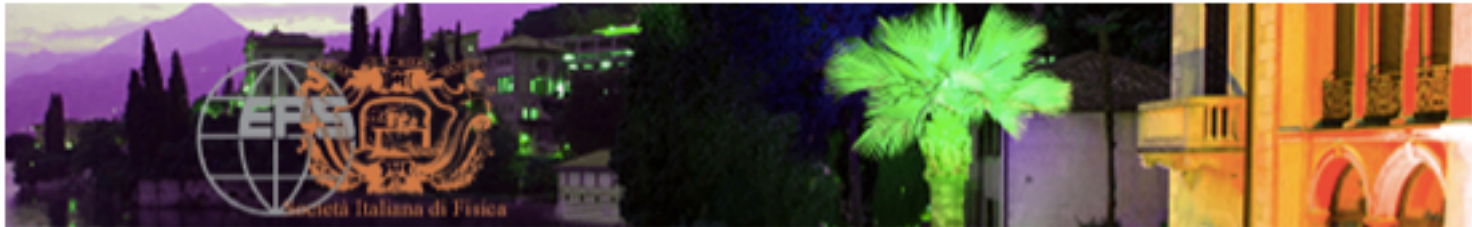


Joint EPS-SIF International School on Energy 2014



Course II - **Energy: basic concepts and forefront ideas**

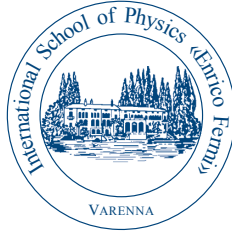
17 - 23 July 2014 - VILLA MONASTERO - VARENNA, LAKE COMO

WELCOME !

PASSION FOR PHYSICS

International School of Physics Enrico Fermi

60th Anniversary



Società Italiana di Fisica

15 June 2013
Villa Monastero
Varenna (Lake Como)

UNDER THE HIGH PATRONAGE OF THE PRESIDENT OF THE ITALIAN REPUBLIC



POLITECNICO DI MILANO



1953

“ With the hope that this ‘dress rehearsal’ – being as it is in the hands of so outstanding scientists and followed by students with so impatient inquiring mind – might proceed worthily and fruitfully grow, I have the honour to declare open the 1953 summer course of the International School of Physics of the Italian Physical Society.

And to this School, that adds up to the other initiatives of our association, I would dare assign as mission, the famous one, contained in the words of the ‘great Farnese’ (Cardinal Alessandro Farnese): Votis subscript fata secundis (Destiny does make dreams come true).”

Giovanni Polvani – SIF President



1953

With these words the then President of the Italian Physical Society **Giovanni Polvani** concluded his inaugural address to the 1st course of the Varenna School which was titled:

“Issues related to elementary-particle detection, with special attention to cosmic radiation”.

The course was directed by Giampietro Puppi and the lecturers were outstanding scientists like Cecil Powell, Patrick Blackett, Hannes Alfvén, Giuseppe (Beppo) Occhialini, to name but a few.

A scenic view of a lake with mountains in the background and a decorative metal railing in the foreground. The railing is ornate, with floral and scrollwork patterns. The lake is calm, and the mountains are hazy in the distance under a clear sky.

1954

The 1st course was a real success, to the extent that Puppi was asked to direct another one in the Summer of 1954.

The 2nd course was again devoted to elementary particles, this time placing emphasis on accelerators: *“The contribution from existing and planned accelerators to elementary particles physics”*.

In his opening address Puppi talked about *“the fantastic world of high-energy phenomena”*.

To illustrate them, eminent physicists were invited to lecture, like Enrico Fermi, Werner Heisenberg, Gilberto Bernardini, Bruno Rossi ...

INTRODUZIONE

G. POLVANI - Discorso inaugurale	pag. 4
G. PUPPI - Prolusione	» 8

PARTE PRIMA - Fisica delle particelle elementari.

SEZIONE I: <i>Questioni relative alla Fisica dei pioni e nucleoni</i>	pag. 17
---	---------

E. FERMI - Lectures on Pions and Nucleons	» 17
W. HEISENBERG - The production of Mesons in very High Energy Collisions	» 96

SEZIONE II: <i>Questioni relative alla fotoproduzione e fenomeni connessi</i> pag. 104	
--	--

G. BERNARDINI - Lectures on Photoproduction	» 104
B. T. FELD - Photomeson Production from Hydrogen	» 139
B. T. FELD - The Photodisintegration of the Deuteron at High Energies and Associated Phenomena	» 145
S. LOKANATHAN and J. STEINBERGER - Search for the β -Decay of the Pion	» 151

SEZIONE III: <i>Questioni riguardanti i mesoni pesanti prodotti dai raggi cosmici o dal cosmotrone</i>	pag. 163
--	----------

B. ROSSI - Lectures on Fundamental Particles	» 163
M. CECCARELLI - Results on Heavy Mesons	» 227
A. BONETTI - On the Identification of Charged Hyperons and the Establishment of Their Decay Schemes in Nuclear Emulsions	» 231
C. DILWORTH and B. ROSSI - Comparison of Results on K-Particles Disintegrating at Rest in Cloud Chambers and Photoemulsions	» 239
N. DALLAPORTA - Statistical Evidence Concerning the χ -Meson Decay	» 247
A. DE BENEDETTI, C. M. GARELLI, L. TALLONE and M. VIGONE - Two Examples of a Star Emitting Two Heavy Unstable Particles	» 249
E. AMALDI - On the Measurement of the Mean Life-Time of Strange Particles	pag. 253
R. LEVI SETTI - Unstable Fragments	» 263

SEZIONE IV: <i>Questioni relative all'origine dei raggi cosmici</i>	pag. 275
---	----------

B. ROSSI - Lectures on the Origin of Cosmic Rays	» 275
U. HABER-SCHAIM - The Energy Spectrum of the Primary Cosmic Radiation	» 336

PARTE SECONDA - Progetti di macchine acceleratrici.

SEZIONE I: <i>Progetto di macchina acceleratrice per il Centro Europeo di Ricerche Nucleari</i>	pag. 339
---	----------

E. AMALDI - CERN, the European Council for Nuclear Research	» 339
J. B. ADAMS - The Alternating Gradient Proton Synchrotron	» 355
A. CITRON and M. G. HINE - Experimental Facilities of the CERN Proton Synchrotron	» 375
G. LÜDERS - Theory of Particle Orbits in the Alternating Gradient Synchrotron	» 392
T. G. PICKAVANCE - Synchrocyclotrons and the CERN 600 MeV Machine	» 403

SEZIONE II: <i>Progetto inglese di macchina acceleratrice</i>	pag. 413
---	----------

T. G. PICKAVANCE - Proton Linear Accelerators for Nuclear Research and the A.E.R.E. 600 MeV Project	» 413
---	-------

SEZIONE III: <i>Progetto francese di macchina acceleratrice</i>	pag. 423
---	----------

H. BRUCK et R. LÉVI-MANDEL - Sur le projet du Synchrotron à protons de Saclay	» 423
---	-------

SEZIONE IV: <i>Progetto italiano di macchina acceleratrice</i>	pag. 442
--	----------

G. SALVINI - The Italian Design of a 1000 MeV Electronsynchrotron. A Comparisons between the Strong and the Weak Focusing	» 442
E. PERSICO - A Theory of the Capture in a High Energy Injected Synchrotron	» 459

1954

Enrico Fermi and Werner Heisenberg gave the first two lectures of a series on the physics of pions and nucleons

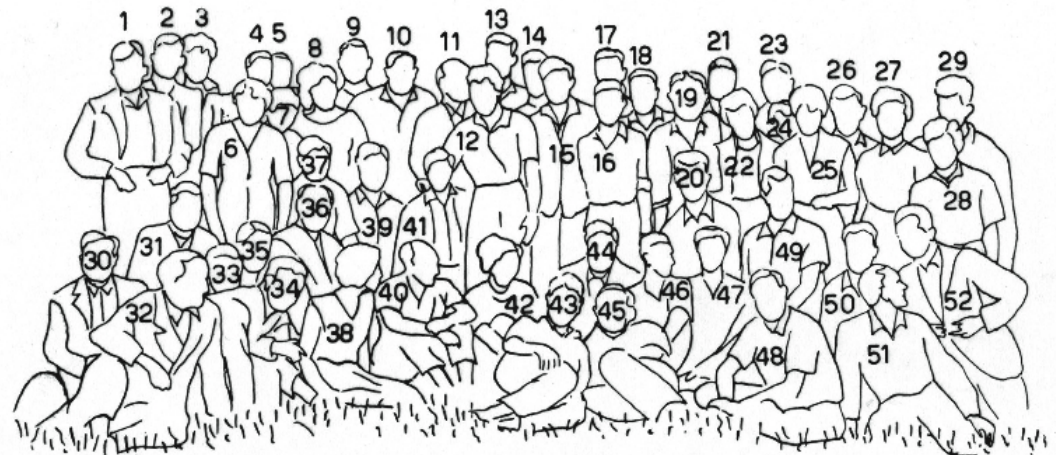
Gilberto Bernardini, Bernard T. Feld and others took care of a second group of lectures on photoproduction

Bruno Rossi lectured on fundamental particles and on the origin of cosmic rays

Various particle accelerator facilities and projects in different laboratories in Europe were illustrated by a number of world experts



A celebrated
group photo
1954



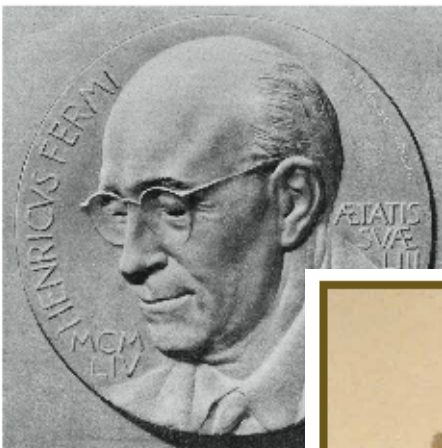
1. M. CRESPI - 2. M. DEUTSCHMANN - 3. B. PUPPI - 4. J. STEINBERGER - 5. N. DALLAPORTA - 6. I. POLVANI - 7. S. C. NASSAR - 8. A. ORKIN-LE-COURTOIS - 9. G. SALVINI - 10. C. CASTAGNOLI - 11. G. POIANI - 12. A. ROGOZINSEY - 13. J. BRIZOT - 14. J. TREMBLEY - 15. M. CECCARELLI - 16. M. PORTER - 17. P. GIACOMETTI - 18. K. KANDIAH - 19. G. WATAGHIN - 20. U. HARER-SCHAIM - 21. J. G. RÖDERER - 22. B. LOCATELLI - 23. K. GOTTSTEIN - 24. C. M. GARELLI - 25. C. DILWORTH-OCCHIALINI - 26. Y. FUJIMOTO - 27. L. TALLONE - 28. G. TOMASINI - 29. R. LEVI-SHETI - 30. A. ROSTAGNI - 31. B. BRUNELLI - 32. A. BORSSELLINO - 33. G. FIDECARO - 34. P. CALDIROLA - 35. B. ROSSI - 36. G. POLVANI - 37. D. KEEFE - 38. G. CINI - 39. M. G. K. MENON - 40. E. FERMI - 41. Y. GOLDSCHMIDT-CLERMONT - 42. M. BRUIN - 43. G. BERNARDINI - 44. G. PUPPI - 45. G. OCCHIALINI - 46. L. SCARSI - 47. B. VITALE - 48. M. CONVERSI - 49. G. QUARENI - 50. A. BONETTI - 51. L. LEPRINCE-RINGUET - 52. B. T. FELD

Fermi gave 16 lectures in Varenna on
“PIONS and NUCLEONS”
from 16th of July to 6th of August 1954

He passed away a few months later

Exactly one year later on the 6th of August 1955
an official commemorative ceremony was organised
by President Polvani in Varenna and Como
in the presence of Fermi's wife, Laura Fermi Capon,
and Fermi's sister, Maria Sacchetti Fermi

President Polvani announced that
the School would be named after Enrico Fermi



In the Aula of Villa Monastero in Varenna in 1955 a bronze medallion with his low-relief effigy was unveiled in memory and in honour of Enrico Fermi



(work of the sculptor
Giannino Castiglioni)

Also a porphyry plaque was placed bearing a Latin epigraph:

ENRICO FERMI

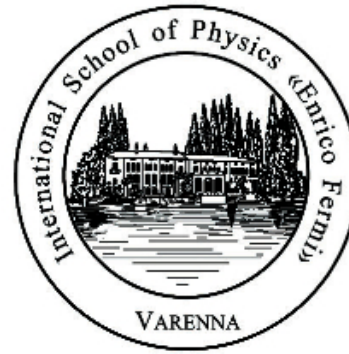
— 1954 - 53rd of his life —

*"Here with quiet spirit among so many natural
beauties, I revealed for the last time,
to a rank of men of science, the ultimate and
most remote elements in motion inside the atoms,
with which I had already made my name immortal"*

In 1955 in Como at the Tempio Voltiano,
Isidor I. Rabi was invited to give the official
commemorative address in honour of Enrico Fermi

“Here in Italy where his memory is so alive and where so many have heard Fermi lecture I do not have to describe the remarkable fascination he could induce in any audience. He used no histrionics in his delivery. It was always calm and deliberate. The fascination lay in the feeling of clarity and simplicity he could impart to the audience. They felt illuminated and had the sense of participating in profound and beautiful insight”

This is what Fermi's lectures still inspire



On the 70th anniversary of the
Nobel Prize award to Enrico Fermi in 1938
the Italian Physical Society
has reprinted in a special issue of
[La Rivista del Nuovo Cimento](#)
the original
“**Lectures on Pion and Nucleons**”
by Enrico Fermi

“ ... a series of astral conjunctions has created around the second course a particular charisma, besides the fact that clearly during the course a sort of theological summa of what was known about pion physics has been made which has served as reference for a long time.

But then Enrico Fermi's death has reflected on this second year a particular light and when anyone talks about Varenna School, the second year and Enrico Fermi cross our minds.”

Giampietro Puppi – Director of the School

1953 – 2013



115 ANNI
e oltre



190 courses
> 12000 participants
60 Nobel Prize winners

Joint EPS-SIF International School on Energy 2014



Course II - **Energy: basic concepts and forefront ideas**

17 - 23 July 2014 - VILLA MONASTERO - VARENNA, LAKE COMO

Sponsors



Directors of the Course

Luisa Cifarelli - Dipartimento di Fisica e Astronomia, Università di Bologna, INFN, Sezione di Bologna (Italy)

Friedrich Wagner - Max-Planck-Institut für Plasmaphysik, Greifswald (Germany)

	Thursday 17 July	Friday 18 July	Saturday 19 July	Sunday 20 July	Monday 21 July	Tuesday 22 July	Wednesday 23 July	
9.00-10.00	Cifarelli Physics & Economy	Bradshaw Materials shortage	Erdmann Energy economy	Muraoka Fukushima	Ohler Networks & Systems	Ripani Fission energy	Ripani Fission energy	
10.00-11.00	Schlögl Chemical energy	Friedrich Energy, environment and public heath	Schulze Bio-energy	Clerici World energy resources	Schulze Bio-energy	Hermans Mobility	Manzella Geothermal power	
11.00-11.30	Coffee break							
11.30-12.30	Schlögl Chemical energy	Prodi Climate	Polman Photo Voltaic materials	Clerici Fossil energy	Polman Photo Voltaic materials	Centro PV devices	Revol Thorium reactors	
12.30-15.00	Lunch							
15.00-16.00	Friedrich Energy, environment and public heath	Erdmann Energy economy	H. Wagner Wind energy		H. Wagner Wind energy	Zannella Industrial develop.		
16.00-17.00	Prodi Climate	Ebert Energy saving tech.	Ebert Energy saving tech.		Ongena Fusion	Ongena Fusion		
17.00-17.30	Break				Break			
17.30-18.30	Goede CO ₂ neutral fuels	Goede CO ₂ neutral fuels	F. Wagner Inter energy supply		Held Envir. & Climate	Held Envir. & Climate		