site of an atomic bomb test in Alamogordo, N.M., in 1945. (AP).

Potsdam and Nagasaki

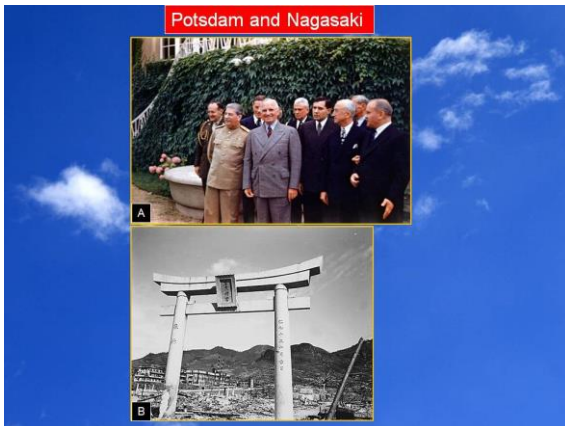


Fig. 32. A. Potsdam Conference in Germany (July 17–August 2, 1945): General Secretary [Joseph Stalin](#) and President [Harry Truman](#). Wikipedia (2023x). B. Remains of a Shinto Shrine, Nagasaki, October 1945 (courtesy the [United States Marine Corps](#), Lieutenant R. J. Battersby, photographer, via the [National Archives](#)). DOE (2023h).

Although J. Robert Oppenheimer did not develop the atomic bombs by himself, he certainly marshaled the people and the forces at Los Alamos National Laboratory under his leadership to develop the bombs. After the World War II, he promoted Nonproliferation of nuclear weapons. He stated that “If there is another world war, this civilization may go under. We need to ask ourselves whether we’re doing all we can to avert that.” (A&E Biography, 1995).

#### EVENTS LEADING TO J. ROBERT OPPENHEIMER’S POLITICAL FALL (1945–1954)

The [Trinity test](#) was successfully conducted. J. Robert Oppenheimer urged President S Truman to restrict further nuclear weapon development, but the President rejected J. Robert Oppenheimer's advice and ordered bombed. Thus in August 1945, the

weapons were used against Japan in the [bombings of Hiroshima and Nagasaki](#), which forced their surrender. This was the only use to date of nuclear weapons in an armed conflict, which ended the World War II. Over 200,000 people perished in those two cities.

Though J. Robert Oppenheimer’s contributions were well recognized by Harvard University (Fig. 33) and by the TIME Magazine (Fig. 34) and LANL (Fig. 35), some project scientists, after Germany’s surrender, questioned the bomb's relevance and the targeting of civilian sites. J. Robert Oppenheimer countered it by saying that it was a military decision and would not have ended the terrible [war in the Pacific](#), but for the bombs. Consequently, J. Robert Oppenheimer was thus unwittingly thrust into the public eye as the “father of the atomic bomb”, but the immense destruction and massive fatalities haunted him in no small measure.

Harvard honorary degrees 1947



Fig. 33. Recipients of Harvard honorary degrees, June 5, 1947. Front row from left: J. Robert Oppenheimer; [Ernest Cadman Colwell](#); General [George C. Marshall](#), Harvard President [James B. Conant](#); General [Omar N. Bradley](#); [T.S. Eliot](#). Wikipedia (2023b).

TIME Magazine Cover, N0vember 8, 1948

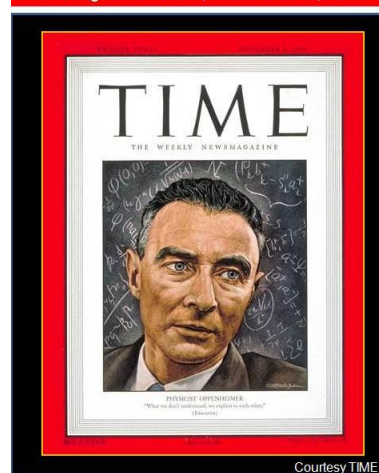


Fig. 34. TIME Magazine Cover, N0vember 8, 1948. Courtesy TIME



## Nuclear Physics Conference at Los Alamos 1946

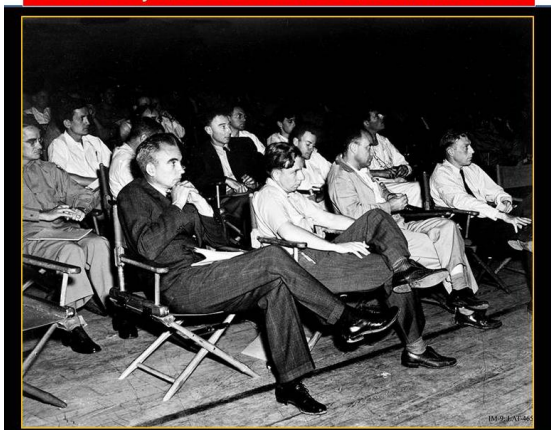


Fig. 35. Scientists attending a colloquium at Los Alamos, August 1946. Left to right, first row: Norris E. Bradbury, John H. Manley, Enrico Fermi, J. M. B. Kellogg. Second row: J. Robert Oppenheimer, Richard P. Feynman, Phil B. Porter. Third row: Gregory Breit (partially hidden), Arthur Hemmendinger, Arthur D. Schelberg. LANL (2023). The photograph is courtesy [Los Alamos National Laboratory](#). The identifications are from Richard G. Hewlett and Francis Duncan, *Atomic Shield, 1947–1952: Volume II, A History of the United States Atomic Energy Commission* (Washington: U.S. Atomic Energy Commission, 1972), opposite page 46.

## AFTERMATH AND FEUD WITH THE PRESIDENT

J. Robert Oppenheimer's feeling of triumph evaporated in the months after the destruction of Nagasaki, caused by another atomic bomb three days after Hiroshima, which the scientist believed was unnecessary and unjustified. His revulsion was so evident on his face that President Harry S. Truman asked him what was the matter when they met at the White House for the first time in October 1945 (Bella, 2023). "Mr. President, I feel I have blood on my hands," J. Robert Oppenheimer told Truman, according to "American Prometheus," the 2005 Oppenheimer biography from authors Kai Bird and Martin J. Sherwin.

While Truman assured J. Robert Oppenheimer that he should not carry the burden of the bombs — "I told him the blood was on my hands, to let me worry about that" — the president was privately infuriated as was seen by what he described to aides as a "crybaby scientist" and the regret he had over the decimation, according to author Ray Monk's 2014 biography, "Robert Oppenheimer: A Life Inside the Center." "Blood on his hands, dammit, he hasn't half as much blood on his hands as I have," Truman said afterward. "You just don't go around bellyaching about it." Truman later told Dean Acheson, his secretary of state: "I don't want to see that son of a bitch in this office ever again." (Bella, 2023).

Notwithstanding the above, his accolades were flowing in viz.

- Member, American Philosophical Society in 1945
- The Presidential Medal for Merit in 1946
- He chaired the influential General Advisory Committee (1947 —1952) of the newly created U.S. Atomic Energy Commission. He also lobbied for international control of nuclear power to avert nuclear proliferation and a nuclear arms race with the Soviet Union.

Institute for Advanced Study, Princeton

In November 1945, J. Robert Oppenheimer left Los Alamos to return to Caltech, but soon found that his heart was no longer in teaching. In 1947, he accepted an offer from Lewis Strauss to take up the directorship of the Institute for Advanced Study in Princeton, New Jersey (Fig. 36). This meant moving back east and leaving Ruth Tolman, the wife of his friend Richard Tolman, with whom he had begun an affair after leaving Los Alamos. The job came with a salary of \$20,000 per annum, plus rent-free accommodation in the director's house, a 17th-century manor with a cook and groundskeeper, surrounded by 265 acres of woodlands.

J. Robert Oppenheimer served as the third Director of the Institute for Advanced Study (IAS) in Princeton, New Jersey from 1947 until 1966, thus far the longest tenure of any Institute Director.

## Institute for Advanced Study



Fig. 36. A. Institute for Advanced Study. Wikipedia (2023q). B. Albert Einstein with J. Robert Oppenheimer in 1950. Wikipedia (2023q). C. Freeman Dyson. Wikipedia (2023r). D. Richard Feynman (Wikipedia, 2023u).

J. Robert Oppenheimer collected European furniture, and French postimpressionist and Fauvist artworks. Like his mother, his art collection included works

by Cézanne, Derain, Despiau, de Vlaminck, Picasso, Rembrandt, Renoir, Van Gogh and Vuillard.

In December 1952, J. Robert Oppenheimer, as the director of the Institute for Advanced Study in Princeton, New Jersey, offered Freeman Dyson a lifetime appointment at the Institute. Later, Freeman Dyson (2007) cautioned that Climate Models are bogus and that they cannot predict the future. The reason was that Climate Models considered CO<sub>2</sub> only in the atmosphere, but ignored CO<sub>2</sub> in the soil, vegetation, and oceans (Dyson, 2015). This aspect was crucial in the current debate on Climate Change (Shanmugam (2023)).

J. Robert Oppenheimer brought together intellectuals at the height of their powers and from a variety of disciplines to answer the most pertinent questions of the age. He directed and encouraged the research of many well-known scientists, including Freeman Dyson (Fig. 36), and the duo of Chen Ning Yang and Tsung-Dao Lee, who won a Nobel Prize for their discovery of parity non-conservation.

J. Robert Oppenheimer also instituted temporary memberships for scholars from the humanities, such as T. S. Eliot and George F. Kennan. Some of these activities were resented by a few members of the mathematics faculty, who wanted the institute to stay a bastion of pure scientific research. Abraham Pais said that J. Robert Oppenheimer himself thought that one of his failures at the institute was being unable to bring together scholars from the natural sciences and the humanities.

During a series of conferences in New York from 1947 through 1949, physicists switched back from war work to theoretical issues. Under J. Robert Oppenheimer's direction, physicists tackled the greatest outstanding problems of the pre-war years viz. infinite, divergent, and nonsensical expressions in the quantum electrodynamics of elementary Particles. Julian Schwinger, Richard Feynman and Shinichiro Tomonaga tackled the problem of regularization, and developed techniques that became known as renormalization. Freeman Dyson was able to prove that their procedures gave similar results. The problem of meson absorption and Hideki Yukawa's theory of mesons as the carrier particles of the strong nuclear force were also tackled.

Probing questions from J. Robert Oppenheimer prompted Robert Marshak's innovative two-meson hypothesis: that there are actually two types of mesons, pions and muons. This led to Cecil

Frank Powell's breakthrough and subsequent Nobel Prize for the discovery of the pion.

The Institute thus became an independent center for theoretical research and intellectual inquiry (Fig. 37). It served as the academic home of internationally preeminent scholars, including Albert Einstein, Hermann Weyl, John von Neumann, and Kurt Gödel, many of whom had emigrated from Europe to the United States.

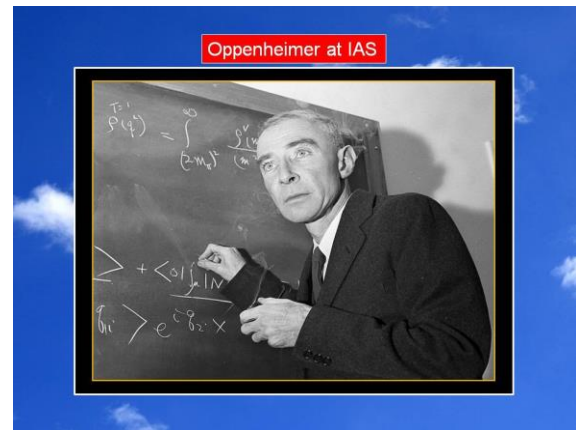


Fig. 37. J. Robert Oppenheimer is shown at his study at the Institute for Advanced Study on Dec. 15, 1957. (John Rooney/AP).

#### ATOMIC ENERGY COMMISSION (AEC)

While Director of the Institute, J. Robert Oppenheimer was also the Chairman of the General Advisory Committee of the Atomic Energy Commission from 1947 through 1952, overseeing all atomic research and development in the United States. For the following two years, he was its consultant. J. Robert Oppenheimer also served on the atomic committee of the Research and Development Board to advise the military, the science advisory committee of the Office of Defense Mobilization and study groups by the dozen. He had a desk in the President's Executive Offices, across the street from the White House.

J. Robert Oppenheimer opposed the development of the hydrogen bomb during a 1949–1950 governmental debate on the question and subsequently took positions on defense related issues that provoked the ire of some U.S. government and military factions.

The AEC security hearings for J. Robert Oppenheimer were triggered late in 1953, when William L. Borden, former executive director of the Joint Congressional Committee on Atomic Energy, wrote an unsolicited letter to J. Edgar Hoover, director of the Federal Bureau of Investigation. Mr.

Borden gave it as his opinion that the scientist had been "a hardened Communist" and that "more probably than not he has since been functioning as an espionage agent."

Mr. Hoover wasted little time in sending the letter and an F.B.I. report to the White House and other agencies. It was then that President Eisenhower cut J. Robert Oppenheimer off from access to secret material. Lewis L. Strauss (pronounced "straws"), then chairman of the Atomic Energy Commission, gave J. Robert Oppenheimer the option of resigning his consultant ship with the commission or asking for a hearing. J. Robert Oppenheimer chose a hearing.

### REVOCATION OF SECURITY CLEARANCE

As an advisor to the U.S. Atomic Energy Commission in 1954, J. Robert Oppenheimer advocated against further nuclear research, especially the hydrogen bomb proposed by Teller. His stance became a point of contention amid the tense Cold War with the Soviet Union. AEC Chairman Lewis Strauss had long resented J. Robert Oppenheimer for publicly dismissing his concerns regarding the export of radioisotopes and for recommending arms talks with the Soviet Union. He also believed that, years earlier, J. Robert Oppenheimer turned Einstein against him. At a hearing intended to eliminate his political influence (Fig. 38), J. Robert Oppenheimer was betrayed by Teller (Fig. 39) and other colleagues.

Edward Teller opposed to restoring J. Robert Oppenheimer's security clearance. His testimony was:

In a great number of cases I have seen Dr. Oppenheimer act -- I understood that Dr. Oppenheimer acted -- in a way which for me was exceedingly hard to understand. I thoroughly disagreed with him in numerous issues and his actions frankly appeared to me confused and complicated. To this extent I feel that I would like to see the vital interests of this country in hands which I understand better, and therefore trust more. In this very limited sense I would like to express a feeling that I would personally feel more secure if public matters would rest in other hands.

Possible reasons for Teller's negative testimony of J. Robert Oppenheimer were:

1. Professional jealousy of J. Robert Oppenheimer with his position, power, and prestige at Los Alamos.
2. At Los Alamos, Teller was passed over for Hans Bethe as the head of the important Theoretical Physics Division by J. Robert Oppenheimer.

3. J. Robert Oppenheimer opposed the development of Hydrogen bomb that Teller was keen on developing.

Strauss (Fig. 39) exploited J. Robert Oppenheimer's associations with communists such as Tatlock and J. Robert Oppenheimer's brother, Frank. Despite Rabi, Kitty, and several other allies testified in J. Robert Oppenheimer's defense, J. Robert Oppenheimer's security clearance was revoked, damaging his public image and neutralizing his policy influence.

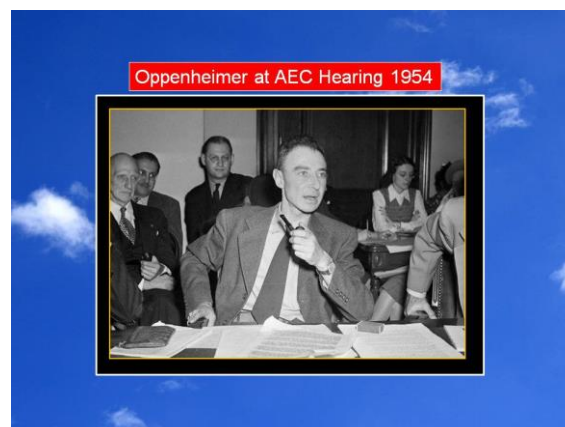


Fig. 38. J. Robert Oppenheimer at AEC Hearing 1954. Credit: <https://famous-trials.com/Oppenheimer> Retrieved August 21, 2023.

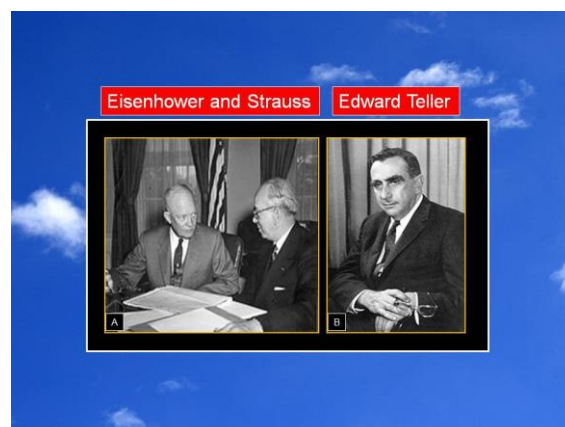


Fig. 39. A. President Dwight D. Eisenhower receives a report from Lewis L. Strauss, Chairman of the Atomic Energy Commission, on the Operation Castle hydrogen bomb tests in the Pacific, March 30, 1954. Strauss pressed for J. Robert Oppenheimer's security clearance to be revoked. Wikipedia . B: J. Robert Oppenheimer's former colleague, Edward Teller, testified against J. Robert Oppenheimer at his security hearing in 1954. Wikipedia (2023b).

At the hearing, J. Robert Oppenheimer was not fully transparent. He once said of human beings: "There are secrets about the thoughts and intentions of men. Sometimes, they're secret because a man doesn't like to know what he's up to, if he can avoid it." (Murrow, 1955).



The AEC issued its decision and opinions on June 29, 1954, with a vote of 4 to 1 to revoke J. Robert Oppenheimer's security clearance, citing "fundamental defects of character", and Communist associations "far beyond the tolerable limits of prudence and self-restraint which are to be expected of one holding the high positions"

This revocation effectively ended his access to the government's atomic secrets albeit his career as a nuclear physicist. Stripped also of his direct political influence, J. Robert Oppenheimer continued to lecture, write, and work in physics. orld than any other single scientist with a Nobel Prize.

Scientists and Politicians who directly or indirectly supported J. Robert Oppenheimer during and after the 1954 Security Hearing include the following:

- Senator John F. Kennedy
- President John F. Kennedy
- President Lyndon B. Johnson
- General Leslie R. Groves
- Albert Einstein
- Hans Bethe
- Ernest O. Lawrence
- Niels Bohr
- Isidor Isaac Rabi
- David Hill
- Robert Serber
- Richard Feynman
- Enrico Fermi.

#### **RESPONSE TO REVOCATION**

1. Albert Einstein noted that AEC stood for "Atomic Extermination Conspiracy".
2. Wernher von Braun, a former Nazi turned American pioneer of rocket technology, such as Saturn V used in the Apollo Program, commented, "In England, Oppenheimer would have been knighted".
3. Author Priscilla McMillan noted: "The head of the Atomic Energy Commission Lewis Strauss had hand-picked the cloak judges and he picked as a prosecutor Roger Robb, a Washington lawyer, who behaved as if he were prosecutor of a criminal defendant." She also observed: "He was really judged on his character and to be told that you are not trustworthy as he literally was because of flaws of character. That's a judgment, which stays with you the rest of your life. And for someone like Oppenheimer who grew up worrying about being flawed, it could not

4. Narrator Jack Perkins pointed out: "Oppenheimer's lawyers did not have security clearance, so they had to leave him alone in the hearing room whenever classified material was discussed." (A&E Biography, 1995).
5. General Leslie Groves, after Oppenheimer's security clearance had been revoked in 1954, said the following: "I was completely responsible for the selection of Dr. Oppenheimer as the head of the los alamos bomb laboratory. Nothing has happened during the affair or afterwards. That led me to believe that that was not a wise choice." (A&E Biography, 1995).
6. Col. John Lansdale, Manhattan Project Security, was outraged by the hearing: "The conduct of the hearing and handling this thing was an outrage. This is the way our government ordered the man who had perhaps made the most important contributions to the devices that won the war. And how do we reward him? We rewarded him by bringing false accusations against him and subjecting him to hearings and so on. I'm still outraged by it." (A&E Biography, 1995).
7. Philip Morrison, who studied under J. Robert Oppenheimer at the University of California, Berkeley, and worked at Los Alamos in 1944, said the following: "Well, you remember we went through many years of this struggle with Mr. McCarthy, and of course, we were dumbfounded when the same thing reached Robert opera which I imagined was going to happen, but I didn't think it would happen quite as vigorously and quite as openly and quite as hard-heartedly as it did. It wasn't a witch hunt, but they had their witch, and they burned him, and it was very unpleasant." (A&E Biography, 1995).
8. Hans Bethe recalled: "Oppenheimer took the outcome of the security hearing very quietly but he was a changed person; much of his previous spirit and liveliness had left him,"
9. According to Kean (2023), "Most biographers treat those humiliating hearings as the central tragedy of Oppenheimer's life. But the friends who knew him best saw things differently. They knew about Oppenheimer's frustrating brilliance — an incandescent mind that simply couldn't focus and see things through. To them, the

tragedy of Oppenheimer's life was that he never became the Einstein he could have been." But the reality was that even without a Nobel Prize, J. Robert Oppenheimer had more impact on the world.

10. Historian Arthur Schlesinger (1954) concluded his evaluation of the AEC security hearing as: "Is absolute security possible short of an absolute state? Robert Oppenheimer was doubtless at moments a cocky, irritating, even arrogant man. But surely no arrogance of Oppenheimer equals the arrogance of those who, in the frightening words of the Gray Board, affirm that "it has been demonstrated that the Government can search . . . the soul of an individual whose relationship to his Government is in question." The government which claims to do this would hardly seem a government for Americans."
11. Author Richard Rhodes summarized the hearing as: "This was merely a hearing, but the truth is it was conducted as a trial. Oppenheimer was ferociously cross-examined. Roger Robb (Lawyer) caught Oppenheimer in a series of contradictions. He made him feel like a fool. Oppenheimer finally cried out in a kind of agony in answer to a question by Rob: Why did you do that Dr. Oppenheimer? Oppenheimer replied: Because I was an idiot." (A&E Biography, 1995).
12. Finally, when the Oppenheimer hearings ended after three grueling weeks. Co-Council Samuel Silverman reads from Oppenheimer's attorney Lloyd K. Garrison's summation: "There is more than Dr. Oppenheimer on trial in this room. The Government of the United States is here on trial also. Our whole security process is on trial here. And is in your keeping as is his life. America must not devour her own children Mr. Chairman and Member of the board." (A&E Biography, 1995).

## EVENTS LEADING TO J. ROBERT OPPENHEIMER'S VINDICATION (1954 – 2022)

### JOHN F. KENNEDY

John F. Kennedy made monumental contributions during the period from 1959 to 1963 in restoring credibility to J. Robert Oppenheimer.

At Strauss's later Senate confirmation hearing for Secretary of Commerce in 1959, Hill testified about Strauss's personal motives in

engineering Oppenheimer's downfall. Thus the U.S. Senate voted against Strauss's nomination and Senator John F. Kennedy voted against Strauss's nomination and thus humiliated Straus for what he did to J. Robert Oppenheimer. On April 29, 1962, the U.S. Government made amends for the treatment J. Robert Oppenheimer suffered during the McCarthy years, when President John F. Kennedy invited J. Robert Oppenheimer to a White House dinner for Nobel Prize winners (Table 4 in Appendix D) (Fig. 40). J. Robert Oppenheimer did attend the Dinner, where President Kennedy offered J. Robert Oppenheimer a chance to clear his name via a second Hearing. But J. Robert Oppenheimer politely declined. The Dinner enabled J. Robert Oppenheimer to personally interact with more Nobel Laureates than any other scientist on this Planet Earth!



Fig. 40. President John F. Kennedy and First Lady Jacqueline Kennedy pose with Nobel Prize winners from the Western Hemisphere at a dinner in their honor on 29<sup>th</sup> April, 1962. Credit: Abbie Rowe. White House Photographs. John F. Kennedy Presidential Library and Museum, Boston.

One of the last acts of President John F. Kennedy was that he signed the Enrico Fermi Award for J. Robert Oppenheimer. The **Enrico Fermi Award** is a scientific award conferred by the President of the United States. It is awarded to honor scientists of international stature for their lifetime achievement in the development, use, or production of energy. It was established in 1956 by the United States Department of Energy in memorial of Italian physicist Enrico Fermi and his work in the development of power. On November 22, 1963, Kennedy was assassinated.

On December 2, 1963, President Lyndon B. Johnson presented J. Robert Oppenheimer with the Enrico Fermi Award as a gesture of political rehabilitation (Fig. 41). In his acceptance remarks, J. Robert Oppenheimer stated that "I think it is just possible, Mr. President, that it has taken some charity

and some courage for you to make this award today” (A&E Biography, 1995).

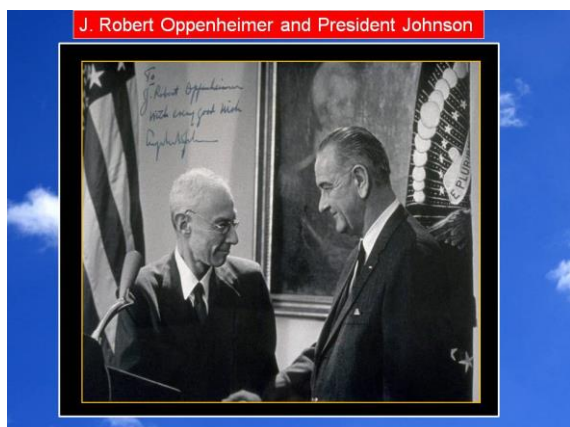


Fig. 41. President Lyndon B. Johnson shakes hands with physicist J. Robert Oppenheimer at a ceremony presenting him with the Enrico Fermi Award in 1963. Corbis/Getty Images  
Source: *IAS*.

Along with Albert Einstein, Bertrand Russell, and Joseph Rotblat he established the World Academy of Art and Science in 1960. He continued lecturing around the world on Nonproliferation of nuclear weapons. However, he was spiritually broken during the final phase of his life (Fig. 42).

In 1961, J. Robert Oppenheimer, with reference to the atomic bombing of Hiroshima and Nagasaki, said the following:

I carry no weight on my conscience. Scientists are not delinquents. Our work has changed the conditions in which men live, but the use made of these changes is the problem of governments, not of scientists.



Fig. 42. Final phase of J. Robert Oppenheimer. Color photo of Oppenheimer by Alfred Eisenstaedt, 1963. Credit: Wellerstein (2012).

## THE U. S. VIRGIN ISLANDS

In St. John in the U. S. Virgin Islands, the two-acre plot where J. Robert Oppenheimer and his family disappeared and lived in a modest cottage part-time from 1955 until his death in 1967. It is a public land today, known locally as “Oppenheimer

Beach.” Though it doesn't appear on most tourist maps, it's regularly touted as one of the best beaches in the Virgin Islands and one of its best-kept secrets. Similarly, the little-known story of how J. Robert Oppenheimer went from a national hero to a villain to Caribbean castaway offers a fascinating glimpse into the life of one of the US' most famous scientists, and the island that ultimately shaped his final days (Srein, 2023). As a Faculty in School of Natural Sciences at IAS in 1966 –1967, he and his wife spent considerable time away from the public eyes at their cottage in St. John in the U. S. Virgin Islands (Fig. 43).



Fig. 43. A. In the midst of Oppenheimer's fall, "the father of the atomic bomb" escaped to St. John in the U. S. Virgin Islands and built a house on what is now known as “Oppenheimer Beach”. Credit: CD Wheatley/Getty Images). From Stein (2023). B. J. Robert Oppenheimer, his wife Kitty, and children. A local legend is that J. Robert Oppenheimer moved his family to the Virgin Islands because he felt it would be one of the last places affected by a nuclear blast. Credit: Getty Images. From Stein (2023).

## Death and Memorial Service in Princeton

Oppenheimer died of throat cancer at 8 O' clock on Saturday, February 18, 1967 (aged 62), at his home in Princeton, New Jersey, U.S. J. Robert Oppenheimer was cremated and his ashes were deposited in the waters of St. John in the U.S. Virgin Islands.

His final days can be best described in the words of Freeman Dyson as published in the New Atlantis (Valiunas, 2006). In late 1965, J. Robert Oppenheimer was diagnosed with cancer of the throat, caused by forty years of heavy smoking. As Oppenheimer's death approached, Freeman Dyson, his former subordinate at Los Alamos and his colleague at the Institute for Advanced Study, found him ever finer in spirit: “He accepted his fate gracefully; he carried on with his job; he never complained; he became quite suddenly simple and no longer trying to impress anybody.” He was noblest toward the end, and seeing him frail and dying, one thinks of both the private man and the public life he



led, a life with consequences beyond the state of his own soul.

When J. Robert Oppenheimer died in 1967, his published articles in physics totaled 73, ranging from topics in quantum field theory, particle physics, the theory of cosmic radiations to nuclear physics and cosmology (Veisdal, 2021).

On February 19, 1967, the New York Times published the following in its Obituary (Losin, 1967):

In 1954 he was stripped of security clearance by the Atomic Energy Commission because of alleged association with Communists. The same agency nine years later awarded J. Robert Oppenheimer the \$50,000 Fermi award for "his outstanding contributions to theoretical physics and his scientific and administrative leadership."

On February 20, 1967, a statement by the President Lyndon B. Johnson was issued on the Death of J. Robert Oppenheimer:

"I am greatly saddened by Dr. Oppenheimer's death.

America knew him best, of course, as the technical leader of the great wartime effort which led to the successful development of the atomic bomb. From the work he directed, there has resulted not only the nuclear might on which our security rests, but also the great flood of peaceful applications of atomic energy which we are now learning how to use fully for mankind's benefit. He well deserved the Enrico Fermi Award, presented to him in 1963 for these outstanding contributions.

Dr. Oppenheimer was not only a great scientist, but a great humanitarian. He understood fully the implications of his work and did what he could to assure that the world would be a better place in which to live. The world will miss his genius."

Source" Lyndon B. Johnson, Statement by the President on the Death of Dr. J. Robert Oppenheimer. Online by Gerhard Peters and John T. Woolley, The American Presidency Project <https://www.presidency.ucsb.edu/node/237737>  
Retrieved October 26, 2023

On February 25, Saturday at 3:00 pm Eastern Time (US), 1967, one week after his death, a memorial service was held at the Alexander Hall on the Princeton University campus. This service was attended by over 600 people, which included numerous associates from academia and research, Nobel Laureates, government officials, heads of

military, poets, and even the director of the New York City Ballet. In particular, historian Arthur M. Schlesinger Jr., novelist John O'Hara, choreographer George Balanchine, Manhattan Project Director General Leslie R. Groves, diplomat George Kennan, and physicist Hans Bethe. Also, David Lilienthal (AEC), Isidor Isaac Rabi (Manhattan Project), and Eugene Wigner (Manhattan Project) were there. Of course, Oppenheimer's wife Kitty, his brother Frank, and the rest of his family were in attendance. In addition to brief eulogies by Bethe and Kennan, his Princeton neighbor and fellow physicist Henry DeWolf Smyth said in a eulogy, "Such a wrong can never be righted; such a blot on our history never erased.... We regret that his great work for his country was repaid so shabbily." (Wikipedia, 2023z6; Levin, 2023).

In this context, it is worth noting that Smyth was the sole commissioner to vote against stripping Oppenheimer's clearance on June 29, 1954. Smyth's rationale for what McGeorge Bundy has called his "lonely but powerful dissent" was that the evidence against Oppenheimer was weak and even contrived and was easily outweighed by Oppenheimer's contributions to U.S. nuclear weapons efforts. Smyth resigned from the AEC on September 30, 1954 out of frustration with Lewis Strauss (Wikipedia, 2023z6).

#### **AFTER THE DEATH OF J. ROBERT OPPENHEIMER**

President Nixon recognized the "Atomic Pioneers" at the White House (Fig. 44) in 1970. J. Robert Oppenheimer's wife Katherine died in Panama City, Panama in 1972. A number of plays were written about J. Robert Oppenheimer, and American composer John Adams (*Nixon in China*) composed an opera commissioned by the San Francisco Opera entitled *Doctor Atomic*, which premiered in September 2005.

There are also a large number of books on J. Robert Oppenheimer and his life, including most recently, *J. Robert Oppenheimer: The Brain Behind the Bomb (Inventors Who Changed the World)* by Glenn Scherer and Marty Fletcher (Myreportlinks.com, 2007) and *Oppenheimer and the Manhattan Project: Insights into J. Robert Oppenheimer, "Father of the Atomic Bomb,"* by Cynthia C. Kelly (World Scientific Publishing Company, 2006).

The U.S. Department of Energy also declassified in 2014 all the documents related to the 1954 Atomic Energy Commission's hearing on J. Robert Oppenheimer. The released documents

reinforced the public perception that Oppenheimer's career was unjustly cut short by professional jealousy of a few scientists like Edward Teller and by the hysterical 1950s McCarthyism. Consequently, Teller was shunned whereas J. Robert Oppenheimer was praised by the Scientific Community around the world.

On December 16 of 2022, the U.S. Department of Energy formally reversed the 1954 ruling that had stripped J. Robert Oppenheimer of his security clearance. The U.S. Secretary of Energy Jennifer Granholm wrote in a press release the following: "As time has passed, more evidence has come to light of the bias and unfairness of the process that Dr. Oppenheimer was subjected to while the evidence of his loyalty and love of country have only been further affirmed." Though belated, this final act by the U.S. Government is the ultimate vindication against false accusations of espionage after 68 years!



Fig. 44. This photograph was taken during an "Atomic Pioneers" ceremony held at the White House with President Nixon, February 27, 1970. The photograph is courtesy Department of Energy, via Lawrence Berkeley National Laboratory's web page. DOE (2023f).

## J. ROBERT OPPENHEIMER'S IMPACT AND LEGACY

Undoubtedly, J. Robert Oppenheimer made phenomenal contributions to science and society. In recognizing the impact of J. Robert Oppenheimer's contributions to science and society as a whole, the International Astronomical Union in 1970 named a crater on the Moon as "Oppenheimer Crater", which is a large lunar impact crater that lies on the Far side of the Moon (Fig. 45). It was previously known as Crater 382. Diameter: 208 km (Wikipedia, 2023v and NASA, 2016).

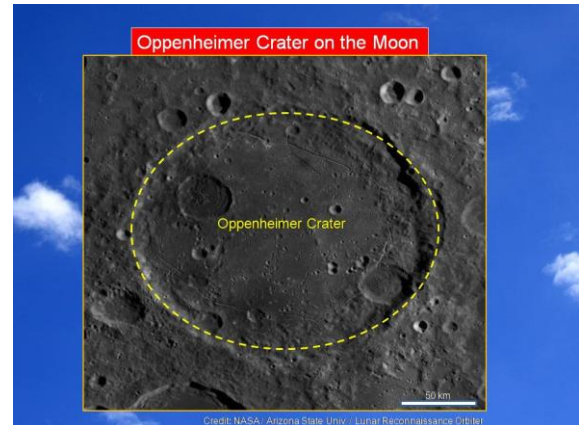


Fig. 45. **Oppenheimer Crater on the Moon.** It is named after Robert Oppenheimer by the International Astronomical Union in 1970. It was previously known as Crater 382. The impact of J. Robert Oppenheimer is so great on so many levels on society that it is difficult to fathom. Diameter: 208 km. Credit: Wikipedia (2023v) and NASA (2016).

His specific impacts, to name, a few includes

1. The "father of the atomic bomb". Under his direction, the LANL designed and produced the nuclear weapons that ended the World War II.
2. His policy of nuclear nonproliferation is more relevant today than ever before.
3. His scientific publications are still being used today:
  - Born-Oppenheimer Approximation.
  - Oppenheimer-Phillips effect.
  - Gravitational Contraction and Black Hole.
4. His students went on to receive Nobel Prizes.
5. He practiced the basic lesson that he learned from the Ethical Cultural School in New York City (1911–1921), which was "helping the needy", during the 1930s. For this kind and ethical act, he was unscrupulously blamed for Un-American activities during the McCarthy era in the 1950s.
6. His 1954 AEC hearings exposed corruption in the U. S. politics.
7. In reflecting his philosophy and role in the development of atomic bomb, Oppenheimer described his principles during a speech in the summer of 1960, proving he was a genuine patriotic American (Fig. 46).
8. Prof. George Kennan, Institute for Advanced Study, recalled an emotional event: "I once said to him Robert there isn't a university in Europe that wouldn't have you momentarily if you wanted to come on to their faculty. Why do you submit to this? Why don't you go over and take a professorship over there? And the the tears

came to his eyes, and he said **I happen to love this Country.**" (A&E Biography, 1995).

9. In celebrating his achievements, the Princeton Magazine has published J. Robert Oppenheimer's photo on the cover of its Spring 2023 issue (Fig. 47) with a cover story by Levin (2023).
10. J. Robert Oppenheimer should, without any doubt, be considered as the single most consequential scientist in human history. **His legacy is one of historical greatness.**

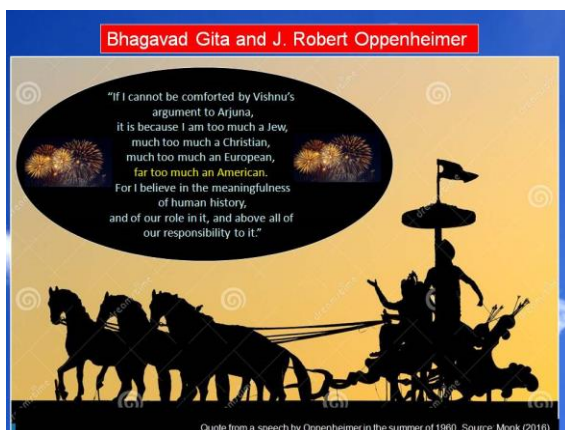


Fig. 46. In reflecting his philosophy and role in the development of atomic bomb, J. Robert Oppenheimer described his principles during a speech in the summer of 1960, proving he was a genuine patriotic American (Monk, 2026). Mahabharata image credit: Nitish Kumar and Dreamstime.com. The Bhagavad Gita and Mahabharata dates back to the second half of the first millennium BCE.

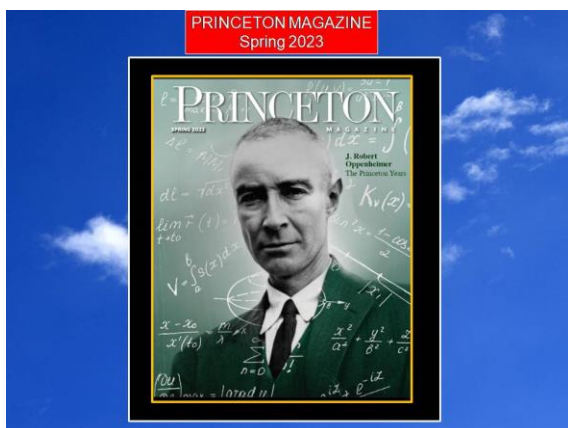


Fig. 47. Photo of J. Robert Oppenheimer on the cover of the Spring 2023 issue of Princeton Magazine. See cover story by Levin (2023). Credit: "Portrait of J. Robert Oppenheimer," Alan Richards, photographer. From the Shelby White and Leon Levy Archives Center in Princeton, N.J. Courtesy Princeton Magazine, Witherspoon Media Group.

William Happer (2023), who is a Senior Fellow at the Independent Institute and the Cyrus Fogg Brackett Professor Emeritus in the Department of Physics at Princeton University, wrote that "Julius Robert Oppenheimer is once more in the news, thanks

to the highly publicized film "Oppenheimer." As a physics graduate student at Princeton University in the early 1960s, I had occasional interactions with Oppenheimer, who was then the director of the Institute for Advanced Study. He was not very friendly to students at this stage of his career. But having suffered more than his share from "the slings and arrows of outrageous fortune," he remained a sympathetic figure to most students."

## EPILOGUE

The review as narrated in the foregoing owed it to the Movie "Oppenheimer" and therefore it would be more appropriate to recall the following as a befitting finale to the Review Article.

## MEMORABLE SCENES FROM THE MOVIE

The movie is full of memorable scenes. In my view, the following ones are quite striking.

1. The movie begins with a bizarre mix of Oppenheimer's thoughts ranging from beautiful raindrops, serene ripples, to obsessive thoughts about the burning stars and exploding universe. Suddenly, Oppenheimer wakes up and realizes that he is about to give his opening statement at the AEC hearing. This opening scene sets the stage for the viewers as to what to expect during the next three hours.
2. Amid difficulties in conducting experiments at Cambridge, J. Robert Oppenheimer receives advice from Niels Bohr to go to the University of Göttingen (Germany) and study theoretical physics under Max Born. Bohr asks: "Can you hear the music, Robert?" Oppenheimer replies: "Yes, I can." Oppenheimer shifts to the University of Göttingen. At Göttingen, he continues to have visions of hidden universe illustrating his mind obsessed with quantum mechanics, image of split human face by iPicasso, angst in the room with broken shards of glass, lying in bed sleepless, and consumed by obsessive thoughts of collapsing universe, and rhythmic sound waves accompanied by loud rumbling and thudding noise. Thus, begins the illustrious career of J. Robert Oppenheimer as a brilliant theoretical physicist.
3. J. Robert Oppenheimer concedes to General Leslie Groves that he cannot run a hamburger stand but he can run the Manhattan Project. He proceeds with great enthusiasm to a blackboard and explains how he would organize the project in building the bomb by connecting UC Berkeley, Met Lab, and Oak



- Ridge, connected by rail, at a secured central location (Los Alamos). General Leslie Groves is convinced of Oppenheimer's foresight to run the project.
4. J. Robert Oppenheimer begins his first lecture at UC Berkeley on Quantum Mechanics with great excitement to only one student that grows to many with his popularity.
  5. Inside a remote New Mexico mountain cabin, J. Robert Oppenheimer expresses his wish to his younger brother Frank Oppenheimer: "When I was a kid, I thought that if I could find a way to combine physics with New Mexico, my life would be perfect."
  6. Haakon Chevalier informing J. Robert Oppenheimer about the secret passing of information to the Soviet Spies. J. Robert Oppenheimer dismissing it saying "that would be treason".
  7. J. Robert Oppenheimer's final visit to his mistress Jean Tatlock in San Francisco. Seemingly disgusted by her husband's reaction, Katherine "Kitty" Oppenheimer utters these words: "You don't get to commit sin, and then ask all of us to feel sorry for you when there are consequences."
  8. Trinity test: First spectacular detonation of a nuclear weapon on this Planet Earth. When the bomb explodes at the Trinity climax scene, the sound goes totally silent! After a few moments of silence, the sound slowly resumes with Oppenheimer's voice saying a line from Bhagavad Gita: *'Now I am become Death, the destroyer of worlds.'*
  9. The removal of Japan's ancient traditional capital, Kyoto, as a target city for bombing by the Secretary of War Henry Stimson on the basis of its cultural importance. Stimson says that he and his wife went to Kyoto on their honeymoon. Sadly, the culture supersedes over human lives!
  10. J. Robert Oppenheimer's speech at Los Alamos after bombing of Japan with mixed emotions.
  11. After bombing of Hiroshima, J. Robert Oppenheimer told President Truman at the Oval Office in the White House, "Mr. President, I feel I have blood on my hands." Truman insultingly responds with the quote: "Hiroshima isn't about you," meaning that it was Truman who decided to drop the bomb, not Oppenheimer.
  12. As William Borden reads his inaccurate and inflammatory attack letter at the hearing, Oppenheimer quietly utters this line with disgust to his attorney: "Is anyone ever going to tell the truth?"
  13. The heated verbal exchange between J. Robert Oppenheimer and the lawyer Roger Robb at the hearing.
  14. After the U.S. Senate voted against Strauss's nomination for the Secretary of Commerce, his aide informs Strauss that one of the young Senators who voted against Strauss was John. F. Kennedy.
  15. J. Robert Oppenheimer's magnanimous gesture in shaking hands with Edward Teller, who backstabbed him at the security hearing, at the Fermi Award in 1963.
  16. Kitty refuses to shake Teller's hand at the Fermi Award with an angry facial expression. The background music hits a dark note.
  17. The insanely jealous Strauss and his obsessive monologue about Oppenheimer at the end of the movie. The acting by Robert Downey Jr. deserves an Academy Award (Oscar) for this part alone.
  18. In the final scene, J. Robert Oppenheimer is admitting to Albert Einstein that he views his actions as changing the world for the worse by saying "I believe we did." This final scene is so haunting and jarring all at the same time, it stays with you long after you left the theater pondering over the future of humanity! (Fig. 48).

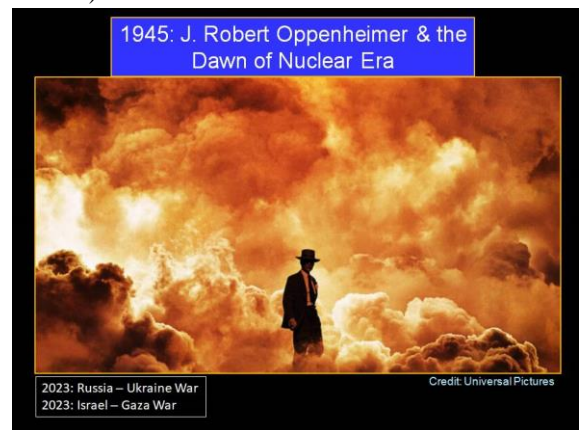


Fig. 48. The History will remember That J. Robert Oppenheimer was closely associated with the dawning of the Nuclear Era in 1945.

Although Nolan has been faithful to historical events, some events, as portrayed in the movie, are wrong. For example, there is no historical evidence that Oppenheimer plucked the apple laced with cyanide from the hands of Niels Bohr at Cambridge.

A movie with three hours of dialogues without any action scenes is a masterful achievement

by Nolan. This 3-hour long movie could be tedious for some who are unfamiliar with characters and events. However, I found the movie quite exhilarating and fast moving.

J. Robert Oppenheimer, who had the future of humanity in his hands, was the only scientist in the World History who was linked with winners of 50 Nobel Prizes. He directly worked with 18 of them at the Los Alamos National Laboratory. Although J. Robert Oppenheimer himself was nominated three times for the Nobel Prize in Physics — once in 1946, another in 1951, and again in 1967 — he never won it himself (Mancini, 2023). Nevertheless, J. Robert Oppenheimer was considered to be one of the greatest minds of the 20<sup>th</sup> Century. J. Robert Oppenheimer was a spokesperson for the conscience of all humankind for a peaceful world. For his noble notion, he was punished.

This movie is thus a story of human ingenuity, fragility, and cruelty. This story also reaffirms the fact that in the end, the truth does matter!

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The purpose of this article is purely educational. I have tried to use material in the public domain (e.g., Wikipedia, 2023a–z10). Where attribution is required, I have listed them for each image or quote. It is not my intention to infringe on content ownership. If you happen to find your art or images in the article without proper credit, please let me know, and I will be glad to credit to appropriate sources. Because the life of J. Robert Oppenheimer has been discussed in so many books, articles, movies, videos, and other medium, it is a true challenge to track the true provenance of a statement

or an image. In order to maintain accuracy of events, I have watched the movie ‘Oppenheimer’ in its entirety five times (15 hours).

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**PPENDIX A:**



**Table 1. J. Robert Oppenheimer is linked to winners of 50 Nobel Prizes during his lifetime and posthumously.**

Serial Number	Year	Subject	Nobel Laureate (Lifespan)	Affiliation
1	1906	Physics	J. J. Thomson (1856–1940)	U. Cambridge
2	1908	Chemistry	Ernest Rutherford (1871–1937)	U. Cambridge
3	1921	Physics	Albert Einstein (1879–1955)	Institute for Advanced Study
4	1922	Physics	Niels Bohr (1885–1962)	U. Göttingen
5	1925	Physics	James Franck (1882–1964)	U. Heidelberg
6	1927	Physics	Arthur Compton (1892–1962)	Washington University in St. Louis
7	1932	Physics	Werner Heisenberg (1901–1976)	U. Göttingen
8	1933	Physics	Paul Dirac (1902–1984)	U. Cambridge
9	1934	Chemistry	Harold Urey (1893–1981)	U. Copenhagen
10	1935	Physics	James Chadwick (1891–1974)	U. Cambridge
11	1938	Physics	Enrico Fermi (1901–1954)	U. Göttingen
12	1939	Physics	Ernest O. Lawrence (1901–1958)	U. California, Berkeley
13	1944	Physics	Isidor Isaac Rabi (1898–1988)	Columbia University
14	1945	Physics	Wolfgang Pauli (1900–1958)	U. Göttingen
15	1946	Physiology or Medicine	Hermann Muller (1890–1967)	Columbia University
16	1946	Physics	Percy Bridgman (1882–1961)	Harvard University
17	1948	Physics	Patrick Blackett (1897–1974)	U. Cambridge
18	1950	Physics	Cecil Frank Powell (1903–1969)	U. Cambridge
19	1950	Literature	Bertrand Russell (1872–1970)	Trinity College, Cambridge
20	1951	Chemistry	Edwin McMillan (1907–1991)	U. California, Berkeley
21	1951	Chemistry	Glenn Seaborg (1912–1999)	U. California, Berkeley
22	1952	Physics	Felix Bloch	Stanford University

			(1905–1983)	
<b>23</b>	1952	Physics	Edward Purcell (1912–1997)	Harvard University
<b>24</b>	1953	Peace	George C. Marshall (1880–1959)	U. S. Secretary of Defense (Wikipedia, 2023z7)
<b>25</b>	1954	Physics	Linus Pauling (1901–1994)	Caltech
<b>26</b>	1954	Physics	Max Born (1882–1970)	U. Göttingen
<b>27</b>	1955	Physics	Willis Lamb (1913–2008) Wikipedia (2023z5)	U. California, Berkeley (A student of Oppenheimer)
<b>28</b>	1957	Physics	Chen –Ning Yang (b. 1922)	Institute for Advanced Study
<b>29</b>	1957	Physics	Tsung-Dao Lee (b. 1926)	Institute for Advanced Study
<b>30</b>	1959	Physics	Emilio Segrè (1905–1989)	Los Alamos National Laboratory (LANL)
<b>31</b>	1959	Physics	Owen Chamberlain (1920–2006)	Los Alamos National Laboratory
<b>32</b>	1960	Chemistry	Willard Libby (1908–1980)	U. California, Berkeley
<b>33</b>	1962	Peace	Linus Pauling (1901–1994)	Caltech
<b>34</b>	1963	Physics	Maria Goeppert Mayer (1906–1972)	Los Alamos National Laboratory
<b>35</b>	1963	Physics	Eugene Wigner (1902–1995)	U. Göttingen
<b>36</b>	1965	Physics	Shinichiro Tomonaga (1906–1979)	Institute for Advanced Study
<b>37</b>	1965	Physics	Julian Schwinger (1918–1994)	U. California, Berkeley
<b>38</b>	1965	Physics	Richard Feynman (1918–1988)	Caltech
<b>39</b>	1966	Chemistry	Robert Mulliken (1896–1986)	University of Chicago
<b>40</b>	1967	Physics	Hans Bethe (1906–2005)	Cornell University
<b>41</b>	1968	Physics	Luis Walter Alvarez (1911–1988)	U. California, Berkeley
<b>42</b>	1969	Physics	Murray Gell–Mann (1929–2019)	Institute for Advanced Study
<b>43</b>	1975	Physics	James Rainwater (1917–1986)	Columbia University
<b>44</b>	1975	Physics	Aage Bohr (1922–2009)	Institute for Advanced Study
<b>45</b>	1980	Physics	Val Fitch (1923–2015)	Los Alamos National Laboratory
<b>46</b>	1985	Chemistry	Jerome Karle (1918–2013)	University of Chicago
<b>47</b>	1989	Physics	Norman Ramsey (1915–2011)	Columbia University
<b>48</b>	1995	Peace	Joseph Rotblat (1908–2005)	Los Alamos National Laboratory
<b>49</b>	1995	Physics	Frederick Reines (1918–1998)	Los Alamos National Laboratory
<b>50</b>	2005	Physics	Roy Glauber (1925–2018)	Los Alamos National Laboratory

**APPENDIX B:**

**Table 2. Timeline of key events covering 153 years of history (1870–2023) associated with J. Robert Oppenheimer (before, during, and after his lifetime). Data from multiple sources that include AHF (2022a, b), Bird and Sherwin (2005), Monk (2014), the people profiles (2023), and Yorston (2023), among others.**

Serial Number	Date	Event	Comment
1	1870	Ella Friedman, J. Robert Oppenheimer’s would be mother, was born in 1870 in New York City to a German Jewish family. She was a painter.	
2	1871 May	Julius S. Oppenheimer, J. Robert Oppenheimer’s would be father, was born in the United German Empire	
3	1888	Julius Oppenheimer, a German Jew, left Germany in 1888 for the United States virtually penniless at 17 years of age.	
4	1888–1903	Julius became a wealthy executive in a leading textile manufacturer in New York City.	
5	1903	Julius and Ella got married and settled in New York City. They lived a posh life and they had the original paintings of Vincent Van Gogh and Pablo Picasso, among other artists, on the wall.	
6	1904 April 22 <sup>nd</sup>	Julius Robert Oppenheimer was born to an affluent Jewish family in New York City, New York.	Known as J. Robert Oppenheimer
7	1909	At an early age of 5, J. Robert Oppenheimer was introduced to Mineralogy by his grandfather Benjamin.	
8	1910 August 8 <sup>th</sup>	Katherine Puening was born in Recklinghausen, Westphalia, Prussia, Germany.	Would be wife of J. Robert Oppenheimer
9	1911 September	Enrolled in the Ethical Cultural School in New York City.	
10	1912	Frank Oppenheimer was born in New York City. Frank would follow Robert by becoming a Physicist.	Robert’s younger brother
11	1913 May 14 <sup>th</sup>	Katherine Puening arrived in the United States aboard <i>SS Kaiser Wilhelm der Grosse</i> .	Would be wife of J. Robert Oppenheimer
12	1914 February 21 <sup>st</sup>	Jean Tatlock was born in Ann Arbor, Michigan	She had a relationship with Robert from 1936 to 1943
13	1916	At age 12, J. Robert Oppenheimer delivered an invited lecture at the prestigious New York Mineralogical Club.	
14	11918	At 14, he went on a Summer Camp. He was brutally bullied, but he never complained. He was also fearless at that age. He would go on sailing under stormy conditions, totally oblivious to danger (Yorston, 2023).	
15	1921	Graduated as valedictorian of his high school class– The Ethical Culture School of New York.	
16	1921–1922	After being bedridden with dysentery from a trip to Europe, he spent the summer in New Mexico to recuperate. This delayed his enrollment at Harvard by a year.	
17	1922	Enrolled at Harvard University.	
18	1925	Received Bachelor’s degree in chemistry from Harvard University. At Harvard, <ol style="list-style-type: none"> <li>1. He took six courses a semester.</li> <li>2. He studied Greek, Latin, Eastern Philosophy, and Poetry.</li> <li>3. He never read Newspapers or interested in Politics.</li> <li>4. He never showed interest in dating.</li> <li>5. He ate mostly chocolate and artichokes. His lunch consisted of butter toast with chocolate syrup.</li> </ol>	
19	1925	Began graduate work in physics at Cavendish Laboratory in Cambridge, England under J. J. Thomson. He was unable to succeed as an experimental Physicist at Cambridge because he did not possess the basic qualities, namely, dexterity, attention to details, and patience.	
20	1925	At Cambridge, J. Robert Oppenheimer was diagnosed with Dementia praecox, the old name for Schizophrenia (Yorston, 2023) because of his failed attempt to kill his tutor, Patrick Blackett.	
21	1926	At Cambridge, J. Robert Oppenheimer was fascinated by the lectures on Quantum Mechanics given by Paul Dirac. In the spring of 1926, Max Born	



		invited J. Robert Oppenheimer at Cambridge to come to Göttingen in Germany. J. Robert Oppenheimer took the advice and moved from Cavendish Laboratory to the University of Göttingen to finish his graduate studies under Max Born. This was a turning point in J. Robert Oppenheimer's life from one of failure and misery in experimental physics to one of success and glory in theoretical physics.	
22	1927	Received Ph.D. in Physics from the University of Göttingen in less than a year. After his Ph.D. Oral exam, James Franck, one of the internal examiners, a Nobel Prize winner, famously said "I am glad, that's over. He was at the point of questioning me."	
23	1927	Published a seminal paper On <u>quantum chemistry</u> and <u>molecular physics</u> , which is the the Born–Oppenheimer (BO) approximation. It is the best-known mathematical approximation in molecular dynamics. Specifically, it is the assumption that the <u>wave functions of atomic nuclei</u> and <u>electrons</u> in a molecule can be treated separately, based on the fact that the nuclei are much heavier than the electrons.	
24	1927–1928	National Research Fellow at Harvard and Caltech.	
25	1929	International Education Board Fellow at the University of Leyden, in the Netherlands, and the Technische Hochschule in Zürich, Switzerland (Losin, 1967).	
26	1929	He and his brother bought a ranch in the Sangre de Cristo Mountains in New Mexico. They called it Perro Caliente because J. Robert Oppenheimer shouted "Hot Dog" when he found out the cabin was available.	
27	1933	The Solvay Physics Conference, Brussels.	
28	1929–1942	Joined the faculty at the University of California, Berkeley, and Caltech. J. Robert Oppenheimer was described as aloof, arrogant, articulate, adventurous, and enigmatic. But he was always tempered with intellectual generosity to his students. Some of them went on to receive Nobel Prizes because of his mentoring. He often spent time learning Sanskrit and the Bhagavad Gita. This practice was by design and had deeper meanings. To J. Robert Oppenheimer, study of Physics was only an entry point to understanding the larger mystical nature of the Universe.	J. Robert Oppenheimer was a master of foreign languages, which include German, French, Dutch, Greek, Latin, and Sanskrit.
29	Late 1920s	Diagnosed with a mild case of tuberculosis. He spent time in New Mexico for its dry air.	
30	1931	His mother Ella Oppenheimer died in California.	
31	1933	Melba Phillips, one of J. Robert Oppenheimer's first Ph.D. students, completed her degree at the University of California, Berkeley at a time when few women pursued careers in science. In 1935, J. Robert Oppenheimer and Phillips published their description of the Oppenheimer-Phillips effect, an early contribution to nuclear physics that explained the behavior of accelerated nuclei of radioactive hydrogen atoms. In 1952, Phillips was also known for refusing to cooperate with a U.S. Senate judiciary subcommittee's investigation on internal security during the McCarthy era that led to her dismissal from her professorship at Brooklyn College and from her research position at Columbia University Radiation Laboratory.	
32	Mid 1930s	He got involved in social causes and set aside 3% of his salary to help Jews who wish to flee from anti-Jew laws in Nazi Germany.	
33	1936	Oppenheimer was appointed as a Full Professor at UC, Berkeley.	
34	1936–1943	Relationship between J. Robert Oppenheimer and Jean Tatlock persisted even after his marriage to Kitty.	
35	1937	His father Julius Oppenheimer died.	
36	1939 January 29 <sup>th</sup>	At UC Berkeley, a promising young student Luis Walter Alvarez informed J. Robert Oppenheimer of the news that two German Chemists Otto Hahn and Fritz Strassmann had split an atom of uranium by bombarding with neutrons in December 1938. Alvarez convinced J. Robert Oppenheimer of this possibility by repeating the experiment. This experiment was the birth of the idea to develop an atomic bomb (Veritasium, 2023).	
37	1939	His 1939 paper with Hartland Snyder on "Continued Gravitational Contraction", published in <i>Physical Review</i> , demonstrated that a massive star, when it exhausts its nuclear fuel, will necessarily contract forever, forming what we now know as a "Black Hole". J. Robert Oppenheimer was a pioneer in Cosmology.	
38	1939	Frank Oppenheimer received his Ph.D. in Physics from Caltech.	His younger brother

*The Life and Travails of J. Robert Oppenheimer, the Nuclear Scientist: Review Article*

39	1939 August 2 <sup>nd</sup>	Albert Einstein wrote a letter to the U. S. President Franklin Roosevelt.	Table 6 in Appendix F
40	1939 August 9 <sup>th</sup>	Albert Einstein and Leo Szilard wrote a letter to President Franklin Delano Roosevelt (FDR) alerting him about the German's ongoing research on nuclear weapons. But Roosevelt did not respond to this letter immediately because the U.S. was not involved in the World War II in 1939.	
41	1940 November	J. Robert Oppenheimer married Katherine (Kitty) Puening Harrison. She was already pregnant with son Peter at the time of her marriage. Kitty got married to J. Robert Oppenheimer the same day she obtained divorce from her husband Harrison.	
42	1941	President Roosevelt upgraded the informal uranium committee to S-1 committee, which would report directly to the White House. The explicit goal was to develop an atomic bomb (Veritasium, 2023).	
43	1941–1945	Frank Oppenheimer worked at the University of California Radiation Laboratory in Berkeley on the problem of uranium isotope separation under the guidance of Ernest Lawrence.	His younger brother
44	1941 May	Son Peter was born.	
45	1941 December 7 <sup>th</sup>	A surprise military strike by the Japanese Navy Air Service against the U.S. Naval Base at Pearl Harbor in Honolulu, Hawaii. Until then the U.S. was a neutral country in World War II. In response to the Pearl Harbor attack, President Roosevelt took action, and the U.S. entered the World War II. These events led to the origin of the Manhattan Project with J. Robert Oppenheimer in developing nuclear weapons.	1941 December 7 <sup>th</sup>
46	1942 January	Organized a program on fast neutron theoretical physics at the University of California at Berkeley.	
47	1942 May	J. Robert Oppenheimer was hired onto the S-1 Committee as the "Coordinator of rapid rupture" (Veritasium, 2023).	
48	1942 June	Joined the Chicago Met Lab to lead an effort on fast neutron physics, and prepared an outline for the entire neutron physics program.	
49	1942 July– September	Assembled theoretical study group in Berkeley to examine the principles of bomb design. Emerged as the natural leader.	
50	1942 August 13 <sup>th</sup>	The Manhattan Engineer District is formally established.	
51	1942 August 20 <sup>th</sup>	Glenn Seaborg isolates pure plutonium suitable for industrial scale use.	
52	1942 September 29 <sup>th</sup>	Proposed that a "fast-neutron lab" to study fast neutron physics and develop designs for an atomic bomb be created.	
53	1942 October 15 <sup>th</sup>	General Leslie R. Groves appointed J. Robert J. Robert Oppenheimer to head "Project Y", planned to be the new central laboratory for weapon physics research and design, which would become known as the Los Alamos National Laboratory (LANL). General Groves' decision was based on Oppenheimer's (1) brilliant intellect, (2) uncanny ability to explain complex issues in simple terms, (3) motivation, (4) a sense of urgency, (5) charisma, and (6) administrative abilities.	Hans Bethe later commented that "Oppenheimer was the ideal leader for the project because he understood every detail of the project better than anyone else."
54	1942 October 19 <sup>th</sup>	Vannevar Bush approves J. Robert Oppenheimer's appointment in meeting with J. Robert Oppenheimer and General Groves.	
55	1942 November 16 <sup>th</sup>	General Groves and J. Robert Oppenheimer visit the Los Alamos, a mesa in New Mexico and select it for "Site Y".	
56	1942 December 4 <sup>th</sup>	Secretary of War Henry Stimson wrote the letter to close the Ranch School at Los Alamos to clear way for building the Laboratory. The U.S. Government acquired 54,000 acres of land at a cost of \$440,000.	
57	1943–1945	J. Robert Oppenheimer served as the Scientific Director of the Los Alamos National Laboratory (LANL). Early recruitments included John Manley, Robert Wilson, John Williams, Joseph Kennedy, Hans Bethe, Robert Serber, Emil John Konopinski, Richard Feynman, among others.	
58	1943 February 18 <sup>th</sup>	Construction begins at Oak Ridge, TN on buildings for the Y-12 Plant, which was the electromagnetic U-235 separation Plant.	
59	1943 April	A series of Conferences are held among 100 scientific staff at Los Alamos Laboratory for exchanging ideas. Robert Serber gave indoctrination lectures. This is a critical function introduced by J. Robert Oppenheimer.	
60	1943	K-25 Plant construction begins in Oak Ridge, TN.	

	<b>June</b>		
61	1944 January 5 <sup>th</sup>	Jean Tatlock died.	The cause of death at 29 is in dispute.
62	1944	Daughter Katherine "Toni" Oppenheimer was born in Los Alamos.	
63	1945 February 2 <sup>nd</sup>	Los Alamos, NM receives first plutonium from Hanford, WA	
64	1945	Frank Oppenheimer worked at the Los Alamos National Laboratory and at Oak Ridge, Tennessee.	His younger brother
65	1945 May 10 and 11 <sup>th</sup>	Target Committee, composed of J. Robert Oppenheimer, John Von Neumann, Deak Parsons, and Hans Bethe, recommended Kyoto, Hiroshima, Yokohama, and Kokura Arsenal (Niigata is considered) (AHF, 2022a).	
66	1945 May 30 <sup>th</sup>	Secretary of War Henry Stimson rules out Kyoto, the ancient Capital of Japan, as the target for atomic attack.	
67	1945 July 16 <sup>th</sup>	J. Robert Oppenheimer witnessed the successful Trinity test. The "Gadget" was the first ever plutonium device detonated in the world. Designing and building the Gadget was the pinnacle of Science and Engineering research.	
68	1945 July 17 <sup>th</sup> –August 2 <sup>nd</sup>	The Potsdam Conference in Germany where President Truman gave orders to bomb Japan.	
69	1945 August 1 <sup>st</sup>	Arthur Compton submitted the results of a Poll, conducted among the Physicists who participated in the Manhattan Project with mixed opinions on whether or not to drop the bomb, to the Administration. But it was rejected because the President had already made the decision to drop the bomb.	
70	1945 August 6 <sup>th</sup>	The United States detonated an atomic bomb over the Japanese city of Hiroshima killing 70,000–126,000 civilians. The bomb named "Little Boy", an enriched uranium gun-type fission weapon, was used.	
71	1945 August 9 <sup>th</sup>	The United States detonated an atomic bomb over the Japanese city of Nagasaki killing 60,000–80,000 civilians. The bomb named "Fat Man", a plutonium implosion-type nuclear weapon, was used.	
72	1945 August 14 <sup>th</sup>	Japanese News Agency announces surrender.	
73	1945 October 16 <sup>th</sup>	J. Robert Oppenheimer resigned as the first director of Los Alamos Laboratory, accepting a post at Caltech.	
74	1947	J. Robert Oppenheimer became director of the Institute for Advanced Study in Princeton, New Jersey.	
75	1947 August 25 <sup>th</sup>	The Manhattan Engineering District is abolished.	
76	1947–1949	Frank Oppenheimer was appointed as Assistant Professor of Physics at the University of Minnesota. But was forced to resign in 1949 because of his past association with Communist party.	His younger brother
77	1948	TIME Magazine published Oppenheimer photo on the cover of November 8 <sup>th</sup> 1948 issue.	
78	1950 February 1 <sup>st</sup>	On February 1, 1950, the day after Truman had inaugurated development of the Super, J. Edgar Hoover informed Strauss that a Soviet spy had infiltrated the Manhattan Project during the war: Klaus Fuchs, a German refugee from Nazism. Strauss blamed J. Robert Oppenheimer for this terrible lapse in security, and went after him with everything he had (Valiunas, 2006).	
79	1953 November 7 <sup>th</sup>	William Borden Letter to J. Edgar Hoover Regarding Oppenheimer: "The purpose of this letter is to state my own exhaustively considered opinion, based upon years of study, of the available classified evidence that more probably than not J. Robert Oppenheimer is an agent of the Soviet Union."	
80	1953 December	President Dwight D. Eisenhower ordered that a "blank wall be placed between Dr. Oppenheimer and any secret data" pending a security hearing.	
81	1953	During the Second Red Scare, the U.S. Department of Energy revoked J. Robert Oppenheimer's security clearance and asked him to resign from his government position. He refused and demanded a hearing.	
82	1954 June 29 <sup>th</sup>	After a behind the door security hearing in which Edward Teller testified against J. Robert Oppenheimer, J. Robert Oppenheimer's security	



		clearance was revoked by the US Atomic Energy Commission, just 32 hours before it was set to expire.	
83	1955 January 4 <sup>th</sup>	In a TV interview with CBS Edward R. Murrow (1955), J. Robert Oppenheimer described the IAS where he was the Director as a “decompression chamber” for intellectuals. His colleagues included Albert Einstein, Niels Bohr, Freeman Dyson, Richard Feynman, among others. This TV program, which exemplified J. Robert Oppenheimer’s charm, superior intellect, and wit, overturned American opinion on him temporarily damaged by the revocation of his security clearance.	
84	1957–1959	Frank Oppenheimer accepted a teaching position at a high school in Pagosa Springs, Colorado. In 1959, he accepted a teaching position at University of Colorado.	His younger brother
85	1957–1966	In 1957, J. Robert Oppenheimer bought a beach estate in the “Gibney Beach” and relocated there in St. John, the U.S. Virgin Islands. During the next decade, they spent considerable amount of time there away from the Public Eye. This area is locally called “Oppenheimer Beach” (Stein, 2023).	
86	1957 September	France appointed J. Robert Oppenheimer as an Officer of the National Order of the Legion of Honor.	
87	1960	Along with Albert Einstein, Bertrand Russell, and Joseph Rotblat he established the World Academy of Art and Science in 1960.	
88	1960–1965	He continued lecturing around the world on the Non-Proliferation of nuclear weapons.	
89	1962 April 29 <sup>th</sup>	President John F. Kennedy invited him to a White House dinner for Nobel Prize winners. J. Robert Oppenheimer did attend that, Dinner.	
90	1962 May 3 <sup>rd</sup>	J. Robert Oppenheimer was elected a Foreign Member of the Royal Society in Great Britain.	
91	1963	Prior to his assassination on November 22 <sup>nd</sup> 1963, President John F. Kennedy boldly moved into rehabilitating J. Robert Oppenheimer by awarding him the Enrico Fermi Award.	
92	1963 December 2 <sup>nd</sup>	J. Robert Oppenheimer received the Enrico Fermi Award on December 2 <sup>nd</sup> from President Lyndon Johnson.	
93	1966	In 1965, J. Robert Oppenheimer was diagnosed with cancer of the throat. In those days, treatment options were limited. On his deathbed, J. Robert Oppenheimer regretted over his squandered opportunities to focus and complete research in the 1930s and to win a Nobel Prize. According to Kean (2023), Kitty requested Freeman Dyson to work with J. Robert Oppenheimer during his final days. Dyson declined and later said, “But I had to tell her that it was too late. I told her that I would like to sit quietly with Robert and hold his hand. His days as a scientist were over. It was too late to cure his anguish with equations.”	It is futile to speculate what he should or should not have done in his younger days. There were many challenges at LANL that pushed to the point of resigning. But he did not quit. He stayed and completed the task, which changed the world forever.
94	1967 February 18 <sup>th</sup>	J. Robert Oppenheimer died in Princeton, New Jersey. He was undergoing chemotherapy for his lung cancer, fell into a coma, and died.	
95	1967	As a show of vindication, his funeral service was attended by more than 600 scientists and other academic personnel to illustrate their support for his patriotic life.	
96	1967	His ashes were deposited in the waters of St. John, the U.S. Virgin Islands.	
97	1969–1985	Frank Oppenheimer served as the Director of Exploratorium, an interactive museum of art and science– in San Francisco. He died in Sausalito in California on February 3 <sup>rd</sup> 1985.	His younger brother
98	1970 February 27 <sup>th</sup>	President Nixon met with “Atomic Pioneers” at the White House.	
99	1972 October 27 <sup>th</sup>	Katherine “Kitty” Oppenheimer died of embolism in Panama City, Panama. Robert Serber and Toni cremated her and scattered her ashes in St. John, the U. S. Virgin Islands.	She was on a sailing trip with Robert Serber.
100	1977 January	Oppenheimer’s daughter Toni committed suicide in 1977, a month after her 32 birthday, in St. John, U.S. Virgin Islands.	Main causes for her suicide: 1. Death of her father. 2. Her

			two failed marriages. 3. Losing out her position as translator at the U.N. because of false allegations about her late father by FBI.
101	2005	Book “ <i>American Prometheus</i> ” by Kai Bird Martin J. Sherwin (2005) was published.	
102	2023	Son Peter Oppenheimer resides in New Mexico.	
103	2023	Granddaughter Dr. Dorothy Oppenheimer Vanderford resides in Nevada.	
104	2023	Grandson Charles Oppenheimer resides in New Mexico.	
105	2023 July 21 <sup>st</sup>	Movie “ <i>Oppenheimer</i> ”, directed by Christopher Nolan, was released in the United States and the United Kingdom. This movie is based on the Book “ <i>American Prometheus</i> ”.	
106	2023	Oppenheimer’s reputation has been fully rehabilitated.	
107	End Results	Lewis Strauss was humiliated by the Senate’s rejection of his confirmation of Secretary of Commerce. Edward Teller was shunned by scientists. J. Robert Oppenheimer was fully rehabilitated.	The Un–American activities leveled against J. Robert Oppenheimer were proven wrong.
108	Lesson Learned	J. Robert Oppenheimer’s story left an enduring scientific, cultural, and political legacy for the humankind. His philosophy: “We know that as long as men are free to ask what they will, free to say what they think, free to think what they must, science will never regress, and freedom itself will never be wholly lost.” (Emperors and Conquerors, 2023).	J. Robert Oppenheimer was a true patriotic American.
109	Summary	<p>J. Robert Oppenheimer is known for being:</p> <ul style="list-style-type: none"> <li>• Precocious</li> <li>• Fearless</li> <li>• Knowledgeable in</li> </ul> <p>Nuclear Physics Astrophysics Cosmology Quantum Chemistry Mathematics Engineering Mineralogy German French Dutch Greek Latin Sanskrit Bhagavad Gita Eastern Philosophy Poetry European furniture French postimpressionist and Fauvist artworks 19<sup>th</sup> Century Classics Sailing Horseback riding</p> <ul style="list-style-type: none"> <li>• Weird diet and drinking habits</li> <li>• Chain smoker</li> <li>• Clumsy social behavior</li> <li>• Had mistresses</li> <li>• Diagnosed with Schizophrenia</li> <li>• Donor for social causes</li> <li>• Despite 20 years of surveillance, J. Edgar Hoover and the FBI failed to produce any proof that J. Robert Oppenheimer was a member of the Communist Party.</li> <li>• Linked to 50 Nobel Laureates</li> <li>• Quick thinker</li> <li>• Fast learner</li> </ul>	<b>A Genius of Our Time</b>

		<ul style="list-style-type: none"> <li>• Brilliant Scientist</li> <li>• Inspiring Teacher</li> <li>• Pioneering Researcher</li> <li>• Excellent Administrator</li> <li>• Director of Los Alamos National Laboratory that developed atomic bombs, which ended the World War II.</li> <li>• Advocated Nonproliferation of nuclear weapons</li> <li>• Promoter of Arts and Sciences worldwide</li> <li>• His legacy is one of historical greatness.</li> </ul>	
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## APPENDIX C:

Table 3. Key people and their contributions associated with the development and deployment of atomic bombs.				
Serial Number	Date	People	Contribution	Comment
1	1939 July	Eugene Wigner	Wigner and his fellow Hungarian Physicists Leo Szilard and Edward Teller approached Albert Einstein and convinced him to attach his name to a letter to the U. S. President Franklin Roosevelt warning him of the potential threat of nuclear weapons and the U.S. need for government research.	
2	1939 August 2 <sup>nd</sup>	Albert Einstein	Albert Einstein letter to the U. S. President Franklin Roosevelt	Table 6 in Appendix F
3	1942 September 17 <sup>th</sup>	U.S. Army Colonel Leslie Groves	Appointed as the Head of Manhattan Engineer District known as the "Manhattan Project". In 1941, he was in charge of building the Pentagon, the gigantic complex for the war department's 40,000 staff.	
4	1942 October 19 <sup>th</sup>	Vannevar Bush	As the Head of the U.S. Office of Scientific Research and Development (OSRD), approves appointment of J. Robert Oppenheimer to lead the secret work at Los Alamos National Laboratory.	
5	1942 November 16 <sup>th</sup>	General Groves and J. Robert Oppenheimer	Visit the Los Alamos mesa in New Mexico and select it for Site Y.	
6	1943–1945	J. Robert Oppenheimer	Director of the Los Alamos National Laboratory, NM	
7	1942	Enrico Fermi	Enrico Fermi and a group of scientists gathered beneath the football stands at the University of Chicago to work on a special experiment. They achieved the first, controlled, self-sustaining nuclear chain reaction that would change the world forever.	
8	1942	Glenn Seaborg	Isolates pure plutonium suitable for industrial scale use.	
9	1942 December 1 <sup>st</sup>	James Franck	Joined the Met Lab in Chicago as the Director of the Chemistry Division. Involved in the plutonium separation process building on the pioneering work of Glenn Seaborg.	
10	1942–1943	James Conant	Chair, S-1 (Uranium) Committee	
11	1942–1945	Arthur Compton	Director Met Lab, Chicago.	
12	1943	Leo Szilard	Instrumental in urging President Roosevelt to develop nuclear weapons and in initiating the Manhattan Project. However, his participation in the project was minimal because of his conflict with General Groves.	
13	1943	Albert Einstein	Signed the letter to President Roosevelt and lent continued support to the nuclear program.	
14	1943	John Manley	Began working at the Metallurgical Lab at the University of Chicago. From there, he coordinated nationwide fission research and instrument studies for the early phase of the Manhattan Project.	
15	1943 May	Herbert York	Worked on the separation of uranium– 235 isotopes using calutrons. He later became the Director of Lawrence Livermore National Laboratory.	
16	1940–1943	Joseph Kennedy	In 1940, Kennedy codiscovered plutonium with Glenn Seaborg, Edwin McMillan, and Arthur Wahl. Specifically, Kennedy built the instruments that proved the existence of plutonium. Furthermore, Kennedy, Seaborg, and Wahl	



			demonstrated that plutonium was fissile, which was the underpinning for the success of the Manhattan Project.
17	1940–1943	Harold Urey	He worked on the Manhattan Project at Columbia University, overseeing the development of the gaseous diffusion method and the production of a suitable barrier for the separation of uranium isotopes.
18	1942–1945	Arthur Compton	Served as Project Director at the Metallurgical Lab at the University of Chicago.
19	1942–1945	Frank Oppenheimer	Frank, the younger brother of J. Robert Oppenheimer, conducted research on various aspects of nuclear physics and made contributions to uranium enrichment. In 1945, he went Oak Ridge to monitor the equipment at the Y-12 Plant. Then he moved back to Los Alamos and became the Executive Officer to Kenneth Bainbridge and worked on planning and executing the Trinity Test.
20	1943–1945	James Chadwick	Headed the British Mission at the Manhattan Project.
21	1943–1946	Emilio Segrè	Group leader for the Manhattan Project.
22	1943–1944	Robert Wilson	Early on, Wilson eloped organize the laboratory and brought his Princeton University colleagues there to form the Cyclotron Group. In 1944, he was appointed as the Head of Research Division at Los Alamos, with responsibility for experimental nuclear physics and for the nuclear measurements, which were made during the test of the bomb.
23	1943–1946	Ernest O. Lawrence (1901-1958)	Ernest O. Lawrence (1901-1958) was an American scientist and 1939 recipient of the Nobel Prize in Physics for his invention of the cyclotron. He developed and supervised the electromagnetic isotope separation process at the Radiation Laboratory at Berkeley and at Oakridge, Tennessee during the Manhattan Project.
24	1944 August	Enrico Fermi	Went to Los Alamos as an Associate Director and a Consultant.
25	1944	Enrico Fermi	Went to Hanford Site and inserted the first uranium slug into the “B” pile reactor, just as he did for the first pile in the CP-1 reactor two years earlier.
26	1944	Hans Bethe	Calculated the critical mass and efficiency of uranium-235 and the multiplication of nuclear fission in an exploding atomic bomb. Along with Richard Feynman, Bethe developed a formula for calculating the bomb’s explosive yield.
27	1944	Joseph Rotblat	He worked at the Los Alamos National Laboratory.
28	1944	Philip Morrison	Philip Morrison studied under J. Robert Oppenheimer at the University of California, Berkeley, and received his Ph.D. in 1940. In 1942, he joined the Chicago Met Lab as a research associate. He transferred to Los Alamos in 1944, where he worked in the critical assemblies group of the Weapon Physics Division and participated in dangerous criticality experiments.
29	1943–1945	Niels Bohr	He worked as a consultant at Los Alamos under the assumed name Nicholas Baker for security reasons. A close confidant of J. Robert Oppenheimer.
30	1943–1945	Von Neumann	Played a key role in building both A- bomb and H-bomb. His main contribution was on supervising vast and complex mathematical calculations using primitive electronic computers.
31	1944–1945	Edward Teller	Played a role in the development of fusion based weapons, despite differences with Oppenheimer. He is known as the “father of the hydrogen bomb”.
32	1944–1945	Isidor Isaac Rabi	Served as a consultant and brought scientific expertise and organizational skills to the project.
33	1944–1945	Robert Serber	Delivered essential lectures and theories vital to the design of the bomb.
34	1944–1945	Richard Feynman	Developed critical formulas with Bethe and contributed to safety procedures.

35	1944–1945	Klaus Fuchs	He worked on the problems related to the implosion bomb. In 1945, he passed along secret information on atomic bombs to the Soviet Union.
36	1944–1952	Melba Phillips	Worked at the Columbia University Radiation Laboratory.
37	1945	Luis Walter Alvarez	Made critical inventions for the success of the bomb.
38	1945	Kenneth Bainbridge	Directed the Trinity Test.
39	1945 August 6 <sup>th</sup>	Colonel Paul Tibbets Jr.	Dropped the atomic bomb “Little Boy” from a Boeing–29 super fortress bomber, named “Enola Gay”, on the Japanese City of Hiroshima.

## APPENDIX D:

Table 4. A total of 49 Nobel Laureates attended (45 are listed below) the White House Dinner hosted by President John F. Kennedy and First Lady Jacqueline Kennedy in honoring Nobel Laureates from the Western Hemisphere on April 29, 1962. In restoring credibility of J. Robert Oppenheimer, President Kennedy invited J. Robert Oppenheimer as a Special Guest to the Dinner. Modified after <https://www.jfklibrary.org/assetviewer/archives/JFKWHP/1962/Month%2004/Day%2029/JFKWHP-1962-04-29-B> Retrieved August 17, 2023

Serial Number	Dinner Participant	Lifespan	Comment
1	Anderson, Carl D. (Carl David)	1905–1991	–
2	Bardeen, John	1908–1991	–
3	Beadle, George Wells	1903–1989	–
4	Bloch, Felix	1905–1983	–
5	Buck, Pearl S. (Pearl Sydenstricker)	1892–1973	–
6	Bunche, Ralph J. (Ralph Johnson)	1904–1971	–
7	Calvin, Melvin	1911–1997	–
8	Chamberlain, Owen	1920–2006	–
9	Cori, C. F. (Carl Ferdinand)	1896–1984	–
10	Debye, Peter J. W. (Peter Josef William)	1884–1966	–
11	Doisy, Edward Adelbert	1893–1986	–
12	Erlanger, Joseph	1874–1965	–
13	Giauque, William F. (William Francis)	1895–1982	–
14	Hemingway, Mary (Mary Welsh)	1908–1986	–
15	Hench, Philip S. (Philip Showalter)	1896–1965	–
16	Hess, Victor F. (Victor Franz)	1883–1964	–
17	Hofstadter, Robert	1915–1990	–
18	Kendall, Edward C. (Edward Calvin)	1886–1972	–
19	Kennedy, John F. (John Fitzgerald)	1917–1963	President & Host
20	Kennedy, Jacqueline	1929–1994	Host
21	Kornberg, Arthur	1918–2007	–
22	Kusch, Polykarp	1911–1993	–
23	Lee, T. D.,	1926–	–
24	Libby, Willard F. (Willard Frank)	1908–1980	–
25	Lipmann, Fritz (Fritz Albert)	1899–1986	–
26	Marshall, Katherine Tupper	1882–1978	–
27	McMillan, Edwin M. (Edwin Mattison)	1907–1991	–
28	Mossbauer, Rudolf L. (Rudolf Ludwig)	1929–2011	–
29	Muller, H. J. (Hermann Joseph)	1890–1967	–
30	Murphy, William Parry	1892–1987	–
31	Oppenheimer, J. Robert	1904–1967	Special Guest
32	Pearson, Lester B. (Lester Bowles)	1897–1972	–
33	Purcell, Edward M. (Edward Mills)	1912–1997	–
34	Rabi, I. I. (Isidor Isaac)	1898–1988	–
35	Robbins, Frederick C.	1916–2003	–
36	Saint-John Perse	1887–1975	–
37	Seaborg, Glenn Theodore	1912–1999	–
38	Segré, Emilio	1905–1989	–
39	Shockley, William	1910–1989	–
40	Stanley, Wendell M. (Wendell Meredith)	1904–1971	–
41	Szent-Györgyi, Albert	1893–1986	–
42	Tatum, Edward L. (Edward Lawrie,	1909–1975	–

43	Urey, Harold Clayton	1893–1981	–
44	Von Békésy, Georg	1899–1972	–
45	Waksman, Selman A. (Selman Abraham)	1888–1973	–

## APPENDIX E:

Table 5. Publications by J. R. Oppenheimer <https://academictree.org/physics/publications.php?pid=52640>  
Retrieved August 9, 2023

Year	Citation	Score
1979	<b>Oppenheimer JR.</b> Oppenheimer on Einstein <i>Bulletin of the Atomic Scientists</i> . 35: 36-39. DOI: <a href="https://doi.org/10.1080/00963402.1979.11458597">10.1080/00963402.1979.11458597</a>	0.236
1965	Steenberg NRF, <b>Oppenheimer JR.</b> The Flying Trapeze: Three Crises for Physicists <i>International Journal</i> . 20: 285. DOI: <a href="https://doi.org/10.2307/40199550">10.2307/40199550</a>	0.19
1963	<b>Oppenheimer JR.</b> Fermi Prize: J. Robert Oppenheimer Named to Receive Annual AEC Award. <i>Science (New York, N.Y.)</i> . 140: 161-3. PMID <a href="https://pubmed.ncbi.nlm.nih.gov/17819826/">17819826</a> DOI: <a href="https://doi.org/10.1126/science.140.3563.161">10.1126/science.140.3563.161</a>	0.252
1963	<b>Oppenheimer JR.</b> COMMUNICATION AND COMPREHENSION OF SCIENTIFIC KNOWLEDGE. <i>Proceedings of the National Academy of Sciences of the United States of America</i> . 50: 1194-200. PMID <a href="https://pubmed.ncbi.nlm.nih.gov/16578560/">16578560</a>	0.179
1963	<b>Oppenheimer JR.</b> The Fermi Award <i>Physics Today</i> . 16: 21-23. DOI: <a href="https://doi.org/10.1063/1.3050979">10.1063/1.3050979</a>	0.218
1960	<b>Oppenheimer JR.</b> In the Keeping of Unreason <i>Bulletin of the Atomic Scientists</i> . 16: 18-22. DOI: <a href="https://doi.org/10.1080/00963402.1960.11454041">10.1080/00963402.1960.11454041</a>	0.193
1957	<b>Oppenheimer JR.</b> Impossible Choices. <i>Science (New York, N.Y.)</i> . 125: 1021. PMID <a href="https://pubmed.ncbi.nlm.nih.gov/17791105/">17791105</a> DOI: <a href="https://doi.org/10.1126/science.125.3256.1021">10.1126/science.125.3256.1021</a>	0.186
1956	<b>Oppenheimer JR.</b> Science and Our Times <i>Bulletin of the Atomic Scientists</i> . 12: 235-237. DOI: <a href="https://doi.org/10.1080/00963402.1956.11453735">10.1080/00963402.1956.11453735</a>	0.174
1953	<b>Oppenheimer JR.</b> Atomic Weapons and American Policy <i>Bulletin of the Atomic Scientists</i> . 9: 202-205. DOI: <a href="https://doi.org/10.1080/00963402.1953.11457429">10.1080/00963402.1953.11457429</a>	0.197
1951	<b>Oppenheimer JR.</b> Comments on the Military Value of the Atom <i>Bulletin of the Atomic Scientists</i> . 7: 43-45. DOI: <a href="https://doi.org/10.1080/00963402.1951.11457138">10.1080/00963402.1951.11457138</a>	0.18
1950	ARNOLD W, <b>OPPENHEIMER JR.</b> Internal conversion in the photosynthetic mechanism of blue-green algae. <i>The Journal of General Physiology</i> . 33: 423-35. PMID <a href="https://pubmed.ncbi.nlm.nih.gov/15410487/">15410487</a>	0.224
1949	<b>Oppenheimer JR</b> , Buckley OE, <b>Conant JB</b> , Dubridge LA, <b>Fermi E</b> , <b>Rabi II</b> , Rowe H, <b>Seaborg GT</b> , Smith CS. AEC Advisory Committee Statement on Fellowships <i>Bulletin of the Atomic Scientists</i> . 5: 210-254. DOI: <a href="https://doi.org/10.1080/00963402.1949.11457085">10.1080/00963402.1949.11457085</a>	0.64
1949	<b>Oppenheimer JR.</b> A Letter to Senator McMahon <i>Bulletin of the Atomic Scientists</i> . 5: 163-163. DOI: <a href="https://doi.org/10.1080/00963402.1949.11457071">10.1080/00963402.1949.11457071</a>	0.184
1948	Tomonaga SI, <b>Oppenheimer JR.</b> On infinite field reactions in quantum field theory [9] <i>Physical Review</i> . 74: 224-225. DOI: <a href="https://doi.org/10.1103/PhysRev.74.224">10.1103/PhysRev.74.224</a>	0.239
1948	Lewis HW, <b>Oppenheimer JR</b> , Wouthuysen SA. The multiple production of mesons <i>Physical Review</i> . 73: 127-140. DOI: <a href="https://doi.org/10.1103/PhysRev.73.127">10.1103/PhysRev.73.127</a>	0.286
1948	Epstein ST, <b>Finkelstein RJ</b> , <b>Oppenheimer JR.</b> Note on stimulated decay of negative mesons <i>Physical Review</i> . 73: 1140-1141. DOI: <a href="https://doi.org/10.1103/PhysRev.73.1140">10.1103/PhysRev.73.1140</a>	0.271
1948	<b>Oppenheimer JR.</b> Physics in the Contemporary World <i>Bulletin of the Atomic Scientists</i> . 4: 65-86. DOI: <a href="https://doi.org/10.1080/00963402.1948.11460172">10.1080/00963402.1948.11460172</a>	0.201
1948	<b>Oppenheimer JR.</b> International Control of Atomic Energy <i>Bulletin of the Atomic Scientists</i> . 4: 39-48. DOI: <a href="https://doi.org/10.1080/00963402.1948.11460162">10.1080/00963402.1948.11460162</a>	0.211
1947	<b>Oppenheimer JR.</b> Functions of the International Agency in Research and Development <i>Bulletin of the Atomic Scientists</i> . 3: 173-176. DOI: <a href="https://doi.org/10.1080/00963402.1947.11459078">10.1080/00963402.1947.11459078</a>	0.201
1946	Bethe HA, <b>Oppenheimer JR.</b> Reaction of Radiation on Electron Scattering and Heitler's Theory of Radiation Damping <i>Physical Review</i> . 70: 451-458. DOI: <a href="https://doi.org/10.1103/physrev.70.451">10.1103/physrev.70.451</a>	0.239
1941	<b>Oppenheimer JR</b> , <b>Schwinger J.</b> On the interaction of mesotrons and nuclei <i>Physical Review</i> . 60: 150-152. DOI: <a href="https://doi.org/10.1103/Physrev.60.150">10.1103/Physrev.60.150</a>	0.587
1941	<b>Oppenheimer JR.</b> On the spin of the mesotron [5] <i>Physical Review</i> . 59: 462. DOI: <a href="https://doi.org/10.1103/PhysRev.59.462">10.1103/PhysRev.59.462</a>	0.184
1940	<b>Oppenheimer JR</b> , <b>Snyder H</b> , Serber R. The production of soft secondaries by mesotrons <i>Physical Review</i> . 57: 75-81. DOI: <a href="https://doi.org/10.1103/Physrev.57.75">10.1103/Physrev.57.75</a>	0.578

1939	<b>Oppenheimer JR, Snyder H.</b> On Continued Gravitational Contraction <i>Physical Review</i> . 56: 455-459. DOI: <a href="https://doi.org/10.1103/PhysRev.56.455">10.1103/PhysRev.56.455</a>	0.599
1939	<b>Oppenheimer JR, Schwinger JS.</b> On pair emission in the proton bombardment of fluorine [10] <i>Physical Review</i> . 56: 1066-1067. DOI: <a href="https://doi.org/10.1103/PhysRev.56.1066">10.1103/PhysRev.56.1066</a>	0.588
1939	<b>Oppenheimer JR, Volkoff GM.</b> On Massive Neutron Cores <i>Physical Review</i> . 55: 374-381. DOI: <a href="https://doi.org/10.1103/PhysRev.55.374">10.1103/PhysRev.55.374</a>	0.227
1938	<b>Oppenheimer JR, Serber R.</b> On the stability of stellar neutron cores [1] <i>Physical Review</i> . 54: 540. DOI: <a href="https://doi.org/10.1103/PhysRev.54.540">10.1103/PhysRev.54.540</a>	0.215
1938	<b>Oppenheimer JR, Serber R.</b> Note on boron plus proton reactions <i>Physical Review</i> . 53: 636-638. DOI: <a href="https://doi.org/10.1103/PhysRev.53.636">10.1103/PhysRev.53.636</a>	0.212
1937	Kalckar F, <b>Oppenheimer JR, Serber R.</b> Note on resonances in transmutations of light nuclei <i>Physical Review</i> . 52: 279-282. DOI: <a href="https://doi.org/10.1103/PhysRev.52.279">10.1103/PhysRev.52.279</a>	0.202
1937	Kalckar F, <b>Oppenheimer JR, Serber R.</b> Note on nuclear photoeffect at high energies <i>Physical Review</i> . 52: 273-278. DOI: <a href="https://doi.org/10.1103/PhysRev.52.273">10.1103/PhysRev.52.273</a>	0.23
1937	Carlson JF, <b>Oppenheimer JR.</b> On Multiplicative Showers <i>Physical Review</i> . 51: 220-231. DOI: <a href="https://doi.org/10.1103/PhysRev.51.220">10.1103/PhysRev.51.220</a>	0.181
1937	<b>Oppenheimer JR, Serber R.</b> Note on the nature of cosmic-ray particles [15] <i>Physical Review</i> . 51: 1113. DOI: <a href="https://doi.org/10.1103/PhysRev.51.1113">10.1103/PhysRev.51.1113</a>	0.206
1937	Nordheim G, Nordheim LW, <b>Oppenheimer JR, Serber R.</b> The disintegration of high energy protons <i>Physical Review</i> . 51: 1037-1045. DOI: <a href="https://doi.org/10.1103/PhysRev.51.1037">10.1103/PhysRev.51.1037</a>	0.227
1935	<b>Oppenheimer JR.</b> Are the formulae for the absorption of high energy radiations valid? <i>Physical Review</i> . 47: 44-52. DOI: <a href="https://doi.org/10.1103/PhysRev.47.44">10.1103/PhysRev.47.44</a>	0.286
1935	<b>Oppenheimer JR.</b> Note on the production of pairs by charged particles <i>Physical Review</i> . 47: 146-147. DOI: <a href="https://doi.org/10.1103/PhysRev.47.146">10.1103/PhysRev.47.146</a>	0.264
1935	<b>Oppenheimer JR.</b> Note on charge and field fluctuations <i>Physical Review</i> . 47: 144-145. DOI: <a href="https://doi.org/10.1103/PhysRev.47.144">10.1103/PhysRev.47.144</a>	0.248
1934	<b>Lauritsen CC, Oppenheimer JR.</b> On the scattering of the Th C" $\gamma$ -rays [11] <i>Physical Review</i> . 46: 80-81. DOI: <a href="https://doi.org/10.1103/PhysRev.46.80">10.1103/PhysRev.46.80</a>	0.231
1933	<b>Oppenheimer JR, Plesset MS.</b> On the Production of the Positive Electron <i>Physical Review</i> . 44: 53-55. DOI: <a href="https://doi.org/10.1103/PhysRev.44.53.2">10.1103/PhysRev.44.53.2</a>	0.266
1932	Carlson JF, <b>Oppenheimer JR.</b> The Impacts of Fast Electrons and Magnetic Neutrons <i>Physical Review</i> . 41: 763-792. DOI: <a href="https://doi.org/10.1103/PhysRev.41.763">10.1103/PhysRev.41.763</a>	0.265
1931	<b>Oppenheimer JR.</b> Note on light quanta and the electromagnetic field <i>Physical Review</i> . 38: 725-746. DOI: <a href="https://doi.org/10.1103/PhysRev.38.725">10.1103/PhysRev.38.725</a>	0.272
1931	Hall H, <b>Oppenheimer JR.</b> Relativistic Theory of the Photoelectric Effect. Part I. Theory of the K-Absorption of X-rays. Part II. Photoelectric Absorption of Ultra gamma Radiation <i>Physical Review</i> . 38: 57-79. DOI: <a href="https://doi.org/10.1103/PhysRev.38.57">10.1103/PhysRev.38.57</a>	0.254
1931	Carlson JF, <b>Oppenheimer JR.</b> On the Range of Fast Electrons and Neutrons <i>Physical Review</i> . 38: 1787-1788. DOI: <a href="https://doi.org/10.1103/PhysRev.38.1787">10.1103/PhysRev.38.1787</a>	0.221
1931	<b>Ehrenfest P, Oppenheimer JR.</b> Note on the statistics <sup>1</sup> of nuclei <i>Physical Review</i> . 37: 333-338. DOI: <a href="https://doi.org/10.1103/PhysRev.37.333">10.1103/PhysRev.37.333</a>	0.608
1930	<b>Oppenheimer JR.</b> Two notes on the probability of radiative transitions <i>Physical Review</i> . 35: 939-947. DOI: <a href="https://doi.org/10.1103/PhysRev.35.939">10.1103/PhysRev.35.939</a>	0.272
1930	<b>Oppenheimer JR.</b> On the theory of electrons and protons <i>Physical Review</i> . 35: 562-563. DOI: <a href="https://doi.org/10.1103/PhysRev.35.562">10.1103/PhysRev.35.562</a>	0.248
1930	<b>Oppenheimer JR.</b> Note on the theory of the interaction of field and matter <i>Physical Review</i> . 35: 461-477. DOI: <a href="https://doi.org/10.1103/PhysRev.35.461">10.1103/PhysRev.35.461</a>	0.283
1928	<b>Oppenheimer JR.</b> On the Quantum Theory of the Ramsauer Effect. <i>Proceedings of the National Academy of Sciences of the United States of America</i> . 14: 261-2. PMID <a href="https://pubmed.ncbi.nlm.nih.gov/16587330/">16587330</a>	0.231
1928	<b>Oppenheimer JR.</b> On the Quantum Theory of the Autoelectric Field Currents. <i>Proceedings of the National Academy of Sciences of the United States of America</i> . 14: 363-5. PMID <a href="https://pubmed.ncbi.nlm.nih.gov/16577110/">16577110</a>	0.238
1928	<b>Oppenheimer JR.</b> On the quantum theory of electronic impacts <i>Physical Review</i> . 32: 361-376. DOI: <a href="https://doi.org/10.1103/PhysRev.32.361">10.1103/PhysRev.32.361</a>	0.256
1928	<b>Oppenheimer JR.</b> Three notes on the quantum theory of aperiodic effects <i>Physical Review</i> . 31: 66-81. DOI: <a href="https://doi.org/10.1103/PhysRev.31.66">10.1103/PhysRev.31.66</a>	0.276
1928	<b>Oppenheimer JR.</b> On the quantum theory of the capture of electrons <i>Physical Review</i> . 31: 349-356. DOI: <a href="https://doi.org/10.1103/PhysRev.31.349">10.1103/PhysRev.31.349</a>	0.248



1927	<b>Oppenheimer JR.</b> On the Quantum Theory of the Polarization of Impact Radiation. <i>Proceedings of the National Academy of Sciences of the United States of America.</i> 13: 800-5. PMID <a href="#">16587280</a>	0.235
1926	<b>Oppenheimer JR.</b> On the Quantum Theory of the Problem of the Two Bodies <i>Mathematical Proceedings of the Cambridge Philosophical Society.</i> 23: 422-431. DOI: <a href="#">10.1017/S0305004100015255</a>	0.224
1926	<b>Oppenheimer JR.</b> On the Quantum Theory of Vibration–Rotation Bands <i>Mathematical Proceedings of the Cambridge Philosophical Society.</i> 23: 327-335. DOI: <a href="#">10.1017/S0305004100009221</a>	0.218
1926	<b>Oppenheimer JR.</b> Quantentheorie des kontinuierlichen Absorptionsspektrums. <i>Naturwissenschaften.</i> 14: 1282. DOI: <a href="#">10.1007/BF01505727</a>	0.167

## APPENDIX F:

Table 6A. Transcribed Albert Einstein's letter to President Roosevelt.

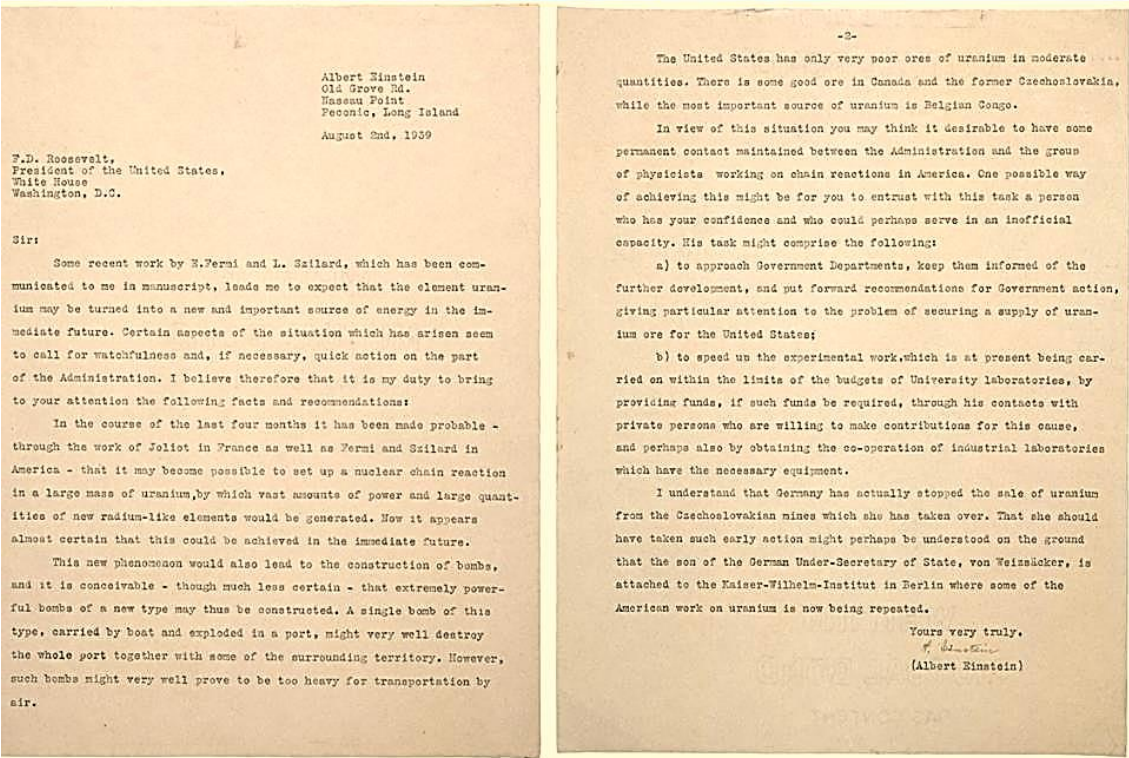
Credit: <https://www.atomicarchive.com/resources/documents/beginnings/einstein.html>

Retrieved November 4, 2023. B. Copy of Albert Einstein's letter to President Roosevelt

Serial Number	Year	Institution Country
1	1939 August 2 <sup>nd</sup>	<p><b>Table 6A. Transcribed Einstein's Letter to President Roosevelt - 1939</b></p> <p style="text-align: right;">Albert Einstein Old Grove Road, Peconic, Long Island August 2nd, 1939</p> <p>F. D. Roosevelt President of the United States White House Washington, D.C.</p> <p>Sir:</p> <p>Some recent work by E. Fermi and L. Szilard, which has been communicated to me in manuscript, leads me to expect that the element uranium may be turned into a new and important source of energy in the immediate future. Certain aspects of the situation which has arisen seem to call for watchfulness and if necessary, quick action on the part of the Administration. I believe therefore that it is my duty to bring to your attention the following facts and recommendations.</p> <p>In the course of the last four months it has been made probable through the work of Joliot in France as well as Fermi and Szilard in America--that it may be possible to set up a nuclear chain reaction in a large mass of uranium, by which vast amounts of power and large quantities of new radium-like elements would be generated. Now it appears almost certain that this could be achieved in the immediate future.</p> <p>This new phenomenon would also lead to the construction of bombs, and it is conceivable--though much less certain--that extremely powerful bombs of this type may thus be constructed. A single bomb of this type, carried by boat and exploded in a port, might very well destroy the whole port together with some of the surrounding territory. However, such bombs might very well prove too heavy for transportation by air.</p> <p>The United States has only very poor ores of uranium in moderate quantities. There is some good ore in Canada and former Czechoslovakia, while the most important source of uranium is in the Belgian Congo.</p> <p>In view of this situation you may think it desirable to have some permanent contact maintained between the Administration and the group of physicists working on chain reactions in America. One possible way of achieving this might be for you to entrust the task with a person who has your confidence and who could perhaps serve in an unofficial capacity. His task might comprise the following:</p> <ol style="list-style-type: none"> <li>a) to approach Government Departments, keep them informed of the further development, and put forward recommendations for Government action, giving particular attention to the problem of securing a supply of uranium ore for the United States.</li> <li>b) to speed up the experimental work, which is at present being carried on within the limits of the budgets of University laboratories, by providing funds, if such funds be required, through his contacts with private persons who are willing to make contributions for this cause, and perhaps also by obtaining co-operation of industrial laboratories which have necessary equipment.</li> </ol> <p>I understand that Germany has actually stopped the sale of uranium from the Czechoslovakian mines which she has taken over. That she should have taken such early action might perhaps be</p>

		<p>understood on the ground that the son of the German Under-Secretary of State, von Weizsacker, is attached to the Kaiser-Wilhelm Institute in Berlin, where some of the American work on uranium is now being repeated.</p> <p style="text-align: right;">Yours very truly, <i>A. Einstein</i> Albert Einstein</p>
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**Table 6B. Copy of Einstein's Letter to President Roosevelt - 1939**



**APPENDIX G:**

Table 7. Library of Congress: J. Robert Oppenheimer Papers		
Credit: <a href="https://www.loc.gov/item/mm77035188/">https://www.loc.gov/item/mm77035188/</a> Retrieved November 4, 2023.		
Serial Number	Year	Content
1	1882–2023	<p style="text-align: center;"><b>Library of Congress: J. Robert Oppenheimer Papers</b></p> <p><b>Headings</b></p> <ul style="list-style-type: none"> <li>● - Bethe, Hans A.--(Hans Albrecht),--1906-2005--Correspondence</li> <li>● - Birge, Raymond T.--(Raymond Thayer),--1887-1980-- Correspondence</li> <li>● - Bloch, Felix,--1905-1983--Correspondence</li> <li>● - Bohr, Niels,--1885-1962--Correspondence</li> <li>● - Born, Max,--1882-1970--Correspondence</li> <li>● - Boyd, Julian P.--(Julian Parks),--1903-1980--Correspondence</li> <li>● - Bush, Vannevar,--1890-1974--Correspondence</li> <li>● - Casals, Pablo,--1876-1973--Correspondence</li> <li>● - Cherniss, Harold F.--(Harold Fredrik),--1904-1987--Correspondence</li> <li>● - Christy, Robert F.,--1916-2012--Correspondence</li> <li>● - Cockcroft, John,--Sir,--1897-1967--Correspondence</li> <li>● - Compton, Arthur Holly,--1892-1962--Correspondence</li> <li>● - Conant, James Bryant,--1893-1978--Correspondence</li> <li>● - Dirac, P. A. M.--(Paul Adrien Maurice),--1902-1984--Correspondence</li> </ul>

		<ul style="list-style-type: none"> <li>● - Eliot, T. S.--(Thomas Stearns),--1888-1965--Correspondence</li> <li>● - Feis, Herbert,--1893-1972--Correspondence</li> <li>● - Fermi, Enrico,--1901-1954--Correspondence</li> <li>● - Frankfurter, Felix,--1882-1965--Correspondence</li> <li>● - Garrison, Lloyd K.--(Lloyd Kirkham),--1897-1991--Correspondence</li> <li>● - Groves, Leslie R.,--1896-1970--Correspondence</li> <li>● - Harrison, Wallace K.--(Wallace Kirkman),--1895-1981--Correspondence</li> <li>● - Huxley, Julian,--1887-1975--Correspondence</li> <li>● - Kennan, George F.--(George Frost),--1904-2005--Correspondence</li> <li>● - Kusaka, Shuichi,--1915-1947--Correspondence</li> <li>● - Lawrence, Ernest Orlando,--1901-1958--Correspondence</li> <li>● - Lee, T. D.,--1926---Correspondence</li> <li>● - MacLeish, Archibald,--1892-1982--Correspondence</li> <li>● - Manley, John Henry,--1907---Correspondence</li> <li>● - Marks, Herbert S.,--1907-1960--Correspondence</li> <li>● - Nabokov, Nicolas,--1903-1978--Correspondence</li> <li>● - Pais, Abraham,--1918-2000--Correspondence</li> <li>● - Pauli, Wolfgang,--1900-1958--Correspondence</li> <li>● - Pauling, Linus,--1901-1994--Correspondence</li> <li>● - Peierls, Rudolf E.--(Rudolf Ernst),--1907-1995--Correspondence</li> <li>● - Roosevelt, Eleanor,--1884-1962--Correspondence</li> <li>● - Roosevelt, Franklin D.--(Franklin Delano),--1882-1945--Correspondence</li> <li>● - Russell, Bertrand,--1872-1970--Correspondence</li> <li>● - Schweitzer, Albert,--1875-1965--Correspondence</li> <li>● - Schwinger, Julian,--1918-1994--Correspondence</li> <li>● - Segrè, Emilio--Correspondence</li> <li>● - Serber, R.--(Robert)--Correspondence</li> <li>● - Szilard, Leo--Correspondence</li> <li>● - Teller, Edward,--1908-2003--Correspondence</li> <li>● - Thomas, Norman,--1884-1968--Correspondence</li> <li>● - Wheeler, John Archibald,--1911-2008--Correspondence</li> <li>● - Yang, Chen Ning,--1922---Correspondence</li> <li>● - Yukawa, Hideki,--1907-1981--Correspondence</li> <li>● - Federation of American Scientists</li> <li>● - Institute for Advanced Study (Princeton, N.J.)</li> <li>● - Los Alamos Scientific Laboratory</li> <li>● - National Academy of Sciences (U.S.)</li> <li>● - Twentieth Century Fund</li> <li>● - Unesco</li> <li>● - U.S. Atomic Energy Commission</li> <li>● - Atomic bomb</li> <li>● - Exchange of publications</li> <li>● - Humanitarianism</li> <li>● - Internal security--United States</li> <li>● - Loyalty</li> <li>● - Nuclear disarmament</li> <li>● - Nuclear energy</li> <li>● - Nuclear energy--Research</li> <li>● - Nuclear nonproliferation</li> <li>● - Nuclear physics</li> <li>● - Official secrets</li> <li>● - Science--History--20th century</li> <li>● - Science--Moral and ethical aspects</li> </ul>
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	<ul style="list-style-type: none"> <li>• - Science--Social aspects</li> <li>• - Science--Societies, etc</li> <li>• - Science--Study and teaching</li> <li>• - Science and state</li> <li>• - Science and international affairs</li> <li>• - Science--Security measures</li> <li>• - Security clearances--United States</li> <li>• - World War, 1939-1945--Science</li> </ul>
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**Appendix H: Original Article in German (First page). Born–Oppenheimer Approximation**

Appendix H: Original Article. Born–Oppenheimer Approximation.

<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">1927 <span style="float: right;">№ 20</span></p> <h2 style="text-align: center;">ANNALEN DER PHYSIK</h2> <p style="text-align: center;">VIERTE FOLGE. BAND 84</p> <hr/> <p style="text-align: center;"><b>1. Zur Quantentheorie der Molekeln; von M. Born und R. Oppenheimer</b></p> <p>Es wird gezeigt, daß die bekannten Anteile der Terme einer Molekel, die der Energie der Elektronenbewegung, der Kernschwingungen und der Rotationen entsprechen, systematisch als die Glieder einer Potenzentwicklung nach der vierten Wurzel des Verhältnisses Elektronenmasse zu (mittlerer) Kernmasse gewonnen werden können. Das Verfahren liefert u. a. eine Gleichung für die Rotationen, die eine Verallgemeinerung des Ansatzes von Kramers und Pauli (Kreisel mit eingebautem Schwungrad) darstellt. Ferner ergibt sich eine Rechtfertigung der von Franck und Condon angestellten Betrachtungen über die Intensität von Bandenlinien. Die Verhältnisse werden am Beispiel der zweiatomigen Molekeln erläutert.</p> <p style="text-align: center;">Einleitung</p> <p>Die Terme der Molekelspektren setzen sich bekanntlich aus Anteilen verschiedener Größenordnung zusammen; der größte Beitrag rührt von der Elektronenbewegung um die Kerne her, dann folgt ein Beitrag der Kernschwingungen, endlich die von den Kernrotationen erzeugten Anteile. Der Grund für die Möglichkeit einer solchen Ordnung liegt offen-</p> </div>	<div style="border: 1px solid black; padding: 10px;"> <p><b>Research: Born–Oppenheimer (BO) Approximation</b>  <b>Institution: University of Göttingen, Germany</b>  <b>Professor: Max Born</b>  <b>Student: J. Robert Oppenheimer</b></p> <p>In quantum chemistry and molecular physics the <b>Born–Oppenheimer (BO) approximation</b> is the best-known mathematical approximation in molecular dynamics. Specifically, it is the assumption that the wave functions of atomic nuclei and electrons in a molecule can be treated separately, based on the fact that the nuclei are much heavier than the electrons. Due to the larger relative mass of a nucleus compared to an electron, the coordinates of the nuclei in a system are approximated as fixed, while the coordinates of the electrons are dynamic. The approach is named after Max Born and his 23-year-old graduate student J. Robert Oppenheimer, the latter of whom proposed it in 1927 during a period of intense ferment in the development of quantum mechanics.</p> <p style="text-align: right;">Credit: Wikipedia (2023z9)</p> </div>
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A. First page

B. Description