

The Lost Notebook of ENRICO FERMI

Francesco Guerra · Nadia Robotti

The Lost Notebook of ENRICO FERMI

The True Story of the Discovery
of Neutron-Induced Radioactivity



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Foreword and acknowledgements

Thanks to Enrico Fermi some extraordinary developments took place in the period December 1933 - October 1934 at the Regio Istituto Fisico (Royal Physics Institute) of the Royal University of Rome in via Panisperna. These developments in nuclear physics led first to the creation of an extremely advanced theoretical model to explain beta nuclear decay and then to the discovery of radioactivity induced by neutron bombardment, together with the extraordinary effects of slow neutrons on the activation of some important nuclear reactions. These developments soon made the Istituto Fisico in Rome the foremost centre for nuclear physics research at an international level. Full recognition of this came when Enrico Fermi was awarded the Nobel Prize for Physics in 1938.

It is fascinating to understand what the conditions were that made this kind of miracle possible and exactly how these important discoveries were made. In particular, by using Fermi's first laboratory notebook, which we have identified at the Fondazione Oscar D'Agostino in Avellino, it is possible to follow in real time the whole process that led to the discovery of neutron-induced radioactivity.

In this book we also study the beginning of nuclear physics research in Rome in the national and international contexts. We see that in national research planning for this sector, organised by the Consiglio Nazionale delle Ricerche (National Research Council) in 1933, Rome was initially assigned a rather marginal task, directed towards nuclear gamma spectroscopy, which fitted well with Rome's research tradition. But very soon, through an incredible sequence of events, Enrico Fermi completely disrupted this line of planning and let Rome acquire a key role of strategic relevance in neutron physics which would then become the basis for all future developments in this sector.

The success of the nuclear structure model developed by Ettore Majorana during his stay in Leipzig in 1933, which considerably improved the proton and neutron model previously introduced by Werner Heisenberg, also played an important role in Fermi's drastic change to the direction of lines of research in Rome.

In 1938 Fermi, after being awarded the Nobel Prize in the ceremony in Stockholm in December, carried out his decision to emigrate permanently to the United States. A few months earlier, at the end of March, Ettore Majorana suddenly disappeared in circumstances which are still not entirely clear. Within a few months Italy lost its two greatest experts in nuclear physics.

In the course of our research we have consulted archive material belonging to several institutions, including the "Archivio Centrale dello Stato" in Rome, the "Domus Galilaeana" in Pisa, the Special Collections Research Center of the University of Chicago, the "Institut Curie" in Paris, the "Accademia Nazionale dei Lincei" in Rome, the

“Accademia Nazionale delle Scienze detta dei XL” in Rome, the “Fondazione Oscar D’Agostino” in Avellino, the Department of Physics of the University of Rome “La Sapienza”, the “Archivio Occhialini-Dilworth” at the University of Milan, the Churchill Archives Centre in Cambridge, the California Institute of Technology in Pasadena, the Duke University in Durham, the University of São Paulo in Brazil, the Nobel Foundation in Stockholm, the “Massimiliano Massimo” Institute in Rome, the University of Rome “La Sapienza”, the University of Palermo. To the directors and staff of all these institutions we express our grateful thanks for their courteous welcome, collaboration and assistance.

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FRANCESCO GUERRA and NADIA ROBOTTI

Buonabitacolo - Genova - Roma
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In the present English version we have included some additional material coming from the ongoing research.

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FG & NR
10 September, 2017

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