The Italian Summer Students Program at Fermilab and other US Laboratories

Emanuela Barzi, Giorgio Bellettini,
Simone Donati, Carmela Luongo

University and INFN Pisa

March 2020, NEWS Scientiific Board Meeting
Work Package 9 "Dissemination and Outreach"

Terms for Applications are now Open

2020 Summer Students
Italian program
at the Fermi National Accelerator Laboratory
and at other US Laboratories
July 27th - September 25th, 2020

Deadline for application March 31, 2020

Outline

FERMI NATIONAL ACCELERATOR LABORATORY

- Italy @Fermilab

THE SUMMER STUDENTS PROGRAM

- Recruitment
- Training Programs
- Costs and Sponsorships
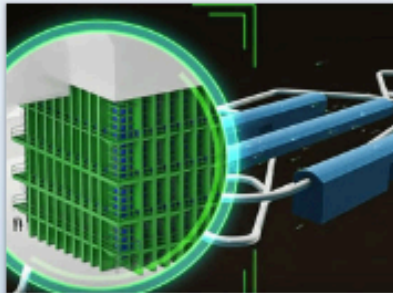- Statistics (1984 – 2019)
- Internships at Space Science Labs

CONCLUSIONS

Fermilab

Fermilab is America's particle physics and accelerator laboratory
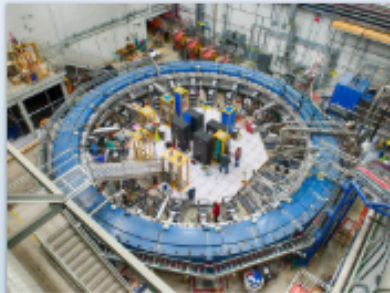
We bring the world together to solve the mysteries of matter, energy, space and time.

What we do

Deep Underground Neutrino Experiment

Fermilab hosts DUNE and the Long-Baseline Neutrino Facility, being built by scientists and engineers from more than 30 countries.

Particle physics

Fermilab explores the universe at the smallest and largest scales, studying the fundamental particles and forces that govern our universe.

Accelerator science and technology

Fermilab designs, builds and operates powerful accelerators to investigate nature's building blocks, advancing technology for science and society.

Detectors, computing and quantum science

Fermilab pioneers the research and development of particle detection technology and scientific computing applications and facilities.

Fermilab Organization

PARTICLE PHYSICS & NEUTRINO DIVISIONS

- Design Lab's particle physics & neutrino experiments

ACCELERATOR DIVISION

- Develop new accelerator techniques
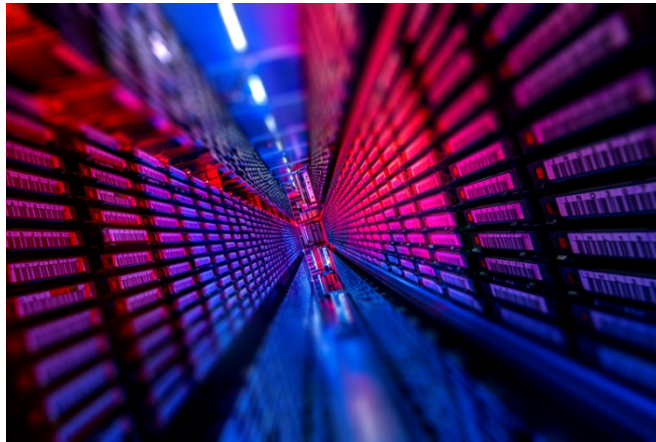- Provide beams for Lab's experiments

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

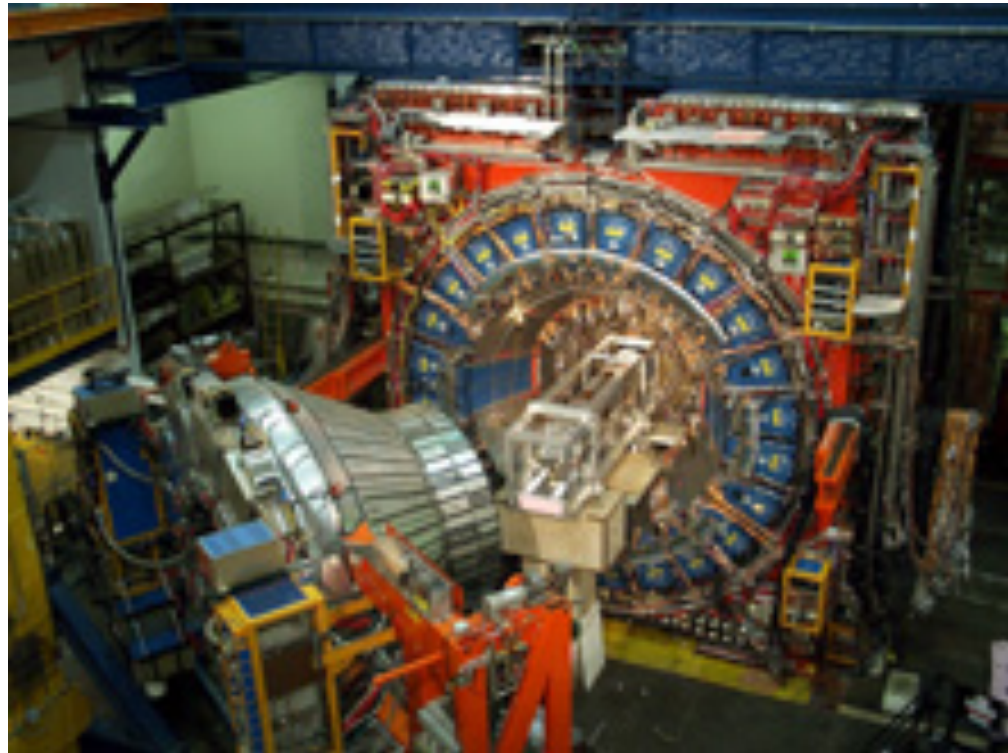**COLLIDER DETECTOR AT FERMILAB (CDF), SINCE 1984**

- ~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 THESES

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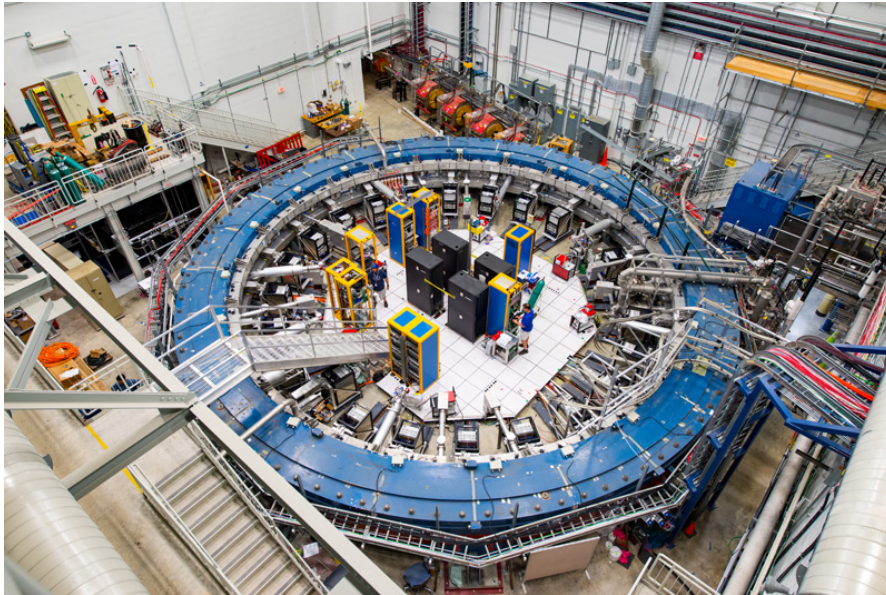
Italy @Fermilab, as of today

NEW LAB's ENDEAVOURS

- **Muon (g-2)**: Measurement of the anomalous muon magnetic moment
- **Mu2e**: Muon to electron conversion experiment
- **Icarus, DUNE**: Short/Long-baseline neutrino experiments
- ~140 Italian scientists

BOLOGNA, CATANIA, FERRARA, FRASCATI, GENOVA, GRAN SASSO, LECCE, MILANO, NAPOLI, PAVIA, PADOVA, PISA, ROMA, TRIESTE (INFN 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

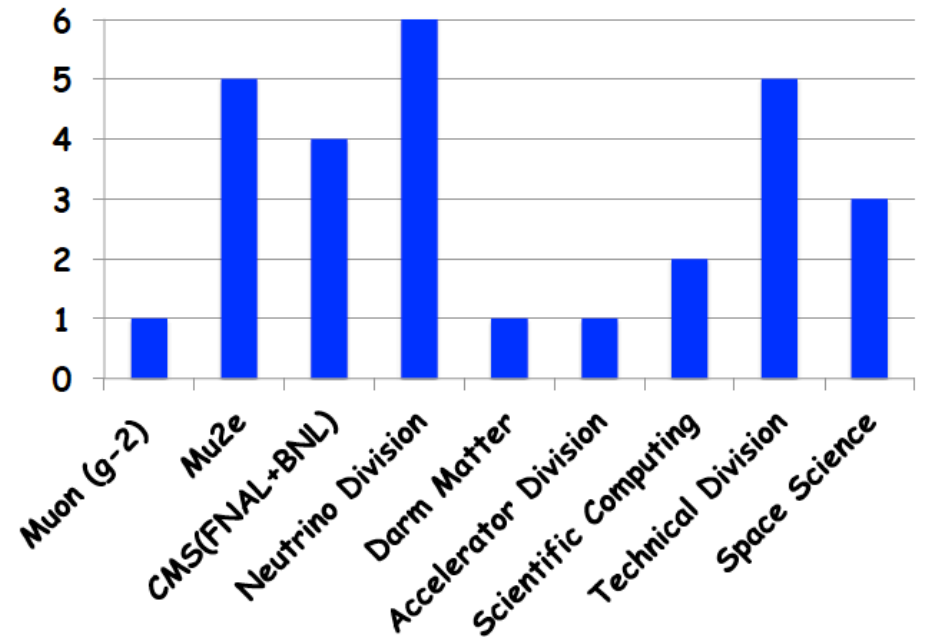**UNIVERSITY CREDITS (since UNIPI Summer School creation in 2015)**

- 6 ECTS credits (ECTS, European Credit Transfer and Accumulation System)

Training Programs (2018-2019)

2018: 10 Physics + 15 Engineering
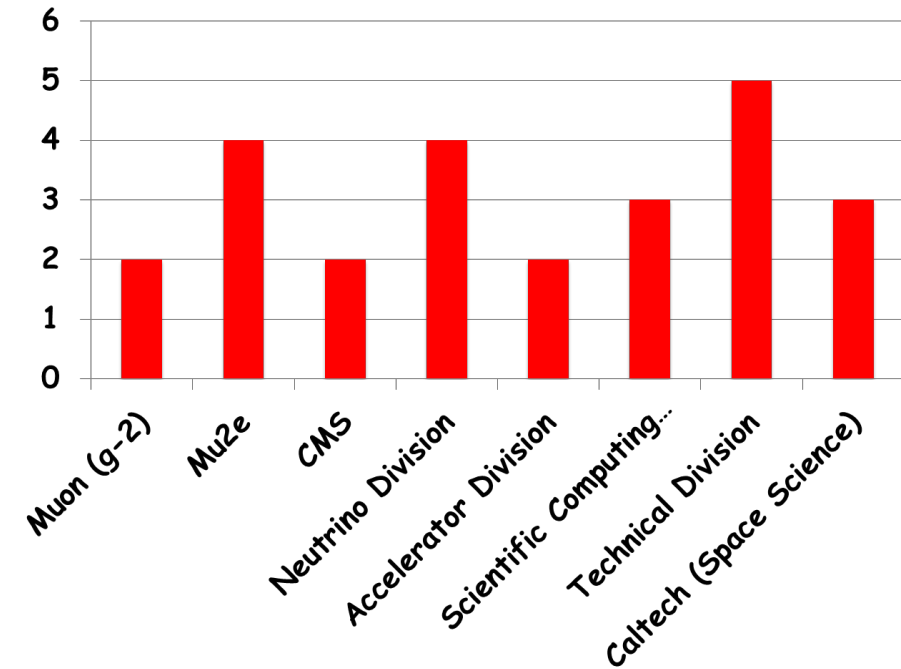
2019: 13 Physics + 15 Engineering

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 (ASI), and Italian National Institute of Astrophysics (INAF, in 2010-2011) sponsors internships at US Space Science Labs

- University of Pisa

Costs

WHAT FERMILAB PROVIDES

- Weekly salary: ~400 $

- Free housing in Dorm

- Shared rental car

- Total cost ~9000 $/student
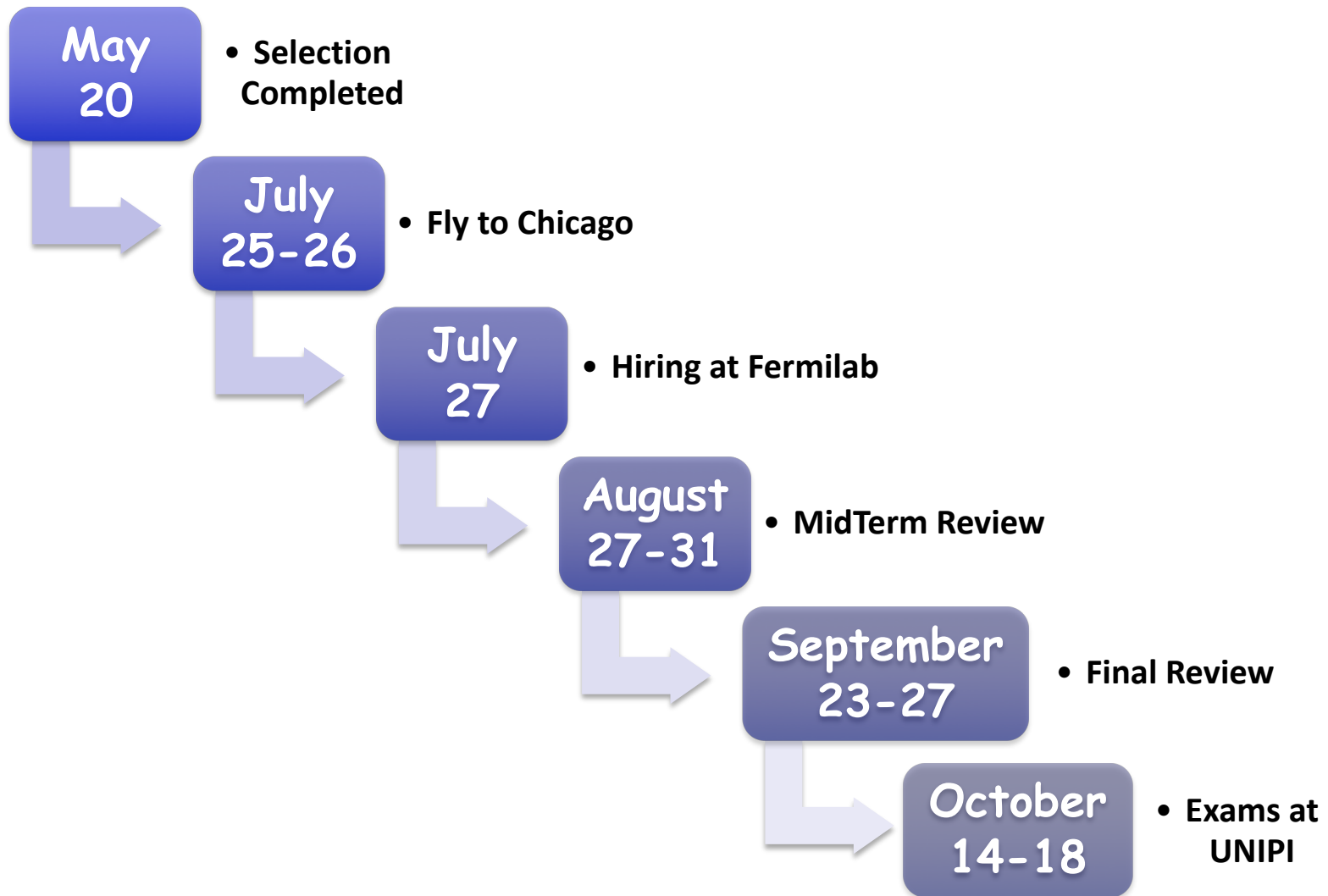
WHAT FERMILAB DOES NOT PROVIDE

- 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 Dates (2020)

May 20 — • Selection Completed

July 25-26 — • Fly to Chicago

July 27 — • Hiring at Fermilab

August 27-31 — • MidTerm Review

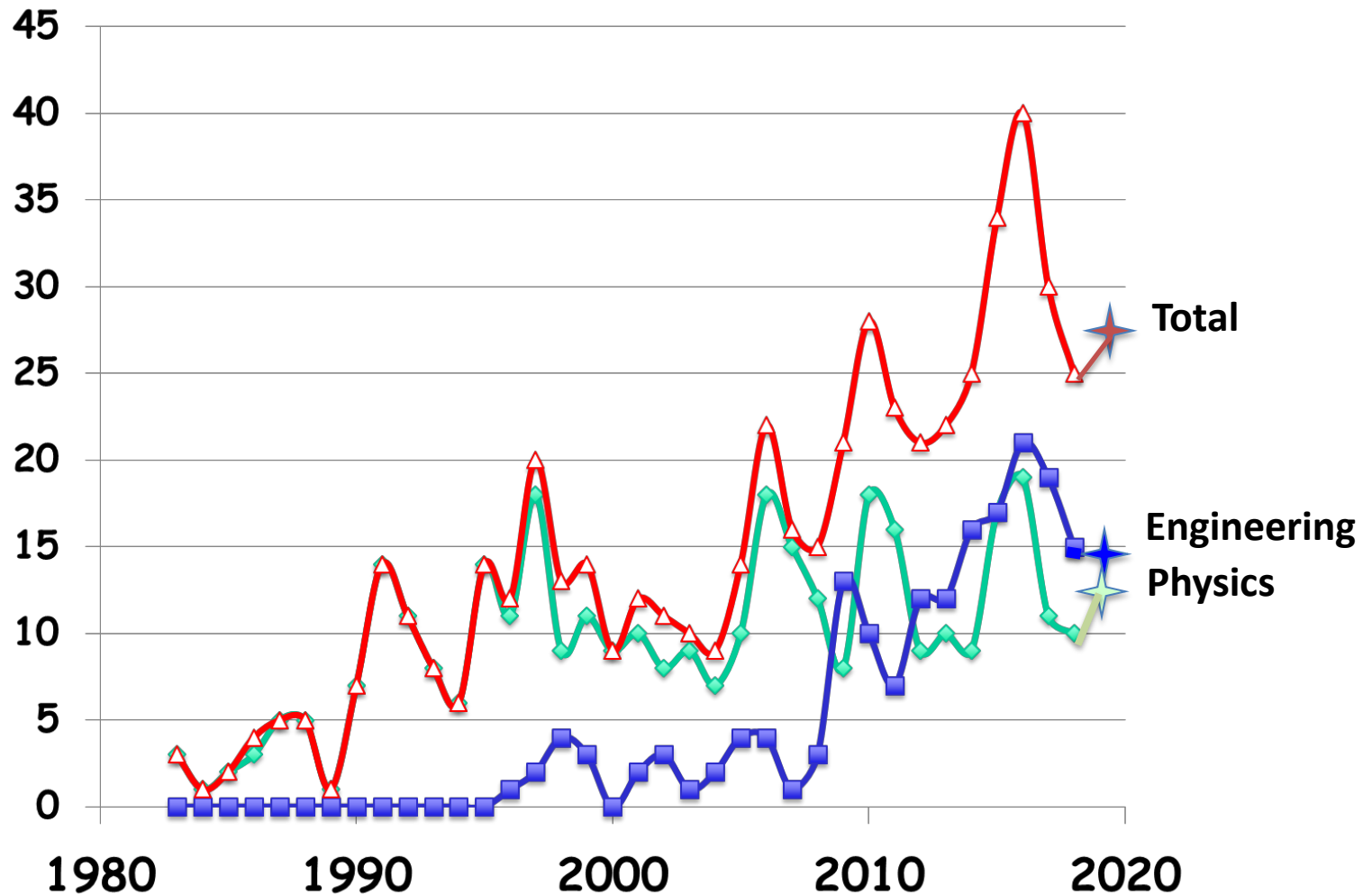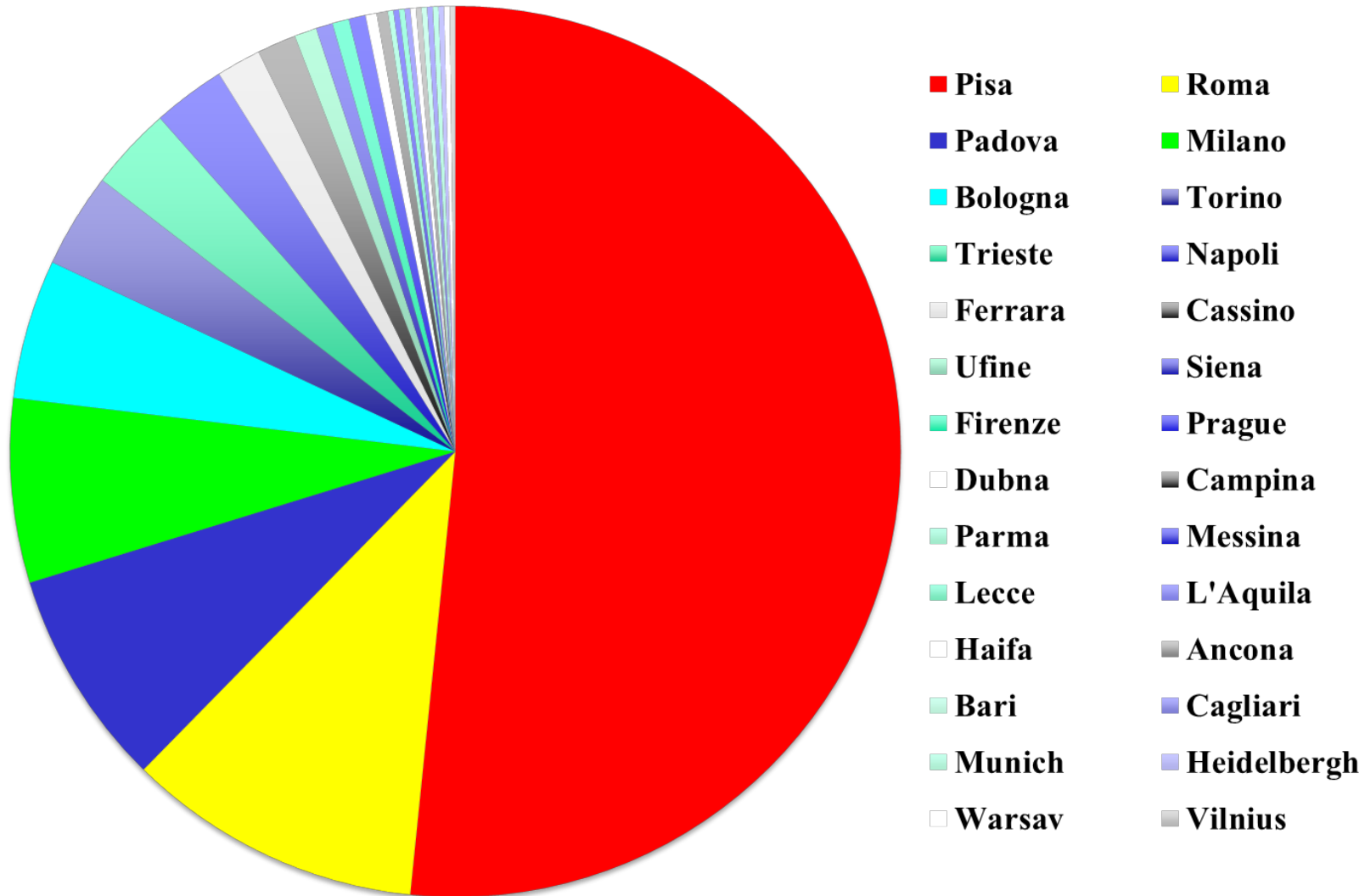**September 23-27** — • Final Review

October 14-18 — • Exams at UNIPI

Students Statistics 1984 - 2019

~550 students

Involved Universities 1984 – 2019

~550 students

Legend:

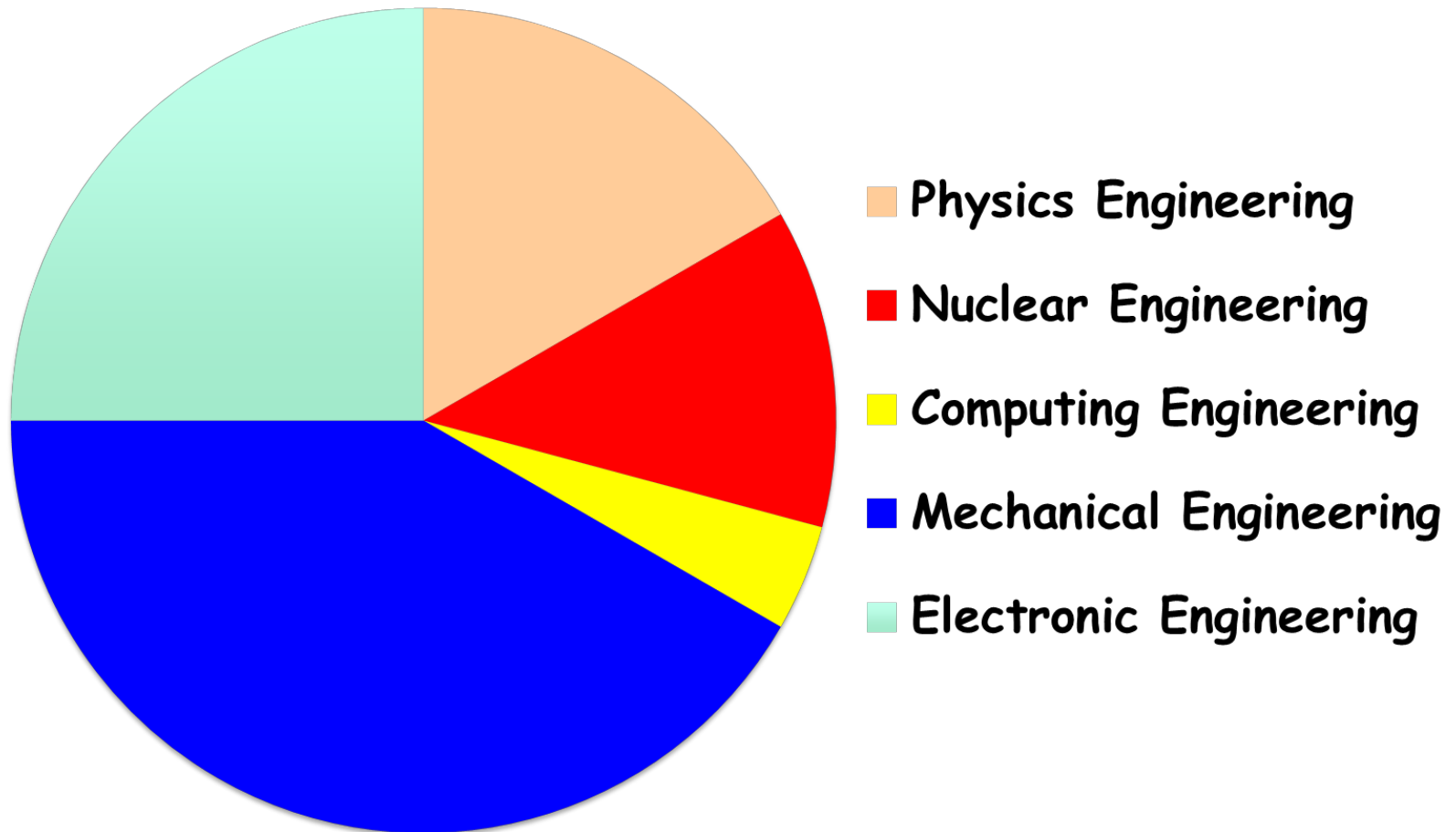|	
■ Pisa	■ Roma
■ Padova	■ Milano
■ Bologna	■ Torino
■ Trieste	■ Napoli
■ Ferrara	■ Cassino
■ Ufine	■ Siena
■ Firenze	■ Prague
■ Dubna	■ Campina
■ Parma	■ Messina
■ Lecce	■ L'Aquila
■ Haifa	■ Ancona
■ Bari	■ Cagliari
■ Munich	■ Heidelbergh
■ Warsav	■ Vilnius

Training Programs 2008-2019

~270 students
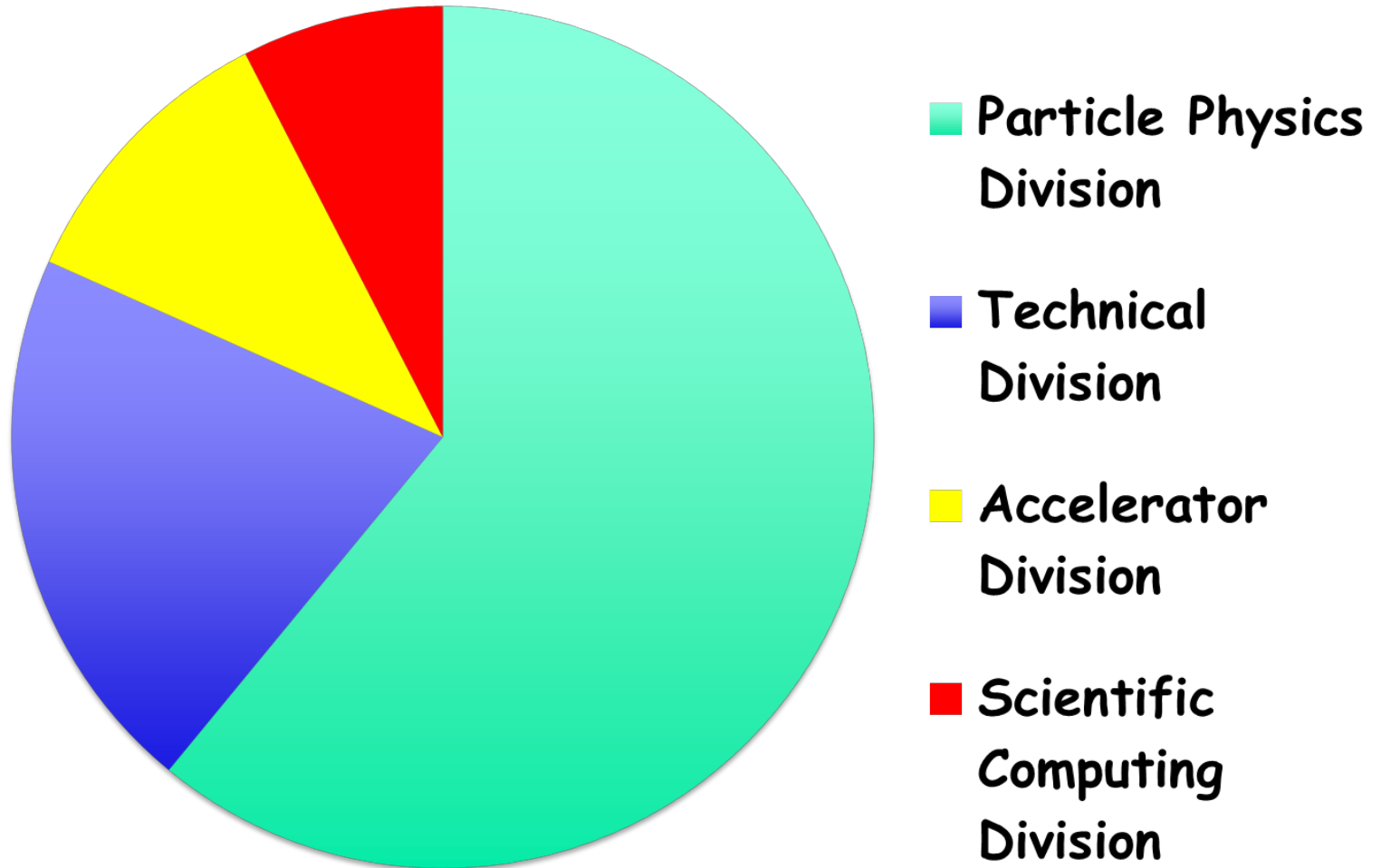
TD Laurea Program 1999 – 2016

24 students had full financial support for 8 months

- Physics Engineering
- Nuclear Engineering
- Computing Engineering
- Mechanical Engineering
- Electronic Engineering

Internships at Space Science Labs

Fermilab, Argonne, Purdue, Colorado, Arizona

Stanford, SLAC

Lewis Research Center
* Spacecraft Systems Technology
* Research and Technology (Power, Prop., Comm.)

Goddard Space Flight Center
* Technology Development for Space and Earth Science
* Advanced Instrument and Sensor Technologies

Ames Research Center
* Thermal Protection Sys./ARC Jets
* Info Sys./Intelligent

NASA Headquarters
* Program Management

Jet Propulsion Laboratory
* Advanced Robotics Technology

Caltech

SSTC (Baltimore)
HSCA (Harvard)
Columbia
Princeton

Johnson Space Center
* Human Transportation Advanced Technologies

Stennis Space Center
* Propulsion Test Technologies
* Communication Remote Sensing Application

Marshall Space Flight Center
* Propulsion Technology

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

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

~550 ITALIAN SUMMER STUDENTS SINCE 1984

- Many summer students developed their career at Fermilab with a Master Thesis and a PhD

Backup, da togliere

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
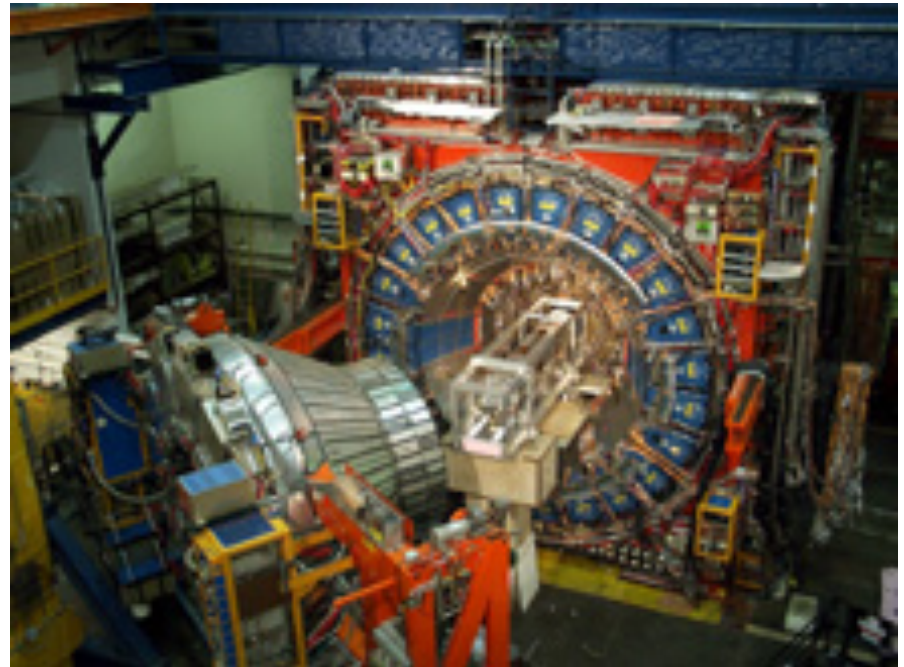

Wilson Hall

Booster, one of the Fermilab's powerful Accelerators

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

Connections with Horizon 2020

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