NE290D: Special Topics in Nuclear History, Politics, and Futures
20^{th} Century Physics Part 3

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January 19, 2021 – W4L7

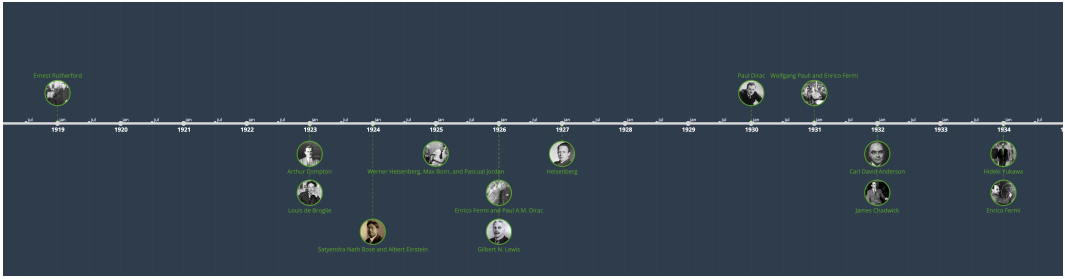
Agenda

1. Summary of QM, R, and AP 1900-1932
2. Discussion of FiC Assignment
3. Nuclear physics 1932-1939
4. Advances in experimental methods

W4L7 Learning Outcomes

1. Recall the major historical milestones in early 20^{th} century physics and describe the experiments that led to them.
2. Organize the events on a timeline.
3. Draw connections between the developments in atomic physics, relativity, and quantum mechanics and explain how their roots in nuclear physics.
4. Weigh the importance of events and help design specific aspects of the Gather.Town project that would contribute to immersive learning environment for undergraduates.

Timeline


Ernest Rutherford
1919
1920
1921
1922
1923
Arthur Compton
Louis de Broglie
1924
Satyendra Nath Bose and Albert Einstein
1925
Werner Heisenberg, Max Born, and Pascual Jordan
1926
Enrico Fermi and Paul A.M. Dirac
Gilbert N. Lewis
1927
Heisenberg
1928
1929
1930
Paul Dirac
1931
Wolfgang Paul and Enrico Fermi
1932
Carl David Anderson
James Chadwick
1933
1934
Irène Curie
Enrico Fermi

Discussion

Tentative Project Ideas

1. Modernize *Blegdamsvej Faust* with a new cast solving a current problem
2. Adopt a different work of literature with either a cast and problem from history or using current affairs

1933 Solvay Conference on "Structure properties of the atomic nucleus"

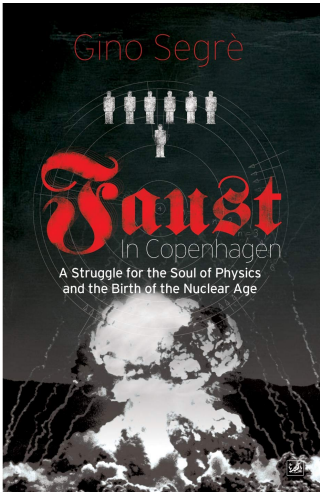
INSTITUT INTERNATIONAL DE PHYSIQUE SOLVAY

SEPTIÈME CONSEIL DE PHYSIQUE -- BRUXELLES. 22-29 OCTOBRE 1933

As told by Segre

Planck in FiC

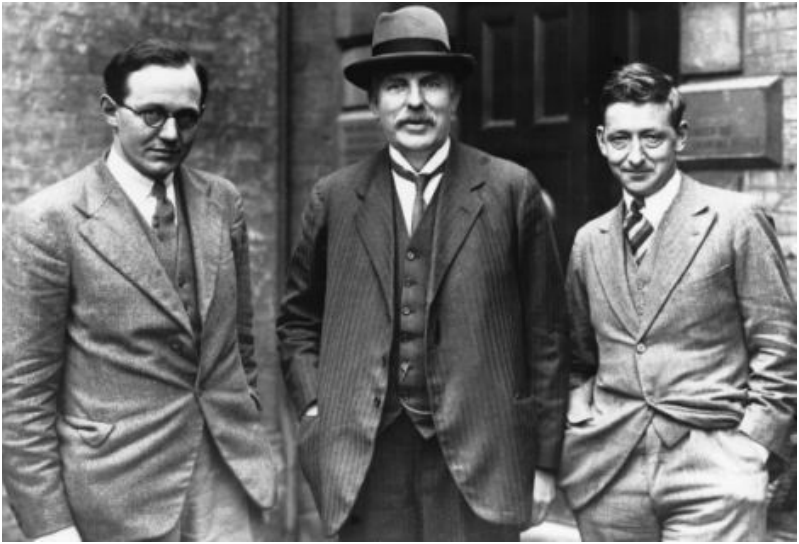
"The years between 1918 and 1933 were characterized by striking upheavals in art, social mores, thought, politics, and science and were probably the twentieth century's most dynamic period. It was an era of great optimism and wild experimenting, marked by James Joyce's cryptic retelling of the story of Ulysses, Arnold Schoenberg's atonal compositions, Giorgio de Chirico's eerie landscapes, Le Corbusier's manifesto for a new architecture, and Heisenberg's perplexing uncertainty principle."



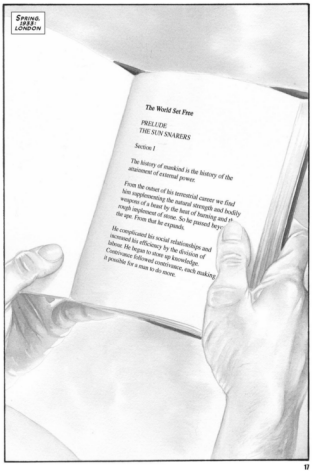
Pauli's Neutrino, Chadwick's Neutron, and Fermi's Theory

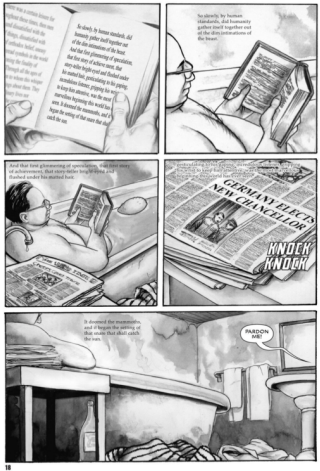
1930-1939: A Play In 3 Parts

Pauli's Neutrino, Chadwick's Neutron, and Fermi's Theory



1933: Szilard takes a bath

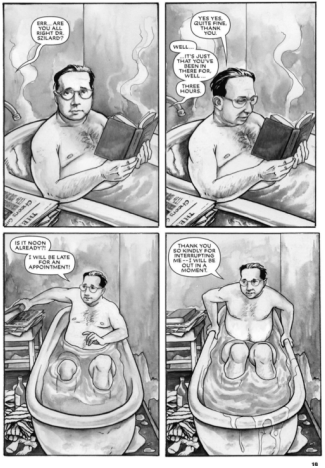


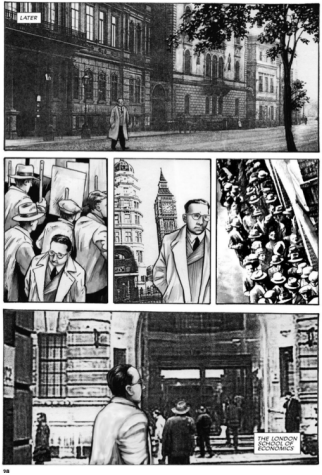


[1] Ottaviani, Jim, et al. Fallout: J. Robert Oppenheimer, Leo Szilard, and the political science of the atomic bomb. Gt Labs, 2001.

1930-1939: A Play In 3 Parts

1933: Szilard takes a walk





[1] Ottaviani, Jim, et al. Fallout: J. Robert Oppenheimer, Leo Szilard, and the political science of the atomic bomb. Gt Labs, 2001.

1933: Szilard conceives the idea of using a chain reaction

[1] https://www.atomicheritage.org/event/september-12-1933

1930-1939: A Play In 3 Parts

1933: Szilard conceives the idea of using a chain reaction

1929-1934: Cyclotron development

In his Berlin and London days between the world wars, Leo Szilard thought about household refrigerators and nuclear chain reactions. He also invented many of the central features of the accelerators that would take the study of nuclear and particle physics to high energies.

Valentine L. Telegdi

[1] Telegdi, Valentine L. "Szilard as an Inventor: accelerators and more." APS April Meeting Abstracts. 1998.

1934: Joliot-Curie Demonstration of Artificial Radioactivity

[1] https://www.atomicheritage.org/event/mid-january-1934

1934: Fermi misses out on first fission observation

[1] https://www.atomicheritage.org/event/may-1934

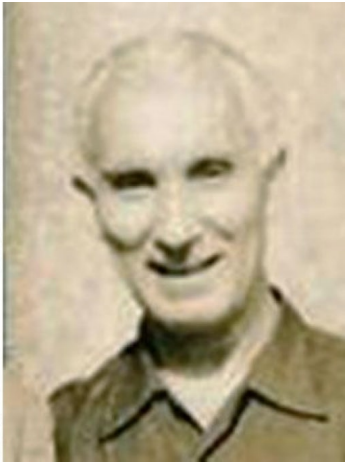
1934: Szilard patents the CR

[1] https://www.atomicheritage.org/event/july-4-1934

1934: Noddack argues for fission

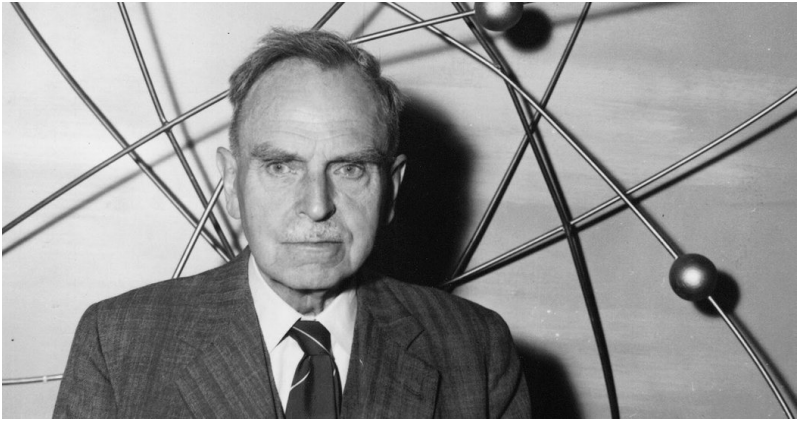
[1] https://www.atomicheritage.org/event/july-4-1934

1938: Majorana vanishes



[1] https://www.atomicheritage.org/event/july-4-1934

1938: Hahn Observes Fission

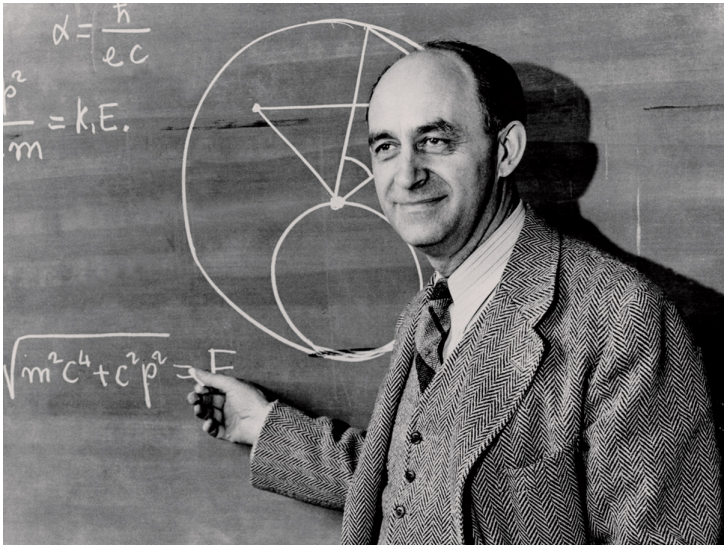


[1] https://www.atomicheritage.org/event/december-21-1938

1938: Meitner and Frisch Explain

[1] https://www.atomicheritage.org/event/december-24-1938

1938: Fermi gives us 2n



1939: Bohr makes an announcement

SEPTEMBER 1, 1939 PHYSICAL REVIEW VOLUME 56

The Mechanism of Nuclear Fission

NIELS BOHR
University of Copenhagen, Copenhagen, Denmark, and The Institute for Advanced Study, Princeton, New Jersey

AND

JOHN ARCHIBALD WHEELER
Princeton University, Princeton, New Jersey

(Received June 28, 1939)

On the basis of the liquid drop model of atomic nuclei, an account is given of the mechanism of nuclear fission. In particular, conclusions are drawn regarding the variation from nucleus to nucleus of the critical energy required for fission, and regarding the dependence of fission cross section for a given nucleus on energy of the exciting agency. A detailed discussion of the observations is presented on the basis of the theoretical considerations. Theory and experiment fit together in a reasonable way to give a satisfactory picture of nuclear fission.

[1] https://www.atomicheritage.org/event/august-2-1939

1939: Einstein signs a letter

1939: WWII Begins

"All the News That's Fit To Print."

The New York Times.

EXTRA

NEW YORK, FRIDAY, SEPTEMBER 1, 1939. THREE CENTS

GERMAN ARMY ATTACKS POLAND; CITIES BOMBED, PORT BLOCKADED; DANZIG IS ACCEPTED INTO REICH

BRITISH MOBILIZING

Navy Raised to Its Full Strength, Army and Air Reserves Called Up

PARLIAMENT IS CONVENED

Midnight Meeting Is Held by Members—Negotiations Admitted Failure

Britain Call Up Forces

Bulletins on Europe's Conflict

London Hears of Warsaw Bombing

French Confirm Beginning of War

HOSTILITIES BEGUN

Warsaw Reports German Offensive Moving on Three Objectives

ROOSEVELT MAKES NAVY

Also Notifies Army Leaders of Warfare—Envoys Tell of Bombing of 6 Cities

FREE CITY IS SEIZED

Forster Notifies Hitler of Order Putting Danzig Into the Reich

ACCEPTED BY CHAMBERLAIN

Peace Ready, Made Then Preparations After Hostilities Appeared Inevitable

Hitler Acts Against Poland

EAST PRUSSIA

BERLIN

WARSAW

POLAND

HITLER GIVES WORD

In a Proclamation He Accuses Warsaw of Appeal to Arms

FOREIGNERS ARE WARNED

They Remain in Poland at Own Risk—Raids In Stead of Any Flares Flying Over Reich

1930-1939: A Play In 3 Parts

Next: The War Efforts