The Italian Summer Students program at Fermilab and other US Laboratories

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Outline

- Fermi National Accelerator Laboratory
- Fermilab Summer School
  - Historical background
  - Recruitment and Sponsors
  - Training Programs and Logistics
  - Connections with Horizon 2020
- Conclusions
Fermi National Accelerator Laboratory

- The most important laboratory in particle physics in USA
- Founded in 1967 as the National Accelerator Laboratory
- Renamed in honor of Enrico Fermi in 1974
  - 1750 employees (scientists, engineers, technicians)
  - > 3500 scientists and 1000 students from 50 countries
  - > 15000 K-12 students on educational programs every year
Discoveries at Fermilab

- 1977: **bottom quark**
- 1995: **top quark**, CDF and D0 experiments
- 2000: **tau neutrino**, DONUT experiment

**CDF**
Collider Detector at Fermilab
Fundamental contributions from Italy and Pisa
Collaboration started in 1984 and still ongoing
~100/600 total scientists at the time of maximum Italian presence (years 2000-2010)
Bologna, Frascati, Padova, Pavia, Pisa, Roma, Siena, Trento, Trieste, Udine (INFN and Universities)
~40 from Pisa (INFN, UNIPI, SNS, UNISI)
5 co-spokesperson from Pisa (18 years)
~100 Master/35 PhD Theses

Giorgio Bellettini, Professor Emeritus of UNIPI
CDF spokesperson at the time of top discovery
One of the Summer School’s coordinators
Fermilab Today

ACCELERATOR DIVISION (AD)
- Develops new accelerator techniques

TECHNICAL DIVISION (TD)
- Develops new technologies for particle physics experiments

COMPUTING DIVISION (CD)
- Computing infrastructure for data handling and analysis

PARTICLE PHYSICS DIVISION (PPD)
- Development of Lab’s Intensity Frontier experiments

Feynman Computer Center
Fermilab PPD and INFN participation

- Muon to electron conversion experiment (Mu2e)
- Measurement of the anomalous muon magnetic moment (Muon (g-2))
- Short/Long-baseline neutrino experiments (MicroBooNE, Icarus, SBND, DUNE)
- Collaboration with CMS at CERN Large Hadron Collider
INTERNATIONAL PROGRAM – MASTER STUDENTS

- Physics/Applied Physics
- Engineering, Materials Science
- Computer Science

ADMISSION

- Curriculum Vitae
- Recommendation Letters
- Interview
- Good knowledge of English
Training Programs

- August – September (9 weeks)

- **Programs for Physicists**
  - Design, construction, commissioning of particle detectors/accelerators
  - Simulation of particle detectors/accelerators and particle physics experiments
  - Analysis of data collected by particle physics experiments

- **Programs for Engineers**
  - Design/Test of particle detectors/accelerator components
  - Design/Test of superconducting materials and magnets for particle accelerators
  - Development of fast electronics components/high precision mechanics
  - Development of advanced computing infrastructures

**UNIVERSITY CREDITS (since Summer School creation in 2015)**
- 6 ECTS credits (ECTS, European Credit Transfer and Accumulation System)
Financial Resources

What does Fermilab provide?

- Weekly salary: ~400 $
- Free housing in Dorm
- Shared rental car
- Total cost $9000/student

What does not Fermilab provide?

- Round-trip journey from Italy to Chicago
- Health insurance: mandatory

Student to-do list

- Valid passport
- Employment and J1 Visa bureaucracy with the help of Fermilab administrative offices
Sponsorships

• 0 (“zero”) cost for the student
• ~9,000 $/student for the sponsor

• Department Of Energy at Fermilab
• Italian National Institute of Nuclear Physics
• Sant’Anna School of Advanced Studies (Pisa)
• ASI (also INAF in 2010-2011): internships at US Space Science Laboratories
• University of Pisa
10 Physics + 15 Engineering students
Important Dates (2018)

- May 20: Selection Completed
- July 28-29: Fly to Chicago
- July 30: Hiring at Fermilab
- August 27-31: MidTerm Review
- September 24-28: Final Review
- October 12-18: Exam at UNIPI
Students Statistics 1984 - 2018

530 students

Total
Engineering
Physics

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Involved Universities 1984 – 2018

530 students

- Pisa
- Padova
- Bologna
- Trieste
- Ferrara
- Ufine
- Firenze
- Dubna
- Parma
- Lecce
- Haifa
- Bari
- Munich
- Warsaw
- Roma
- Milano
- Torino
- Napoli
- Cassino
- Siena
- Prague
- Campina
- Messina
- L'Aquila
- Ancona
- Cagliari
- Heidelbergh
- Vilnius

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Training Programs 2008-2018

250 students

- Particle Physics Division
- Technical Division
- Accelerator Division
- Scientific Computing Division

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Internships at Space Science Labs

Fermilab, Argonne, Purdue, Colorado, Arizona

Stanford, SLAC

AS, INAF, INFN (ISSNAF, CAIF) support: 25 students outside Fermilab in 2010-2017
3 financed by ASI in 2018
24 students had full financial support for 8 months
Connections with Horizon 2020

- Outreach towards FNAL Summer Students by researchers involved in MUSE, NEWS, INTENSE
  - Seminars, lectures, trainings, visits to Lab’s infrastructures
Conclusions

- The Italian Summer Students Program at Fermilab
  - A multi-disciplinary 9-week internship for Physics and Engineering students
  - Hands-on training on Fermilab high-tech research

- ~530 Italian Summer Students since 1984
  - Many students extended their collaboration with a Master Thesis and a PhD and started their career at Fermilab