

H2020-MSCA-RISE-2015 — Grant Agreement N°  
690835



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# Summer Students at Fermilab and other US Laboratories

S. Donati

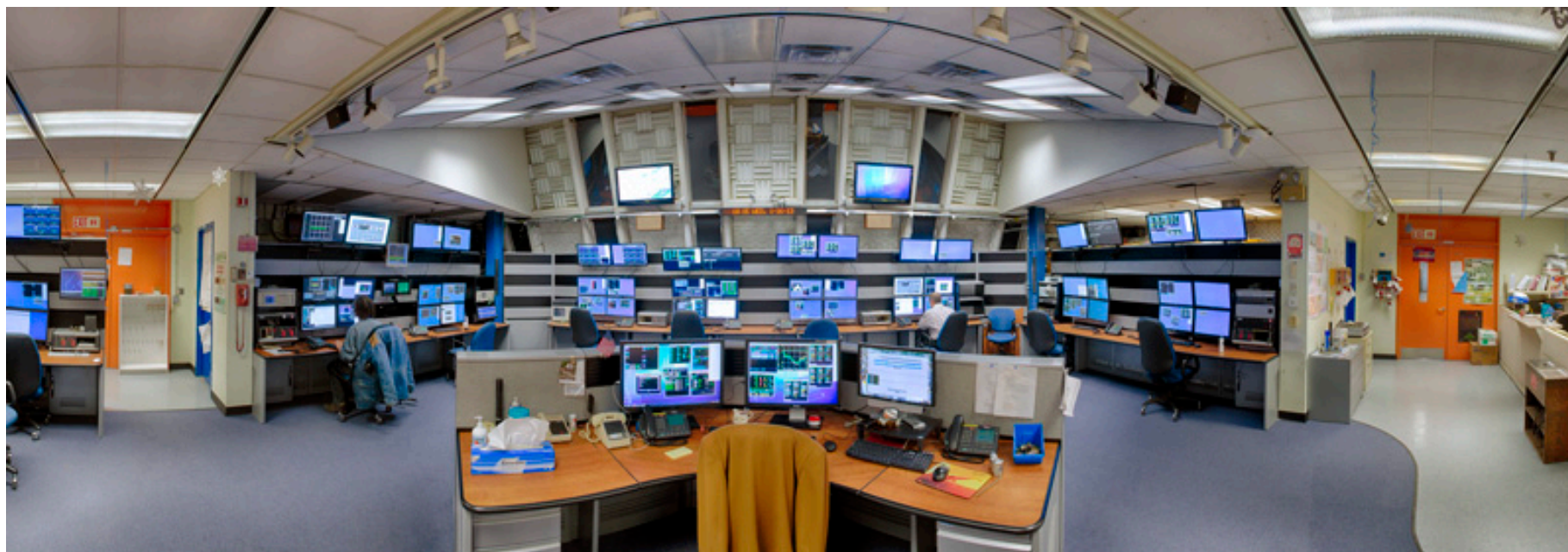
MUSE Mid-Term Meeting - Frascati, May 11<sup>th</sup>, 2017

# UNIVERSITY OF PISA - INFN - FERMILAB SUMMER SCHOOL

<http://www.pi.infn.it/cdf/ss2015/PisaFermilabSummerSchool.htm>  
[fermilab.summerschool@gmail.com](mailto:fermilab.summerschool@gmail.com)

## Scientific Committee

Prof. Simone Donati, Coordinator, Unipi  
Prof. Giorgio Bellettini, Emeritus, Unipi  
Prof. Eng. Emanuela Barzi, Fermilab



# MASTER STUDENTS, NOT ONLY ITALIAN UNIVERSITIES

Physics/Applied Physics  
Engineering, Materials Science, Computing Science

## ADMISSION

Curriculum Vitae + Recommendation Letters + Interview + English

## ACTIVITY AT FERMILAB

August - September (9 weeks)  
Training Program supervised by one Fermilab employee  
MidTerm Review & Final Review, Written Report

## SPONSORS

Italian National Institute of Nuclear Physics and Department Of Energy  
University of Pisa, Sant'Anna School of Advanced Studies (Pisa)  
ASI-CAIF for "spatial" laboratories + "private" sponsors

## UNIVERSITY CREDITS (since 2015)

6 ECTS Credits (ECTS, European Credit Transfer and Accumulation System)

# FERMI NATIONAL ACCELERATOR LABORATORY

The most important laboratory in particle physics in USA  
A few thousand employees and visitors from the entire world

## PARTICLE PHYSICS DIVISION

Detector development and Lab's experiments  
Collaboration with CMS at CERN Large Hadron Collider  
Short/Long-baseline neutrino experiments  
Theoretical Physics Department, Astrophysics Department

## ACCELERATOR DIVISION

Development of new accelerator techniques  
Beams for Lab's experiments

## TECHNICAL DIVISION

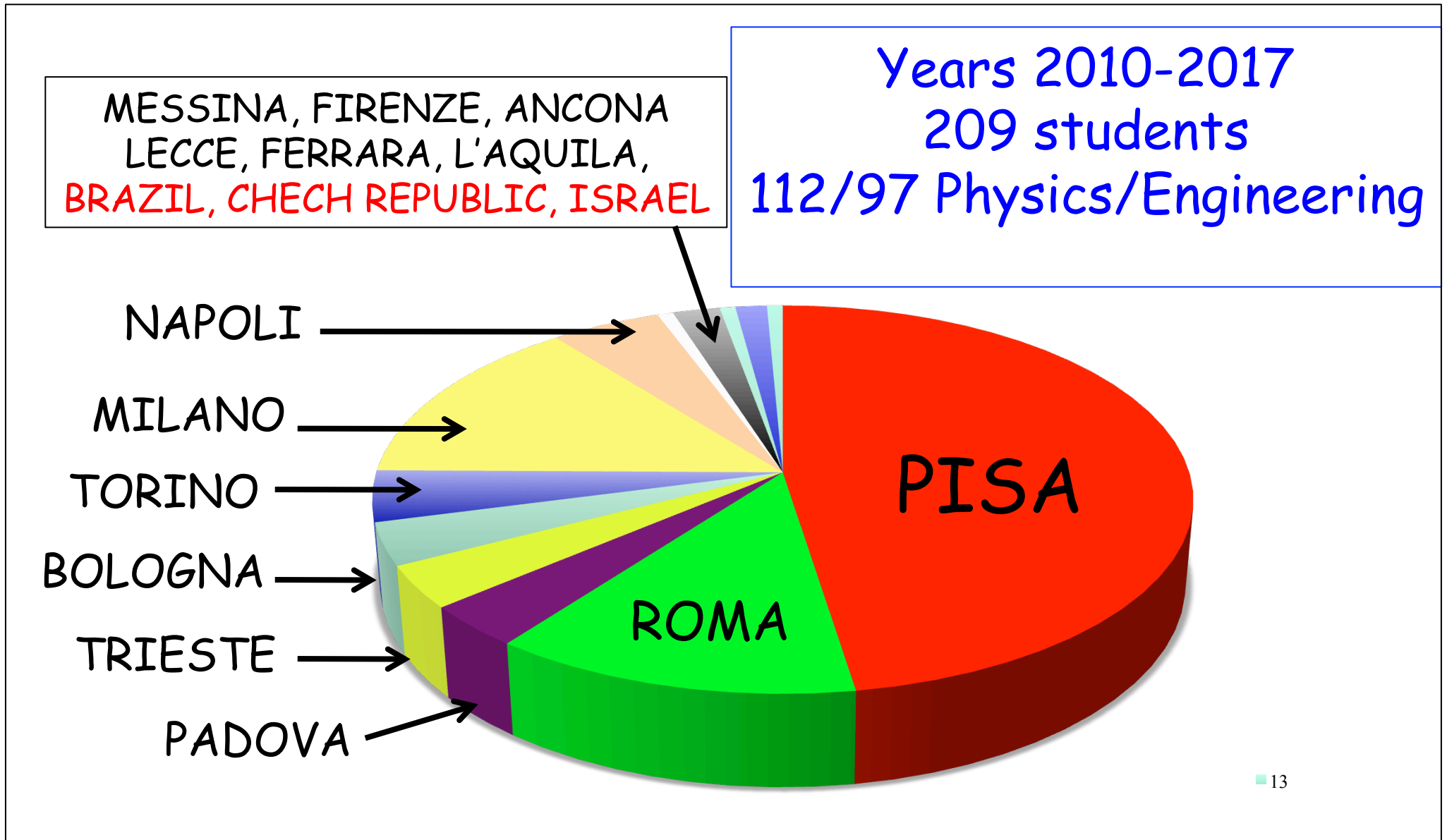
Development of new technologies for particle physics experiments

## COMPUTING DIVISION

Computing infrastructure for data handling and analysis

Ideal environment for students' hands-on training

# ALMOST 500 STUDENTS SINCE 1983



13

LATEST NEWS (2016), MOSTLY RELEVANT FOR NEUTRINO EXPERIMENTS  
2 STUDENTS FROM STATE UNIV. OF CAMPINAS (BRAZIL)  
3 STUDENTS FROM CZECH TECH. UNIV. IN PRAGUE (CZECH REPUBLIC)

# THE TEAM (for the last 10 years)



Giorgio Bellettini



Emanuela Barzi



Simone Donati

AND HERE IS THE FIRST  
SUMMER STUDENT AT  
FERMILAB, "CLASS 1983"



Giorgio Chiarelli, now Director  
of Research at INFN Pisa

**ONLY ONE COMMANDMENT**

THE BEST STUDENT  
FOR  
THE BEST TRAINING PROGRAM

# AIM HIGH, SHOOT HIGHER

DATE EXAM	SCORE
6/7/13 Geometry I	30/30 cum laude
6/13/13 Physics I	30/30 cum laude
6/18/13 General Chemistry	30/30
6/25/13 Mathematical Analysis I and II	30/30
7/15/13 Laboratory I	30/30
7/15/13 Computing I	30/30
1/29/14 Mathematical Analysis III	30/30
5/29/14 Mathematical Methods I	30/30 cum laude
6/18/14 Physics II	30/30 cum laude
6/27/14 Laboratory II	30/30 cum laude
7/14/14 Classical Mechanics	30/30
<b>9/17/14 Geometry II</b>	<b>29/30 (someone was sick)</b>
1/14/15 Mathematical Methods II	30/30 cum laude
1/19/15 Physiology and Physiopathology	30/30 cum laude
6/5/15 Laboratory III	30/30 cum laude
6/15/15 Physics III	30/30 cum laude
6/23/15 Quantum Mechanics	30/30
7/3/15 Structure of Matter	30/30
1/20/16 Particle I	30/30 cum laude
1/29/16 Theoretical Physics I	30/30



# HIGHLIGHTS FROM THE 2016 PROGRAM (36+4+5)

Program	First Name	Nationality	University	Master Degree	Training Program	Destination in USA
F.Massarò(U. Torino)	Valentina	Italiana	Universita' di Napoli Federico II	Fisica	Astrophysics	Harvard-Smithsonian Center for Astrophysics
DOE	Giacomo	Italiana	Politecnico di Milano	Ingegneria	IOTA	Fermilab
DOE	Nicola	Italiana	Universita' di Pisa	Ingegneria	LBNF	Fermilab
DOE	Flavio	Italiana	Politecnico di Torino	Ingegneria	CLOUD	Fermilab
DOE	Federico	Italiana	Universita' di Pisa	Ingegneria	Mu2e	Fermilab
DOE	Adi	Israeliana	Technion – Israel Institute of Technology	Ingegneria	Optical Stochastic Cooling	Fermilab
SSSA-DOE	Isabel	Italiana/Spagnola	Universita' di Pisa - Sant'Anna	Ingegneria	IARC	Fermilab
SSSA-DOE	Alessandro	Italiana	Universita' di Pisa - Sant'Anna	Ingegneria	CMS	Fermilab
DOE	Daniele	Italiana	Universita' di Pisa	Ingegneria	Magnets	Fermilab
DOE	Ian	Italiana	Universita' di Pisa	Ingegneria	Mu2e	Fermilab
DOE	Alessandro	Italiana	Universita' di Pisa	Ingegneria	PIP-II	Fermilab
DOE	Franco	Italiana	Universita' di Pisa	Ingegneria	PIP-II	Fermilab
SSSA-DOE	Salvatore Al	Italiana	Universita' di Pisa - Sant'Anna	Ingegneria	Dune	Fermilab
DOE	Gabriele	Italiana	Universita' di Pisa	Ingegneria	Mu2e	Fermilab
DOE	Francesco	Italiana	Universita' di Ferrara	Ingegneria	Mu2e	Fermilab
DOE	Ceren	Turkish	Politecnico di Milano	Ingegneria	Magnets	Fermilab
DOE	Marco	Italiana	Universita' di Roma III	Fisica	Muon (g-2)	Fermilab
DOE	Letizia	Italiana	Universita' di Torino	Fisica	Dune	Fermilab
DOE	Alessia	Italiana	Universita' di Napoli Federico II	Fisica	Muon (g-2)	Fermilab
DOE	Agnese	Italiana	Universita' di Pisa	Fisica	Muon (g-2)	Fermilab
DOE	Andrea	Italiana	Universita' di Pisa	Fisica	CDF	Fermilab
DOE	Elisabetta	Italiana	Universita' di Milano	Fisica	Mu2e	Fermilab
DOE	Samuele	Italiana	Universita' di Milano	Fisica	HFM	Fermilab
DOE	Gabriele	Italiana	Universita' di Pisa	Fisica	CDF	Fermilab
DOE	Marco	Italiana	Universita' di Ferrara	Fisica	NoVA	Fermilab
DOE	Olmo	Italiana	Universita' di Pisa - Scuola Normale	Fisica	CMS	Fermilab
DOE	Valerio	Italiana	Universita' di Pisa	Fisica	Mu2e	Fermilab
DOE	Riccardo	Italiana	Universita' di Roma III	Fisica	Mu2e	Fermilab
DOE	Tommaso	Italiana	Universita' di Pisa - Scuola Normale	Fisica	Numi	Fermilab
DOE	Diletta	Italiana	Politecnico di Milano	Ingegneria	RF photoinjector	Fermilab
DOE	Fabio	Italiana	Universita' di Pisa	Fisica	Mu2e	Fermilab
DOE	Marco	Italiana	Universita' Politecnica delle Marche	Ingegneria	Mu2e	Fermilab
DOE-Czech	Filip	Czech Republic	Czech Technical University in Prague	Fisica	CMS	Fermilab
DOE-Czech	Karolina	Czech Republic	Czech Technical University in Prague	Fisica	Dune	Fermilab
DOE-Czech	Roman	Czech Republic	Czech Technical University in Prague	Fisica	NoVA	Fermilab
DOE-Brasil	Monica	Brasiliana	State University of Campinas	Fisica	LAriAT	Fermilab
DOE-Brasil	Lucas	Brasiliana	State University of Campinas	Fisica	LAriAT	Fermilab
ASI-CAIF	Marco	Italiana	Universita' di Pisa - Scuola Normale	Fisica	Exoplanets	Princeton
ASI-CAIF	Paolo	Italiana	Universita' di Roma La Sapienza	Ingegneria	Spacecraft Dynamics	University of Colorado Boulder
ASI-CAIF	Andrea	Italiana	Universita' di Padova	Ingegneria	Gailean Moons	Purdue
INFN-DOE	Federica	Italiana	Universita' di Roma La Sapienza	Fisica	FermiLAT	Slac
INFN-DOE	Michael	Italiana	Universita' di Pisa	Fisica	B-Physics	Slac
INFN-DOE	Carlo	Italiana	Politecnico di Milano	Ingegneria	Sensors	Slac
INFN-NSF	Gregorio	Italiana	Universita' di Pisa	Fisica	Ligo	Atlanta
INFN-NSF	Veronica	Italiana	Universita' di Pisa	Fisica	Ligo	Caltech

# FERMILAB LAUREA PROGRAM (TECH. DIVISION)

Last Name	First Name	University	Master Degree	Year	Former SS
Boffo	Cristian	Universita' di Udine	Mechanical Engineering	1999	Y
Fratini	Michela	Universita' di Pisa	Nuclear Engineering	2002	
Mattafirri	Sara	Universita' di Pisa	Nuclear Engineering	2002	
Del Frate	Licia	Universita' di Pisa	Nuclear Engineering	2004	
Lombardo	Vito	Universita' di Pisa & Sant'Anna	Computing Engineering	2007	
Danuso	Marco	Universita' di Pisa & Sant'Anna	Mechanical Engineering	2008	Y
Norcia	Gabriella	Universita' di Pisa	Mechanical Engineering	2009	Y
Gallo	Giuseppe	Universita' di Pisa	Mechanical Engineering	2010	
Bartalesi	Antonio	Universita' di Pisa	Mechanical Engineering	2010	
Quadrelli	Alessandro	Universita' di Pisa	Electrical Engineering	2010	Y
Scorrano	Matteo	Universita' di Pisa	Electronic Engineering	2010	Y
Moio	Simone	Politecnico di Torino	Physics Engineering	2011	Y
Passarelli	Donato	Universita' di Pisa	Mechanical Engineering	2011	
Puccinelli	Federico	Universita' di Pisa	Mechanical Engineering	2011	
Berrutti	Paolo	Politecnico di Torino	Physics Engineering	2011	
Pisoni	Andrea	Politecnico di Milano	Physics Engineering	2012	
Collura	Giulia	Politecnico di Torino	Electronic Engineering	2012	Y
Giannelli	Pietro	Politecnico di Torino	Electronic Engineering	2012	
Li Vigni	Vincenzo	Universita' di Palermo	Electronic Engineering	2012	
Zorzetti	Silvia	Universita' di Pisa	Electronic Engineering	2013	Y
Grandini	Matteo	Universita' di Pisa	Mechanical Engineering	2014	
Reginato	Federico	Politecnico di Milano	Physics Engineering	2014	Y
Palagi	Andrea	Universita' di Pisa	Mechanical Engineering	2014	
Ilardi	Veronica	Universita' di Ferrara	Mechanical Engineering	2016	Y

Red color: Summer Student evolved to a Fermilab staff

# MUSE TRAINING LECTURES

**SUMMER 2016**

Seminars on Muon ( $g-2$ )

**SUMMER 2017**

Working on the Agenda



“The Muon  $g-2$  Experiment”

Training lectures for the students of the Summer School “Summer Students at Fermilab and other US laboratories” (Fermilab, INFN and the University of Pisa)

## Lectures

Tuesday, August 2 – Comitium – Wilson Hall

9:00 - 9:40 C. Polly, “Overview of the Muon  $g-2$  experiment at FNAL”  
9:40 - 9:50 questions and discussion  
9:50 - 10:30 B. Casey, “The tracker of the Muon  $g-2$  experiment at FNAL”  
10:30 - 10:40 questions and discussion

10:40 - 10:55 Break

10:55 - 11:35 J. Kaspar, “The calorimeter of the Muon  $g-2$  experiment at FNAL”  
11:35 - 11:45 questions and discussion

11:45 - 14:30 Lunch break

14:30 - 15:00 C. Ferrari, “Calibration of the Muon  $g-2$  calorimeter”  
15:00 - 15:10 questions and discussion

## Visit to the labs

Wednesday, August 17 – Lab-3

14:00 Visit to the UK activities in  $g-2$

- no training required
- visitors must have covered footwear (no sandals)
- visitors will be provided with clean room garments to wear

Thursday, September 15 – MC-1

9:00 Visit to the Italian activities in  $g-2$

- required: MC-1 Hazard Awareness Training

# OUTREACH AT THE 2016 MUSE GENERAL MEETING



MUSE outreach program for University students

## “The High Intensity Frontier at the Fermilab Muon Campus”

30 September 2016

Pisa University, Polo Didattico Fibonacci  
Building C – Room 131

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Program

14:30 D. Glenzinski (Fermilab)  
“A Rare Opportunity - the Mu2e experiment at Fermilab”

15:30 F. Bedeschi (INFN Pisa)  
“The Muon g-2 Experiment”

16:30 G. Taddei, I. Naranjo De Candido  
“Our experience as Fermilab Summer Students”

Courtesy of F. Happacher

**Master Thesis at CERN**

# MOVING KNOWLEDGE17

(first edition in 2017)

~2 Summer Students involved  
in neutrino Physics will spend  
+4 weeks at Oxford  
9 weeks at Fermilab

Neutrino Summer Student Program



## Moving Knowledge17

Organizing committee:  
Emanuela Barzi, FNAL and OSU  
Giorgio Bellettini, Pisa  
Simone Donati, Pisa  
Luigi Marchese, Oxford  
Ian Shipsey, Oxford

Summer school coordinator:  
Luigi Marchese, Oxford

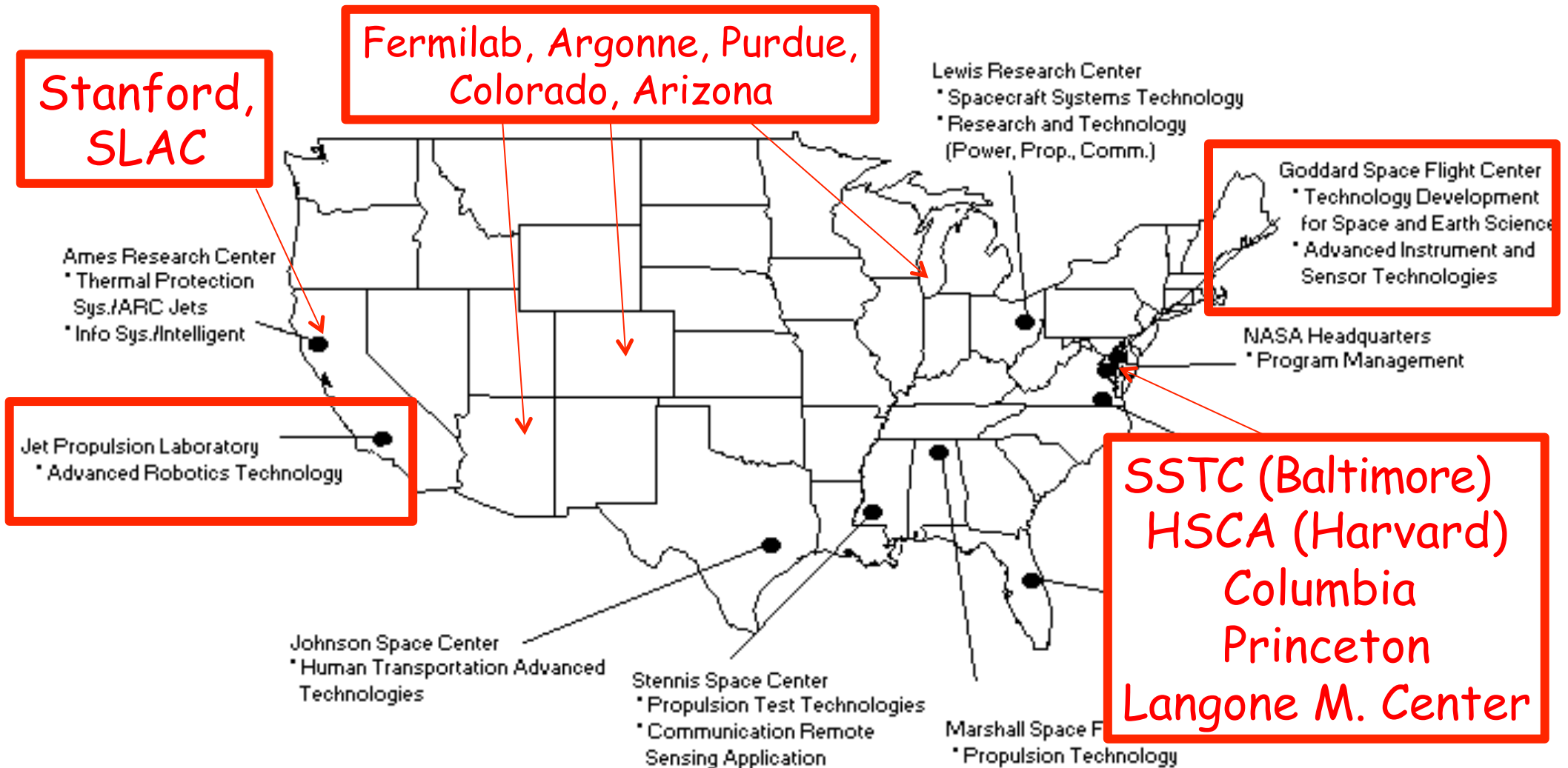
**Nature made neutrinos oscillate into three flavours,  
we make culture oscillate into three countries.**

Pisa university ↔ Oxford university ↔ CAIF



**Apply by April 24, 2017**

# INTERNSHIPS AT OTHER US LABORATORIES



26 Summer Students outside Fermilab in the years 2010-2017  
Financial support from ASI, INAF, INFN (ISSNAF, CAIF)

Access to NASA Laboratories **IS** complicated, managed through Contractors  
(i.e. Caltech for JPL, University of Maryland for Goddard)

# CONCLUSIONS

THE SUMMER STUDENTS AT FERMILAB  
AND OTHER US LABORATORIES PROGRAM  
IS IN HIS FULL MATURITY

AS OF 2017, EXTREMELY DEEP ROOTS IN ITALY,  
GROWING DEEPER IN EUROPE WITH MUSE