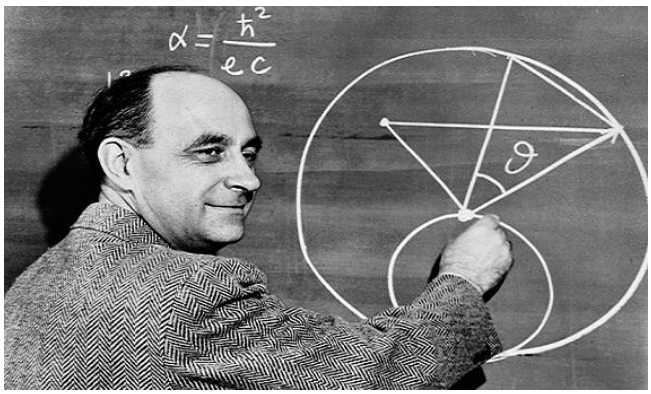
Enrico Fermi: story of a lost and regained notebook



On the 9th of January 2018, to celebrate the 80th anniversary of his Nobel Prize award in 1938 for his discoveries in Rome, we were given a fascinating lesson on the biography of one of the most relevant figures in the history of physics, analysing in particular the experiments that brought him to his great success and fame: Enrico Fermi.

We were honoured to have Professor Cefarelli give the lecture. She is not only one of the most important and eminent figures in the Italian physics area, but is known worldwide for her outstanding articles and publications on sub-nuclear energy. She is currently professor at Bologna University in the field of theoretical Physics and has worked in many big institution of research such as the INFN, CERN, DENY and the JINR.

Enrico Fermi was born in 1901, after attending "Liceo Classico Pilo Albertelli", he graduated in physics at the Scuola Normale Superiore di Pisa with maximum grades in 1922. His remarkable capabilities brought attention to some of the most famous physicians of the time, such as Max Born in Germany and Ehrnenfest in Leiden. His experience abroad increased his knowledge in theoretical physics; however, Professor Cefarelli repeated many times that the greatness of this man was in his 'dual genius'; he was, in fact, not only a professional in theoretical physics, but also in experimental physics. Only few others have been recognized having this double genius like E.Fermi. Newton, Galileo and Maxwell, for example, are some names that can be compared to the Italian physicist.

In 1924 he started teaching at the University of Florence, while looking for a job in Rome. The chance to return to his hometown was given by Orso Mario Corbino who, from that moment, became a constant and important figure for him during his whole life. Here he made several important friendships such as the one with Nello Corrado and Rita Brunetti (first female professor of physics in Italy). During this period, he pursued his studies and experiments in via Panisperma, the place where research on nuclear origin began. Today, via Panisperna is a museum containing most of the work that great Italian physicists produced during the 19th and 20th century.

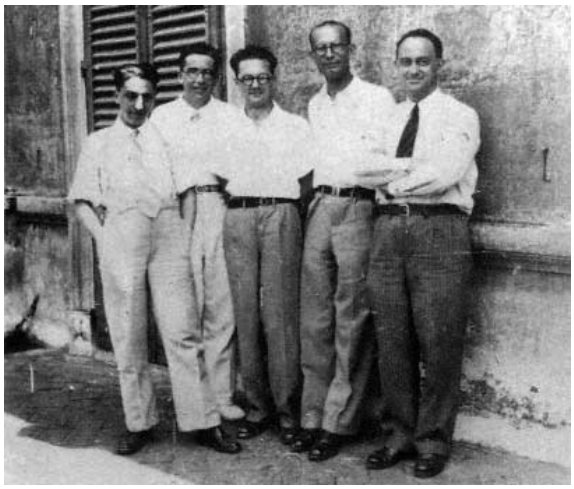
Enrico Fermi's first big discovery was a new paramount statistical theory that described the behaviour of particles in the quantum scale," THE FERMI-DIRAC STATISTICS". In brief, Fermi noticed that the movement of particles, known as "spin", obey Pauli's famous principle: 'the exclusion principle', establishing that two electrons in an atom can't have the same quantum number.

In the same years, in Cambridge, one other important physicist was working on the same theory of Fermi, his name was Paul Dirac (thus the name Fermi-Dirac statistics) who would

have a constant relationship of competition and collaboration with Fermi throughout his academic life.

In the period between 1927-1932, Fermi continued his studies while teaching in Rome. 1929 was particularly important since he started studying nuclear physics thanks to Ettore Majorana. In 1932 he in fact gave an answer to one of the most discussed topics in physics at that time, the 'beta-decay'. It was-well known that during the collision of a beta particle, the principle of energy conservation was violated. Fermi's intuition was to imagine the presence of a secondary particle that he named 'Neutrino' that collected the missing energy during the interaction between these particles. This particle was later on discovered in 1936, giving credit to Fermi's discovery.

Thanks to the "Nobel-couple" Curie-Jolie who discovered in 1934 artificial radioactivity, Fermi could start developing his own ingenious research. Fermi's idea was to use neutron sources with an innovative system, using Radon-gas-Beryllium powder sealed in thin glass tubes to artificially radio activate a substance through contact. Today all the sources that he used are kept in Pisa, except one which was donated to the Washington museum.



Mario Orso Corbino helped and encouraged Fermi to hire an exceptional team to support him during his experiments: Oscar D'Agostino (the only chemist of the group), Emilio Segrè, Edoardo Amaldi, Franco Rasetti and Ettore Majorana as external consultant. Leading these brilliant scientists he made the two discoveries that would grant him a Nobel in 1938.

When they started doing the experiments they usually wrote down every single step and discoveries in a series of very important notebooks. The most significant series was the one of 1930, but one was missing: the notebook of March 1934, when Fermi made the discovery of radioactivity induced by neutrons.

This notebook was found some years ago in Avellino, the birthplace of Oscar D'Agostino, by the two historians Guerra and Robotti and then published by Spilger with the title 'Lost book of E. Fermi'.

The notebook contains the two most important pages (19 and 24) about Aluminium and Calcium radioactivity. This put the bases for the significant discoveries made in 1939 by Bohr and Hans- Strassman on nuclear fission. The only regret of Fermi in his life was to have not discovered it himself earlier on.

The "second part" of the Nobel was given to Fermi's studies on the slowing down of the neutrons. During the summer of 1934 he had the idea to insert a substance between the source and the material in his neutron flask, a light material such as paraffin wax or water.

Doing that he noticed that neutrons, slowing down during the contact with other materials, produced more radioactivity.

E. Fermi's life radically changed with the beginning of the World War II: in fact, his wife was Jewish and when the Racial laws came out, he decided to emigrate to the US with his whole family. In the US, he started working on nuclear fission. In 1942 he mastered the first nuclear chain reaction: the "Chicago Pile (CP-I)". He did his experiments and research in the basement of a campus university. Today, a monument called the "Atom Piece" is located in the same campus to remember these events.

These were the years of the "nuclear run" and Fermi firmly believed in a peaceful use of nuclear technology (today for example it's very used in medicine, for the functioning of nautilus and so on). However, unfortunately it was fundamental for the winning of the big war in 1945.

Fermi came back to visit Italy in 1953 and dedicated his final years to studying cosmic radiation and more in general astrophysics.

He died and was buried in America some months after his last visit to Italy in 1954.

Global Governance doesn't usually have global conversation regarding more scientific topics. However, dedicating two hours to one of the men that revolutionized science and made such an impact on history never goes to waste. We value these people and aspire to emulate them.

As Professor Cefarelli said at the end of her lecture: 'One would need another Fermi'.

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