

# Fermi and Astrophysics

## Report on the progress of the edition of the book

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The drafting of the book, that will be published by WORLD SCIENTIFIC, is almost finished.

It remains to write the preface and to perform a final revision of the Introduction (R. Ruffini).

The *raison d'être* of this book is to report Fermi's work on relativity, astrophysics, cosmology and related subjects to a large international audience.

Most part of Fermi's work on these topics was published in Italian and on this account largely unknown. Twelve papers are presented in the book in an English translation. The translations are due to E. Alesci, D. Bini, D. Boccaletti, A. Geralico, S. Mercuri and revised by R. Jantzen.

Seven Fermi's papers in English, three by Gamow and an excerpt of a famous paper by Alpher and Herman are added to complete the picture.

Below we give the contents of the book.

### 1. Introduction

#### Talking about Fermi, General Relativity, Astrophysics and beyond

### 2. From Fermi's papers of the Italian period

#### a) Foreword

#### b) The papers reprinted (in translation)

- 1) On the Dynamics of a Rigid System of Electric Charges on Translational Motion (Nuovo Cimento XXII, 199-207, 1921)
- 2) On the Electrostatics of a Homogeneous Gravitational Field and on the Weight of Electromagnetic Masses (Nuovo Cimento XXII, 176-188, 1921)
- 3) On Phenomena occurring close to a World Line (Rendiconti Accademia Naz. Lincei XXXI, 21-23, 51-52, 101-103, 1922)
- 4) Correction of a Contradiction between Electrodynamical and Relativistic Electromagnetic Mass Theories (Nuovo Cimento XXV, 159-170, 1923)
- 5) Masses in the Theory of Relativity – from “I Fondamenti della Relatività Einsteiniana” (Hoepli – Milano, pp. 342-344, 1923)
- 6) The Principle of Adiabatics and the Systems which do not admit Angle Coordinates (Nuovo Cimento XXV, 171-175, 1923)
- 7) Some Theorems of Analytical Mechanics of Great Importance for Quantum Theory (Nuovo Cimento XXV, 271-285, 1923)
- 8) A Theorem of Calculation of Probability and some of its Applications (Thesis, 1922)
- 9) Formation of Images with Rontgen Rays (Nuovo Cimento XXV, 63-68, 1923)
- 10) A Statistical Method for the Determination of some Properties of the Atom

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(Rendiconti Accademia Naz. Lincei – serie sesta, VI, 602-607, 1927)

- 11) An Attempt at a Theory of Beta Rays (La Ricerca Scientifica 2 fasc. 12, 1-19, 1933)
- 12) Theories on the Origins of the Elements – from “Conferenze di Fisica Atomica – terza conferenza – (Roma, Accademia Nazionale dei Lincei, 1950, pp. 31-45)

### **3. From Fermi’s papers of the American period**

#### **a) Foreword**

#### **b) The papers reprinted**

- 1) On the Origin of the Cosmic Radiation (Phys. Rev. 75, 1169 – 1174, 1949)
- 2) An Hypothesis on the Origin of the Cosmic Radiation (Nuovo Cimento, suppl. 317- 323, 1949)
- 3) Galactic Magnetic Fields and the Origin of Cosmic Radiation (Ap. J. 119, 1-5, 1954)
- 4) High Energy Nuclear Events (Progr. Theor. Theoret. Phys. 5, 570 – 583, 1950)
- 5) Magnetic Fields in Spiral Arms (Ap. J. 118, 113 – 115, 1953)
- 6) Problems of Gravitational Stability in the Presence of a Magnetic Field (Ap. J. 118, 116 – 141, 1953)
- 7) Studies of Non-linear Problems (Document LA – 1940, May 1955)

### **4. Fermi and Gamow Theory**

#### **a) Foreword**

#### **b) The papers reprinted**

- 1) The Origin of Elements and the Separation of Galaxies (Phys. Rev. 74, 505-506, 1948)
- 2) The Role of Turbulence in the Evolution of the Universe (Phys. Rev. 86, 251, 1952)
- 3) Expanding Universe and the Origin of Galaxies (Det Kongelige Danske Videnskaberne Selskab, vol. 27, n. 10, 1-15, 1953)
- 4) From “Theory of the Origin and Relative Abundance Distribution of the Elements” by Ralph A. Alpher and Robert C. Herman (Reviews of Modern Physics, 22, 193-197, 1950)

### **5. Contributed papers presented at the IX ICRA Network Workshop “Fermi and Astrophysics” (Rome, Pescara, September 2001)**

#### **a) Foreword**

#### **b) A reprint of Vol. 117B, N. 9-11, 2002 of “Il Nuovo Cimento”**