



Enrico Fermi

As a rule, scientists display their talents either as theorists or as experimentalists, but not both.

Einstein, Maxwell, and Gibbs, for example, were great as theorists but not creative as experimentalists, while Faraday and Rutherford, great as experimentalists, were limited as theorists. Only Newton, displayed great talent both as an experimentalist, and as a theorist (and also as a mathematician). Enrico Fermi is another exception to the rule that physics is a bipartisan community. Fermi was, as his biographer and colleague Emilio Segre remarks, «from the first a complete physicist for whom theory and experiment possessed equal weight». He began as a theorist in 1926 by showing how to count the quantum states of atoms according to Pauli's exclusion principle. In the 1930s, he built a complete theory of β -decay, beginning with another Pauli idea, that β -particles always appear in company with tiny particles that carry no electrical charge and almost no mass. This work was a pioneering effort in what is now known as quantum field theory. Fermi could have continued in this direction and become a dedicated theorist. Instead, he chose

to become an experimentalist armed with the technique of neutron bombardment. These efforts were also pioneering, and they led him finally to one of the landmark achievements of modern experimental physics: control of a nuclear chain reaction.

At the age of twenty-five, he had, "practically attained the zenith of a university career in Italy". Corbino expected Fermi to bring modern physics to Italy. As Segre remarks, «a new generation had to take over, and Fermi was to be its leader». Fermi's first step to make himself and his subject known was to give popular lectures and write textbooks. The writing was done during summer vacations in his favourite mountain country, the Dolomites of northern Italy. There, according to Segre, he sometimes worked «lying on his stomach in a mountain meadow, armed with an adequate supply of pencils and bound blank notebooks, [writing] page after page, without a book for consultation, without an erasure or a word crossed out».

(Taken from Da W.H. Cropper, *Great Physicists*, OUP, NY, 2001, pp. 344-348)

EXERCISES

1 True or false?

- a. Fermi wrote his books lying on a beach. T F
- b. Fermi's work was important because it was the control of a nuclear chain reaction possible. T F
- c. Fermi never worked in an Italian University. T F
- d. Fermi was a pure theorist. T F

2 Find and correct mistakes.

- a. Einstein, Maxwell, and Gibbs were great as experimentalists.
- b. Emilio Segre was a writer.
- c. In 1926, Fermi showed how to count the quantum states of atoms according to Pauli's inclusion principle.
- d. After working as a theorist Fermi dedicated his work to the technique of electron bombardment.
- e. Fermi made his subject known giving popular lectures and writing articles.
- f. Fermi wrote his books in the Dolomites using a typewriter.

3 Match questions and answers.

QUESTIONS		ANSWERS	
A	What was Segre's opinion of Fermi?	1	He wrote them during summer vacations in the Dolomites, without a book for consultation, writing on blank notebooks, using pencils.
B	How did Fermi demonstrate that he was a great theorist?	2	With his theory of β -decay, Fermi became one of the pioneers of quantum theory.
C	Where did Fermi write his textbooks?	3	He thought he was one physicist for whom theory and experiment possessed equal weight.

A

B

C