Involving the New Generations in Fermilab Endeavors

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University and INFN Pisa

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Outline

FERMI NATIONAL ACCELERATOR LABORATORY
- Italy @Fermilab

THE SUMMER STUDENTS PROGRAM
- Students’ Recruitment
- Training Programs
- Costs and Sponsorships
- Statistics (1984–2022)
  - 2020 Program (sadly) cancelled
  - 2021 Program replaced with a 3-day Workshop at LNF
  - 2022 Back To Work, 21 Summer Students flying to Fermilab soon
- Internships at Space Science Labs

CONCLUSIONS
Fermilab Organization

PARTICLE PHYSICS & NEUTRINO DIVISIONS
- Design Lab’s particle physics & neutrino experiments

ACCELERATOR DIVISION
- Develop new accelerator techniques
- Provide beams for Lab’s experiments

TECHNICAL DIVISION
- Develop technologies for particle experiments

SCIENTIFIC COMPUTING DIVISION
- Provide infrastructures for data handling/analysis

~1800 EMPLOYEES + THOUSANDS OF VISITORS

Feynman Computer Center
Italy @Fermilab, some history

COLLIDER DETECTOR AT FERMILAB (CDF), SINCE 1984

- ~100/600 Italian scientists in the years 2000-2010

BOLOGNA, FRASCATI, PADOVA, PAVIA, PISA, ROMA, SIENA, TRENTO, TRIESTE, UDINE (INFN and UNIVERSITIES)

- 5 co-spokesperson from Pisa

- ~100 MASTER + 35 PhD THESSES

The 2019 HEP prize of the EPS was awarded to the CDF and D0 Collaborations for the discovery of the top quark (1995)
Italy @Fermilab, as of today

NEW LAB’s ENDEAVOURS

• **Muon (g-2):** Measurement of the anomalous muon magnetic moment
• **Mu2e:** Muon to electron conversion experiment
• **Icarus, SBN, DUNE:** Short/Long-baseline neutrino experiments
• ~150 Italian scientists

BOLOGNA, CATANIA, FERRARA, FRASCATI, GENOVA, GRAN SASSO, LECCE, MILANO, NAPOLI, PAVIA, PADOVA, PISA, ROMA, TRIESTE, UDINE (INFN DEPARTMENTS and UNIVERSITIES)
Students’ Recruitment

INTERNATIONAL PROGRAM
• Applications from most Italian and some European Universities

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 (acknowledged by the UNIPI Summer School)
• 6 ECTS credits (ECTS, European Credit Transfer and Accumulation System)
Training Programs (2018-2019)

2018: 10 PHYSICS + 15 ENGINEERING

2019: 13 PHYSICS + 15 ENGINEERING
Sponsorships

0$ COST FOR THE STUDENT, ~9,000$ FOR THE SPONSOR

- Department Of Energy at Fermilab
- Italian National Institute of Nuclear Physics
- Sant’Anna School of Advanced Studies (Pisa)
- Italian Space Agency (for internships at US Space Science Labs)
- University of Pisa
WHAT FERMILAB PROVIDES

• Weekly salary: ~600 $
• Free housing in Fermilab Dorms
• Shared rental car
• Total cost ~9000 $/student

WHAT FERMILAB DOES NOT PROVIDE

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

STUDENTS’ TO-DO LIST

• Valid passport
• Employment and J1 Visa bureaucracy with the help of Fermilab administrative offices
Important Actions/Dates

January – March
Receive Students’ Applications

March – April
Students Interviews

April - May
Students Selection
TP Assignment

Last weekend of July
Fly to Chicago
Fermilab Hiring

+5 weeks (August)
MidTerm Review

+9 weeks (September)
Final Review

October
Final Exam at UNIPI

January – April
Receive Supervisors’ Training Programs

ICHEP 2022, July 6 - 13, 2022, Bologna (Italy)
# Summer Students Statistics (1984 – 2022)

<table>
<thead>
<tr>
<th>Involved Universities (1984-2022)</th>
<th>570 students</th>
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<tr>
<td>Pisa</td>
<td>52%</td>
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<tr>
<td>Roma</td>
<td>10%</td>
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<tr>
<td>Padova</td>
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<td>Bologna</td>
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<td>Torino</td>
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<tr>
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<tr>
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<td>Siena</td>
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<td>Messina</td>
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<tr>
<td>Lecce</td>
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<tr>
<td>L'Aquila</td>
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<tr>
<td>Ancona</td>
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<td>Bari</td>
<td>&lt;1%</td>
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<tr>
<td>International</td>
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<table>
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<th>Training Programs (2008-2022)</th>
<th>290 students</th>
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<tr>
<td>Particle Physics Division</td>
<td>62%</td>
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<tr>
<td>Technical Division</td>
<td>20%</td>
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<tr>
<td>Accelerator Division</td>
<td>10%</td>
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<tr>
<td>Scientific Computing Division</td>
<td>8%</td>
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</tbody>
</table>
Internships at Space Science Labs

Fermilab, Argonne, Purdue, Colorado, Arizona

Stanford, SLAC

Caltech

ASI, INAF, INFN (ISSNAF, CAIF) supported 30 students outside Fermilab in 2010-2019
Topical Workshop

Involving the new generations in the future Fermilab endeavors

(August 2-4, 2021)

3-DAY FULL IMMERSION WORKSHOP

• 25 PHYSICS/ENGINEERING STUDENTS HOSTED AT INFN – LNF

• SEMINARS OF FERMILAB EXPERIMENTS / TECHNOLOGIES

• VISITS TO LNF INFRASTRUCTURES / HANDS-ON TRAINING BY INFN EXPERTS

Year 2021, we kept the connection alive
Year 2022, Fermilab, we are back

- 21 SUMMER STUDENTS WILL BE AT FERMILAB ON JULY 25 FOR 9 WEEKS
  3-DAY FULL IMMERSION WORKSHOP AT UNIPI AND INFN PISA
  (JULY 18-20, 2022)
- SEMINARS OF FERMILAB EXPERIMENTS / TECHNOLOGIES AND ORGANIZATION
- VISIT TO THE EUROPEAN GRAVITATIONAL OBSERVATORY AND VIRGO

2022: 18 PHYSICS + 3 ENGINEERING

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<th>Field</th>
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<td>Milano</td>
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<td>Amsterdam</td>
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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

~570 ITALIAN SUMMER STUDENTS SINCE 1984

• Many former Summer Students then developed their career at Fermilab with a Master Thesis and a PhD