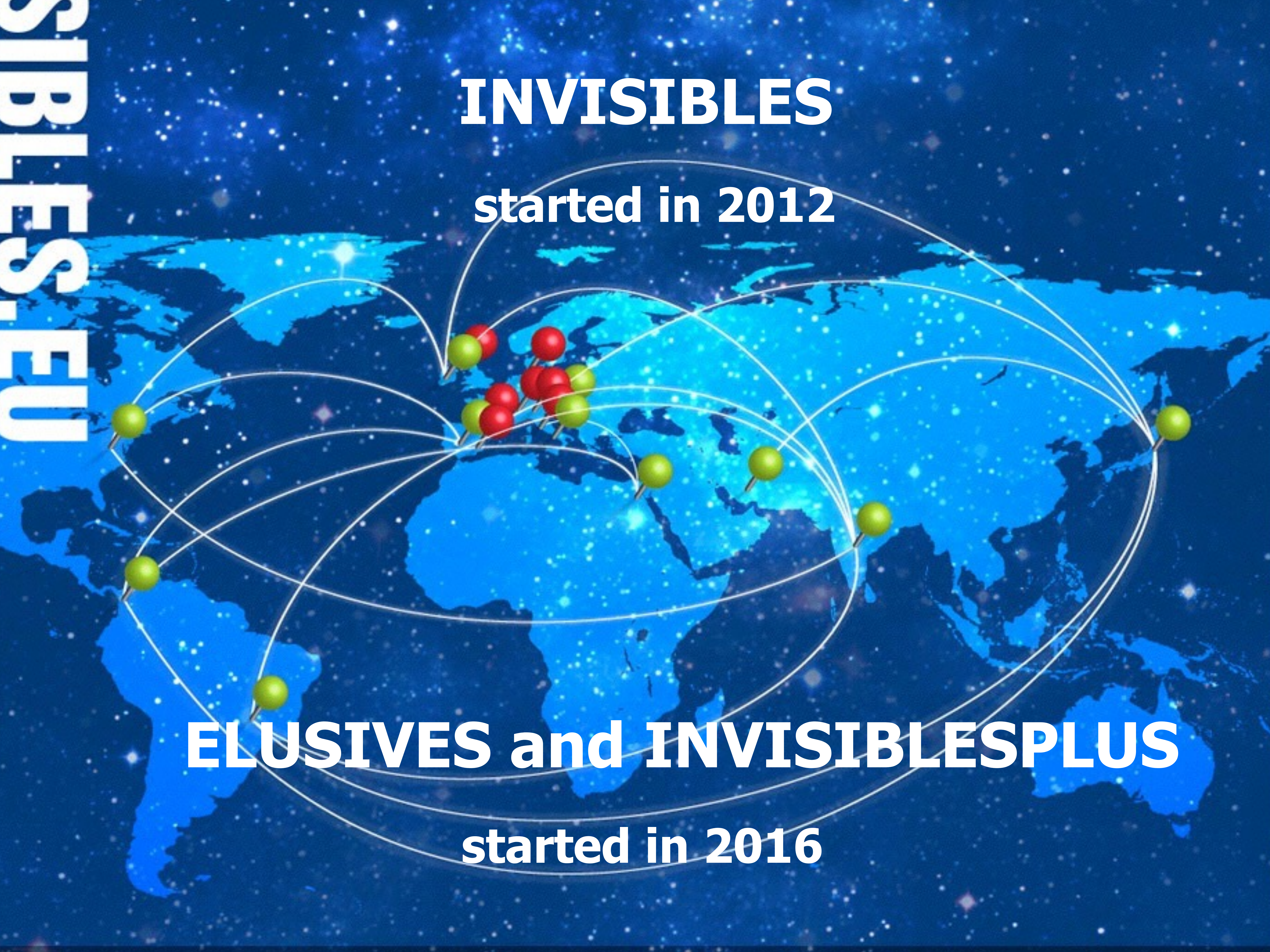
INVISIBLES19
workshop

is the workshop of the Horizon 2020 European networks

ELUSIVES (ITN) and **InvisiblesPlus** (RISE)

The name "INVISIBLES" is that of a previous network we had:

INVISIBLES ITN, 2012-2016


INVISIBLES
started in 2012
ELUSIVES and INVISIBLESPLUS
started in 2016

ELUSIVES and I+ : a bunch of physicists...who want to do physics !

ELUSIVES and I+ : a bunch of physicists…who want to do physics !

…and build the

New Standard Model of Particle Physics

BSM because

1) Experimental evidence for new <u>particle</u> physics:

*** **Neutrino masses**

*** **Dark matter**

** Matter-antimatter asymmetry

2)Uneasiness with SM fine-tunings :

*** **Strong CP problem**

*** **Hierarchy problem**

*** **Flavour puzzle**

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"CP"= Charge conjugation x Parity:
particle-antiparticle exchange

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BSM because

1) Experimental evidence for new <u>particle</u> physics:

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*** **Dark matter** → **CP ?**

** Matter-antimatter asymmetry **CP**

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BSM because

1) **Experimental evidence** for ne... :

*** **Neu...**

*** ... **P ?**

... asymmetry **CP**

ELUSIVES and INVISIBLESPLUS

Neutrino and dark matter physics, focusing on CP-violation

... **SM fine-tunings** :

** **Strong CP problem**

*** **Hierarchy problem**

*** **Flavour puzzle** → **CP**

Network(s) composition

-> Phenomenology: theorists and experimentalists

-> Particle physicists, plus astrophysicists and cosmologists

Scientists from 6 EU countries and 11 non-EU countries involved

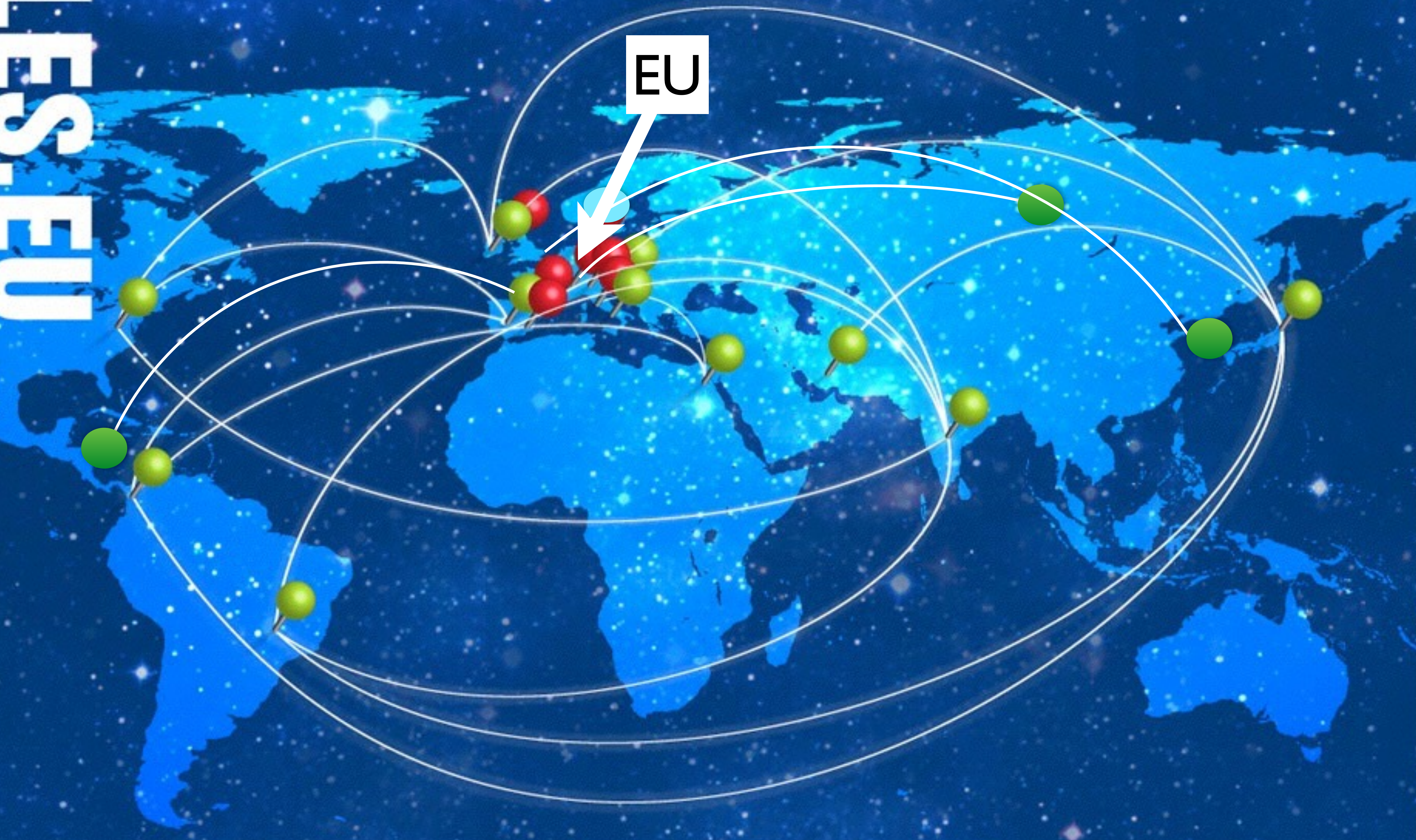
13 + 14 ~ 27 nodes

198 + 109 >> **300 scientists**

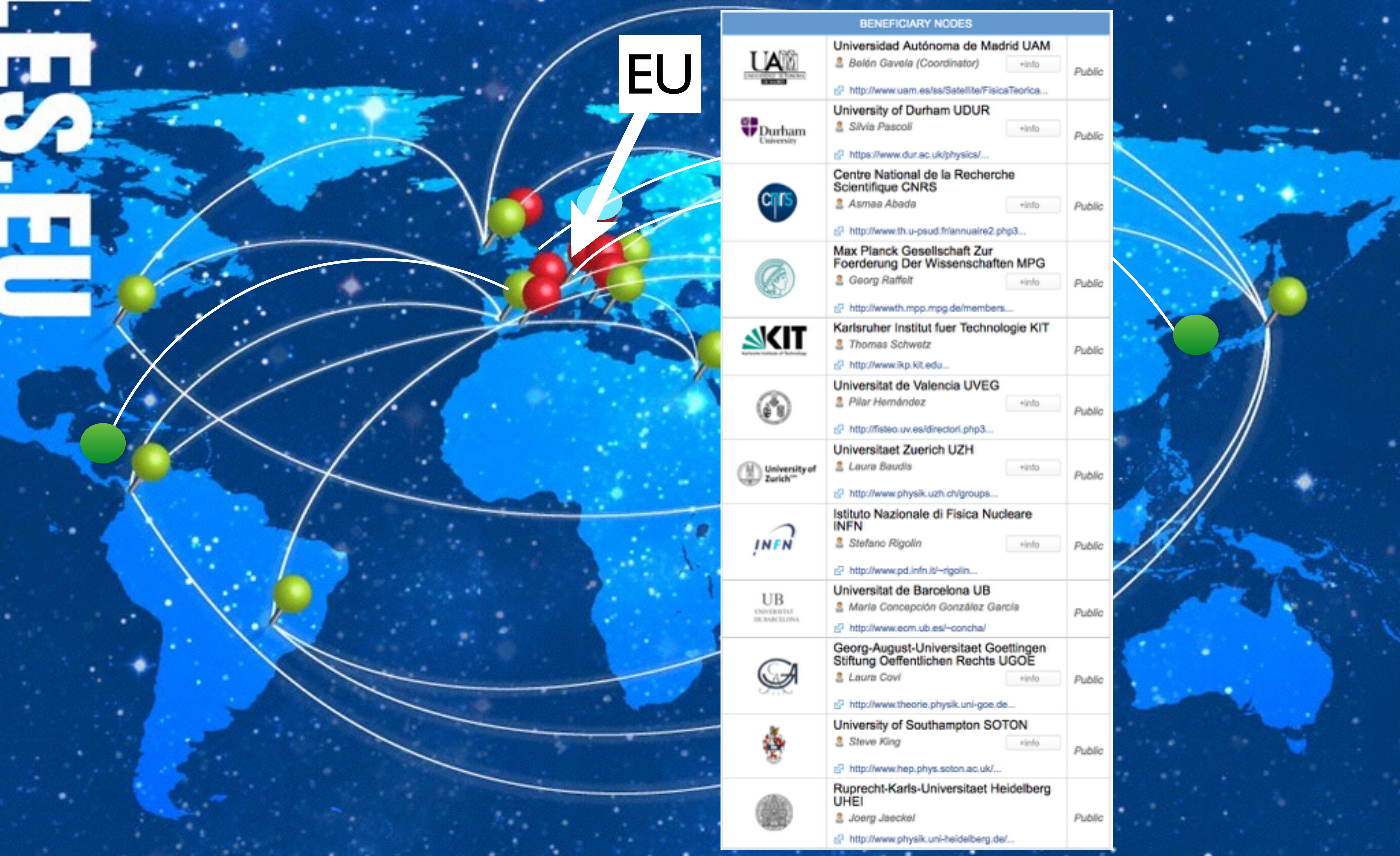
Synergy: the two networks run in parallel for:
training (ITN ELUSIVES)
and staff exchange (RISE INVISIBLESPLUS)

ELUSIVES and INVISIBLESPLUS

ELUSIVES and INVISIBLESPLUS



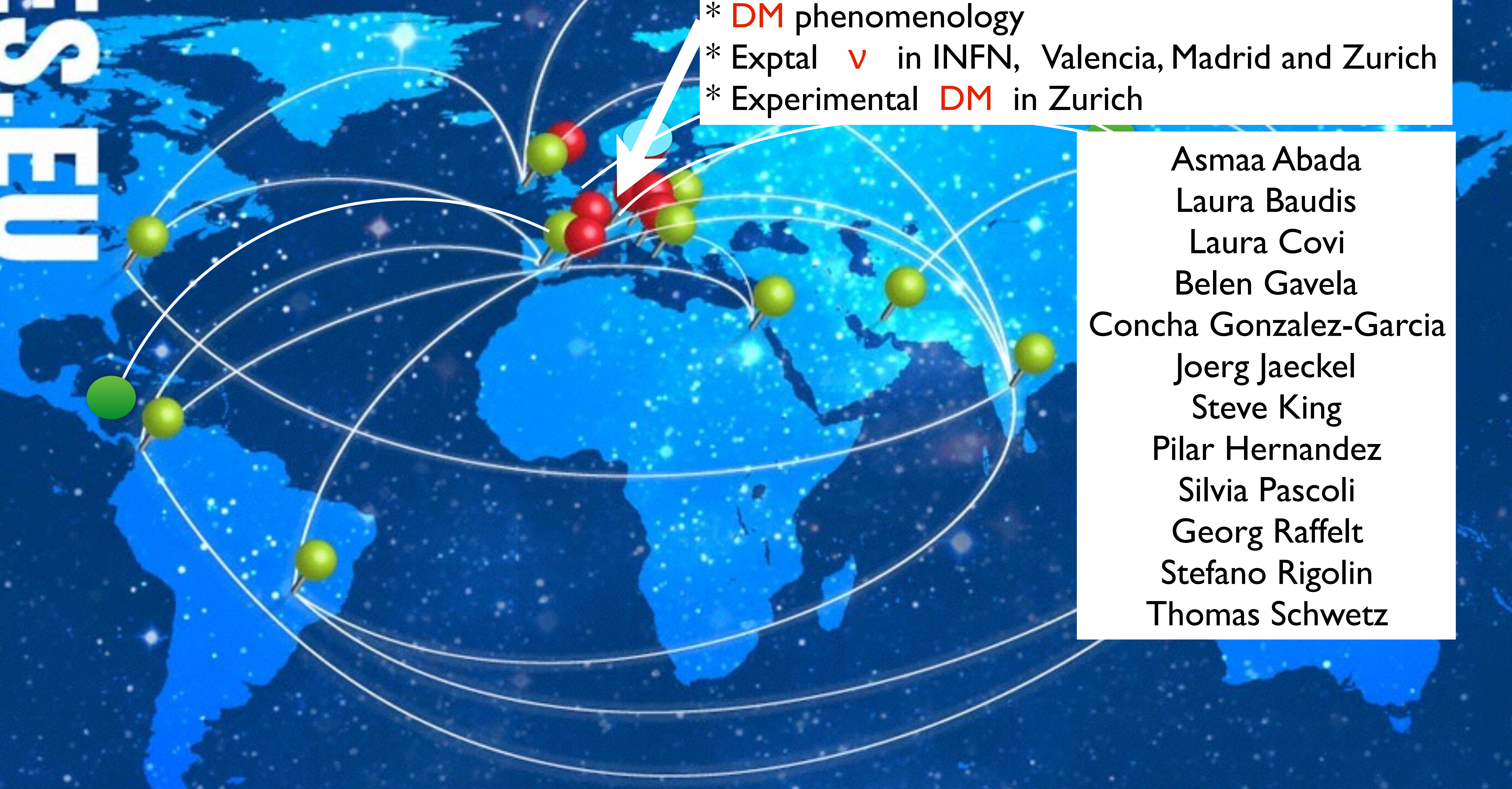
ELUSIVES and INVISIBLESPLUS



BENEFICIARY NODES		
UAM	Universidad Autónoma de Madrid UAM Belén Gavela (Coordinator) +info http://www.uam.es/ss/Satellite/FisicaTeorica...	Public
Durham University	University of Durham UDUR Silvia Pascoli +info https://www.dur.ac.uk/physics/...	Public
cnrs	Centre National de la Recherche Scientifique CNRS Asmaa Abada +info http://www.th.u-psud.fr/annuaire2.php3...	Public
	Max Planck Gesellschaft Zur Foerderung Der Wissenschaften MPG Georg Raffelt +info http://wwwth.mpp.mpg.de/members...	Public
KIT	Karlsruher Institut fuer Technologie KIT Thomas Schwetz http://www.ikp.kit.edu...	Public
	Universitat de Valencia UVEG Pilar Hernández +info http://fisteo.uv.es/directori.php3...	Public
University of Zurich	Universitaet Zuerich UZH Laura Baudis +info http://www.physik.uzh.ch/groups...	Public
INFN	Istituto Nazionale di Fisica Nucleare INFN Stefano Rigolin +info http://www.pd.infn.it/~rigolin...	Public
UB Universitat de Barcelona	Universitat de Barcelona UB María Concepción González García http://www.ecm.ub.es/~concha/	Public
	Georg-August-Universitaet Goettingen Stiftung Oeffentlichen Rechts UGOE Laura Covi +info http://www.theorie.physik.uni-goe.de...	Public
	University of Southampton SOTON Steve King +info http://www.hep.phys.soton.ac.uk/...	Public
	Ruprecht-Karls-Universitaet Heidelberg UHEI Joerg Jaeckel http://www.physik.uni-heidelberg.de/...	Public

ELUSIVES and INVISIBLESPLUS

EUROPE:
* Lots of ν phenomenology
* DM phenomenology
* Exptal ν in INFN, Valencia, Madrid and Zurich
* Experimental DM in Zurich



Asmaa Abada
Laura Baudis
Laura Covi
Belen Gavela
Concha Gonzalez-Garcia
Joerg Jaeckel
Steve King
Pilar Hernandez
Silvia Pascoli
Georg Raffelt
Stefano Rigolin
Thomas Schwetz

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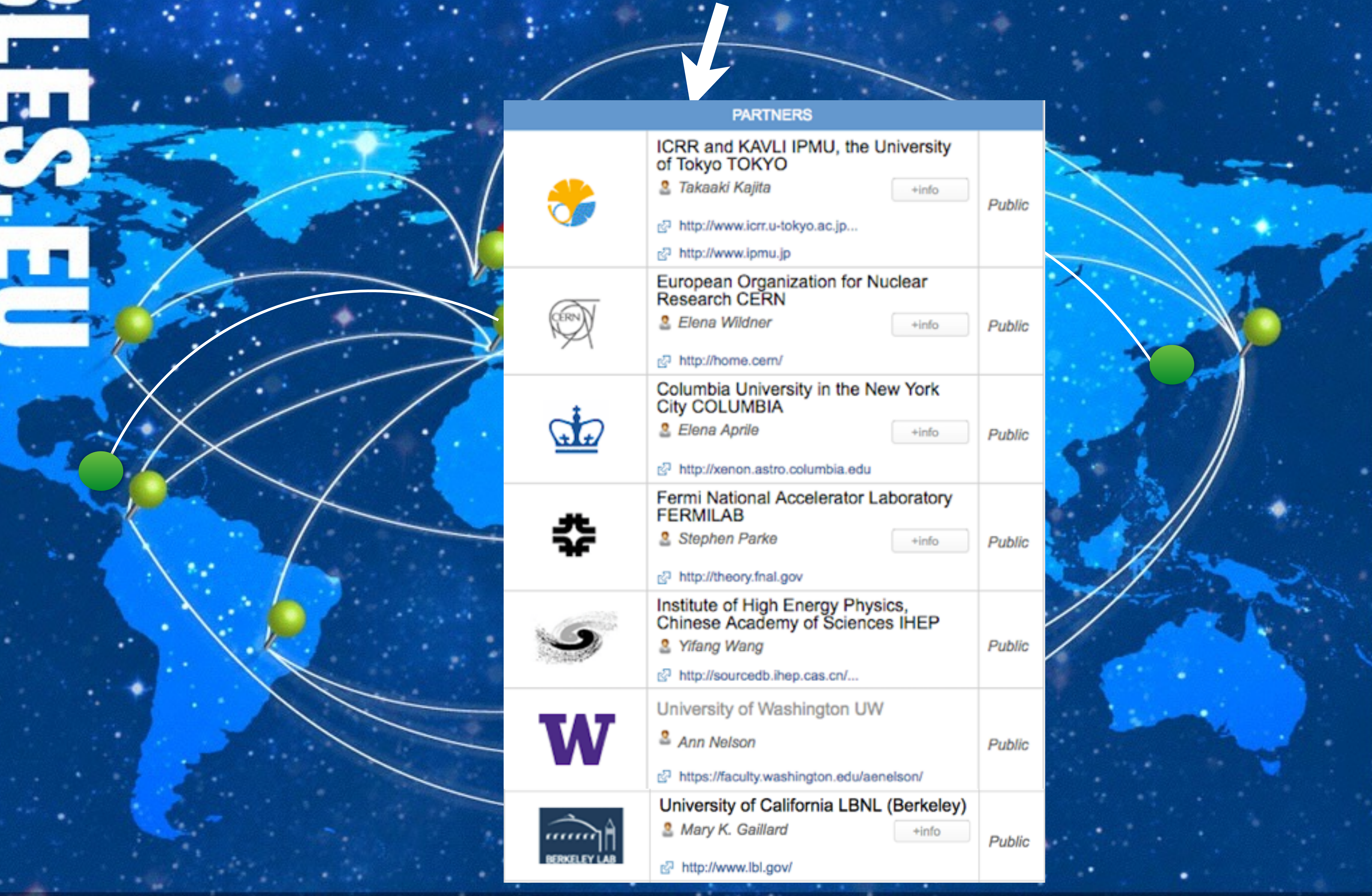
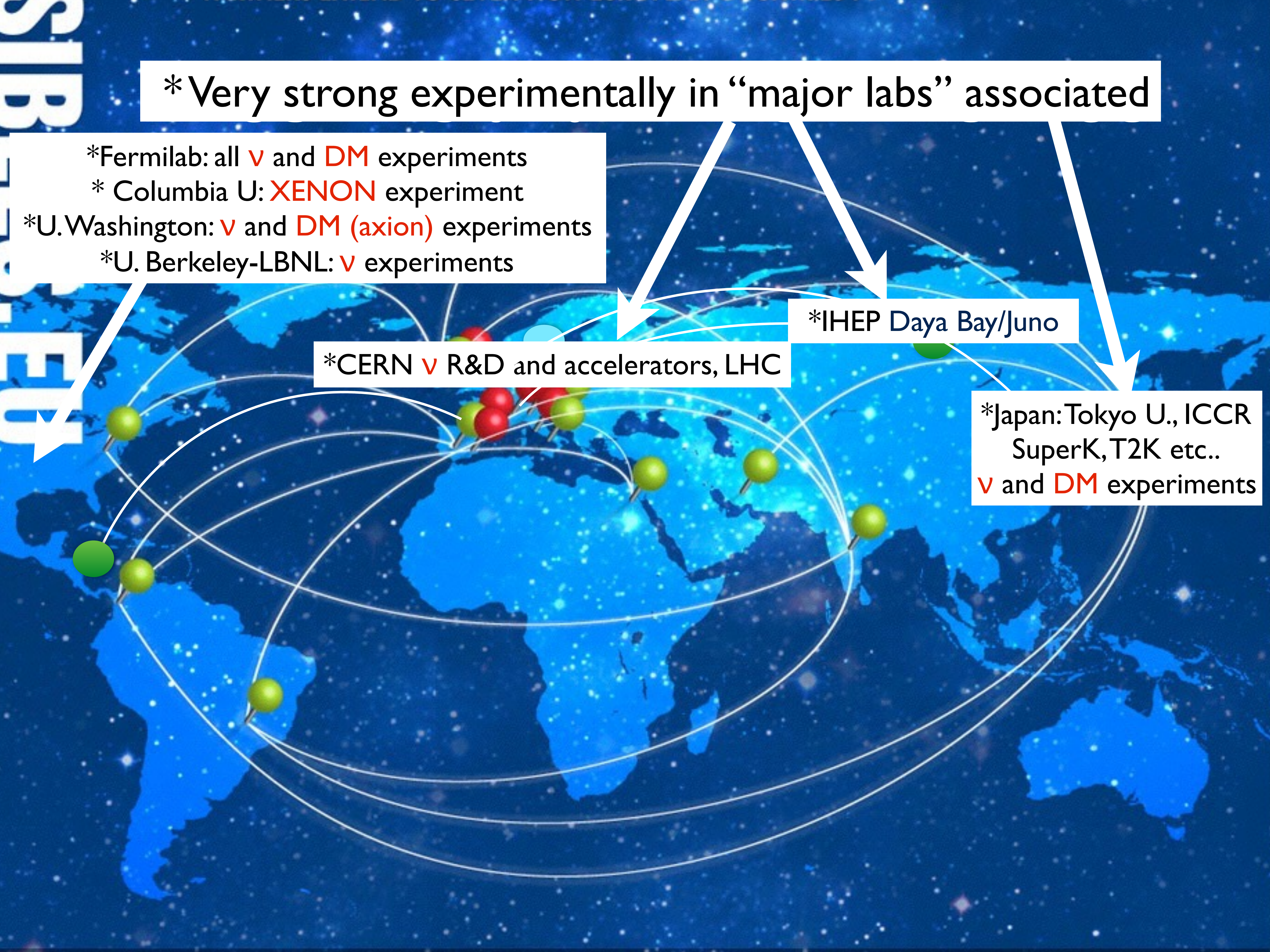
Georg Raffelt
Stefano Rigolin
Thomas Schwetz

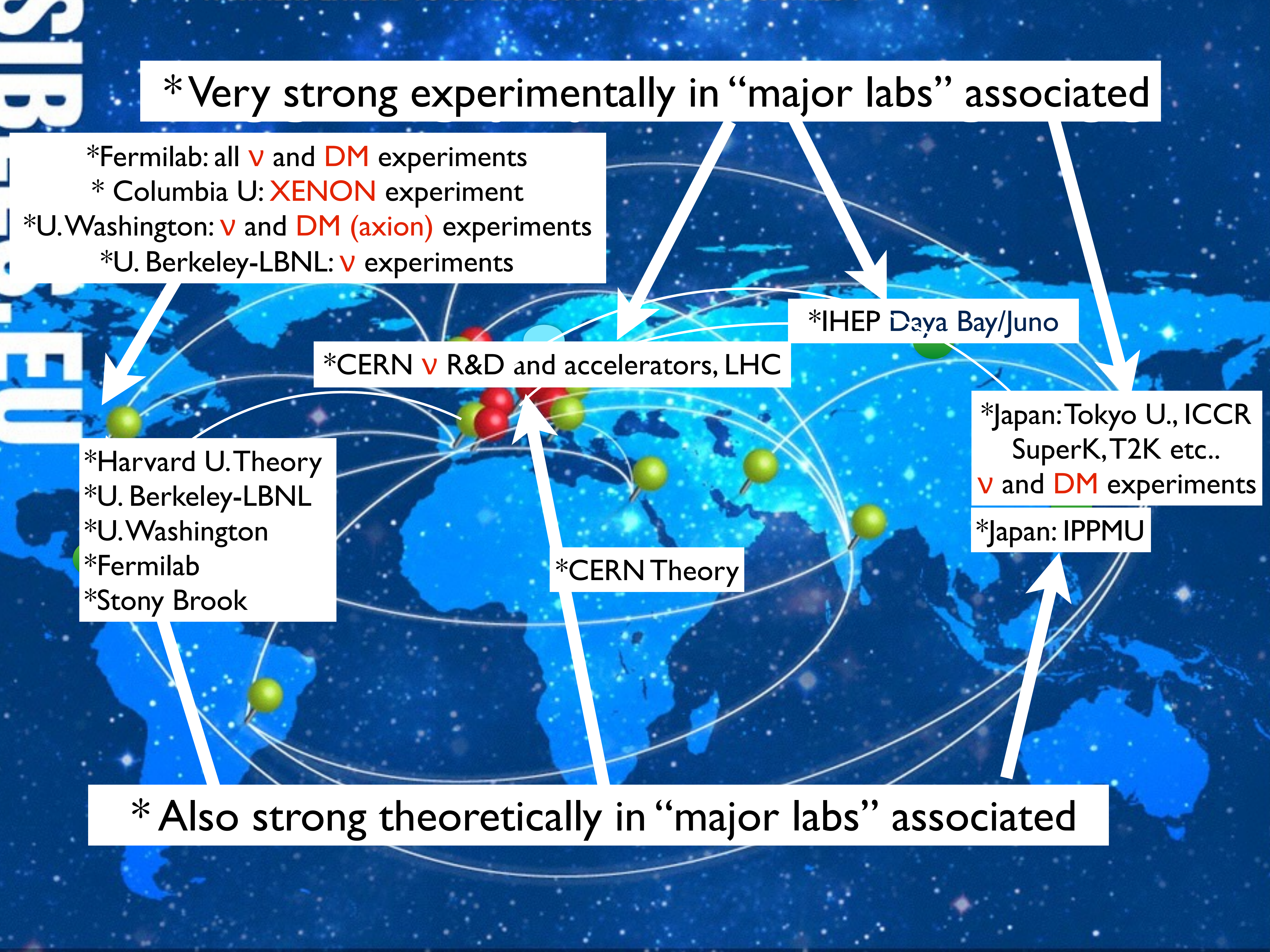
Olga Mena (CSIC)
Marzio Nessi (CERN)

*Very strong experimentally in “major labs” associated



PARTNERS		
	ICRR and KAVLI IPMU, the University of Tokyo TOKYO Takaaki Kajita +info http://www.icrr.u-tokyo.ac.jp... http://www.ipmu.jp	Public
	European Organization for Nuclear Research CERN Elena Wildner +info http://home.cern/	Public
	Columbia University in the New York City COLUMBIA Elena Aprile +info http://xenon.astro.columbia.edu	Public
	Fermi National Accelerator Laboratory FERMILAB Stephen Parke +info http://theory.fnal.gov	Public
	Institute of High Energy Physics, Chinese Academy of Sciences IHEP Yifang Wang http://sourcedb.ihep.cas.cn/...	Public
	University of Washington UW Ann Nelson https://faculty.washington.edu/aenelson/	Public
	University of California LBNL (Berkeley) Mary K. Gaillard +info http://www.lbl.gov/	Public


*Very strong experimentally in "major labs" associated
*Fermilab: all ν and DM experiments
* Columbia U: XENON experiment
*U. Washington: ν and DM (axion) experiments
*U. Berkeley-LBNL: ν experiments
*IHEP Daya Bay/Juno
*CERN ν R&D and accelerators, LHC
*Japan: Tokyo U., ICCR
SuperK, T2K etc..
ν and DM experiments



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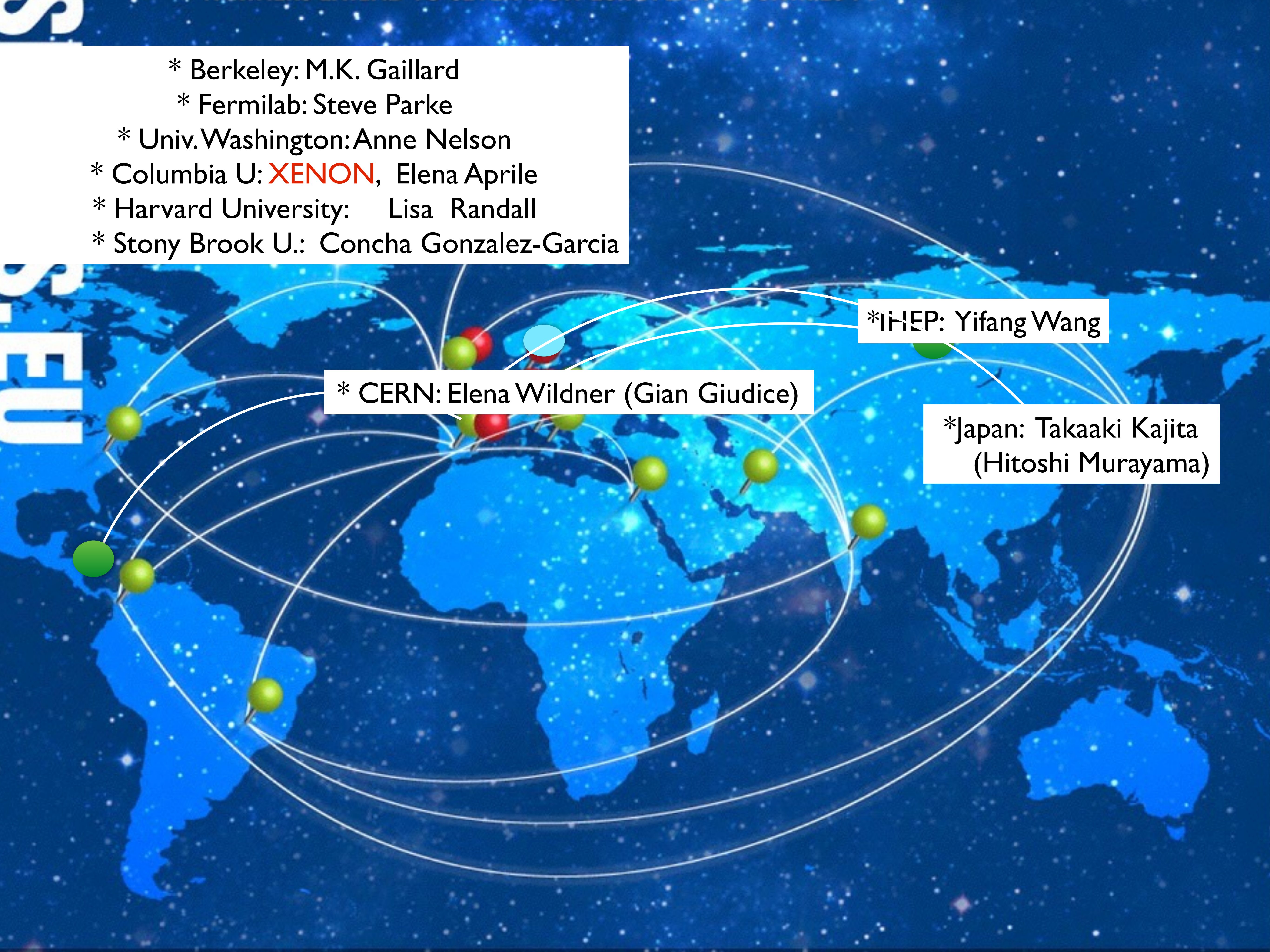
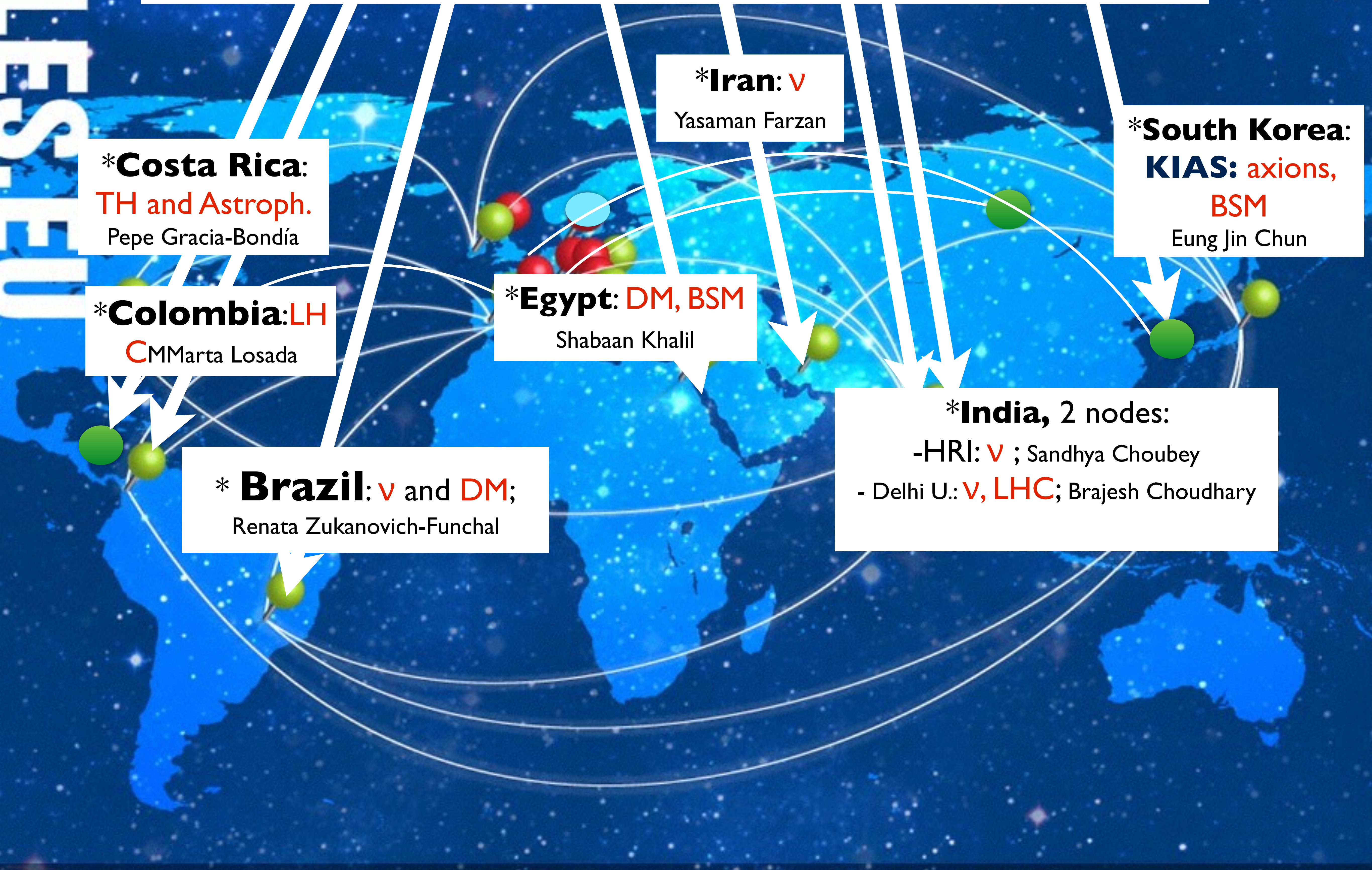
*Japan: IPPMU
*Harvard U. Theory
*U. Berkeley-LBNL
*U. Washington
*Fermilab
*Stony Brook
*CERN Theory
* Also strong theoretically in "major labs" associated


* Berkeley: M.K. Gaillard
* Fermilab: Steve Parke
* Univ. Washington: Anne Nelson
* Columbia U: XENON, Elena Aprile
* Harvard University: Lisa Randall
* Stony Brook U.: Concha Gonzalez-Garcia
*IHEP: Yifang Wang
* CERN: Elena Wildner (Gian Giudice)
*Japan: Takaaki Kajita
(Hitoshi Murayama)

Other very interesting scientific associated partners



Private sector associated partners

Hamamatsu Photonics HAMAMATSU Yuji Yoshizawa http://www.hamamatsu.com/...	Private
GMV Aerospace and Defense SA Unipersonal GMV Ana Curiel http://www.gmv.com/en/	Private
Kromek Group PLC KROMEK Max Robinson http://www.kromek.com	Private
Sissa Medialab MEDIALAB Enrico Balli http://medialab.sissa.it/...	Private
phpdocx http://www.phpdocx.com	Private
El País Patricia Fernández de Lis http://www.elpais.com	Private

Friends of Elusives and InvisiblesPlus

FRIENDS OF INVISIBLES

Membership of this group is open to organisations interested in being part of the network on an informal basis. There will be opportunities to share information, learn about project developments, workshops and activities, and to collaborate with members of our ITN.

	Albert Einstein Center for Fundamental Physics Marc Schumann http://www.einstein.unibe.ch
	Arizona State University Cecilia Lunardini http://www.cosmology.asu.edu
	Centro Atómico Bariloche Esteban Roulet http://fisica.cab.cnea.gov.ar/particulas/index.php
	Duke University Chris Walter http://neutrino.phy.duke.edu/ +info
	Heidelberg University Joerg Jaeckel http://www.thphys.uni-heidelberg.de/index.php?lang=e
	Kavli Institute for Theoretical Physics China, Institute of Theoretical Physics, Chinese Academy of Sciences Yu-Feng Zhou http://www.kitpc.ac.cn http://www.itp.cas.cn
	KTH, Sweden Mattias Blennow http://www.theophys.kth.se/tepp/ +info
	Institute of Physics, Bhubaneswar, India Sanjib Kumar Agarwalla (Assistant Professor) http://www.iopb.res.in/indexphp.php
	National Institute of Chemical Physics and Biophysics (NICPB) Martti Raidal http://coe.kbfi.ee +info
UCLA	The University of California, Los Angeles (UCLA) Graciela Gelmini http://home.physics.ucla.edu/
	The University of Edinburgh Alex Murphy http://www.ed.ac.uk +info
	Tokyo Metropolitan University Osamu Yasuda http://musashi.phys.se.tmu.ac.jp/English/index_e.html
ULB	Université Libre de Bruxelles Thomas Hambye http://www.ulb.ac.be/sciences/physth/
	University of California, Irvine Mu-Chun Chen http://www.physics.uci.edu +info
W	University of Washington Ann Nelson https://sharepoint.washington.edu/phys/Pages/default.aspx
	School of Physical Sciences, Jawaharlal Nehru University Poonam Mehta http://www.jnu.ac.in/SPS/

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The young scientists are be the major asset and the “glue” of

ELUSIVES and INVISIBLESPLUS

2019 School: June 3rd - 7th 2019

Laboratorio Subterraneo de Canfranc

in the Spanish Pyrenees

Committee chair and co-chair: Pilar Hernandez and Olga Mena

70 students accepted

Last week: 2019 at Canfranc

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Last year: 2018 School at Raitenhaslach

some speakers are becoming permanent

Last year: 2018 School at Raitenhaslach

Last week: 2019 School at Canfranc

Last week: School poster session

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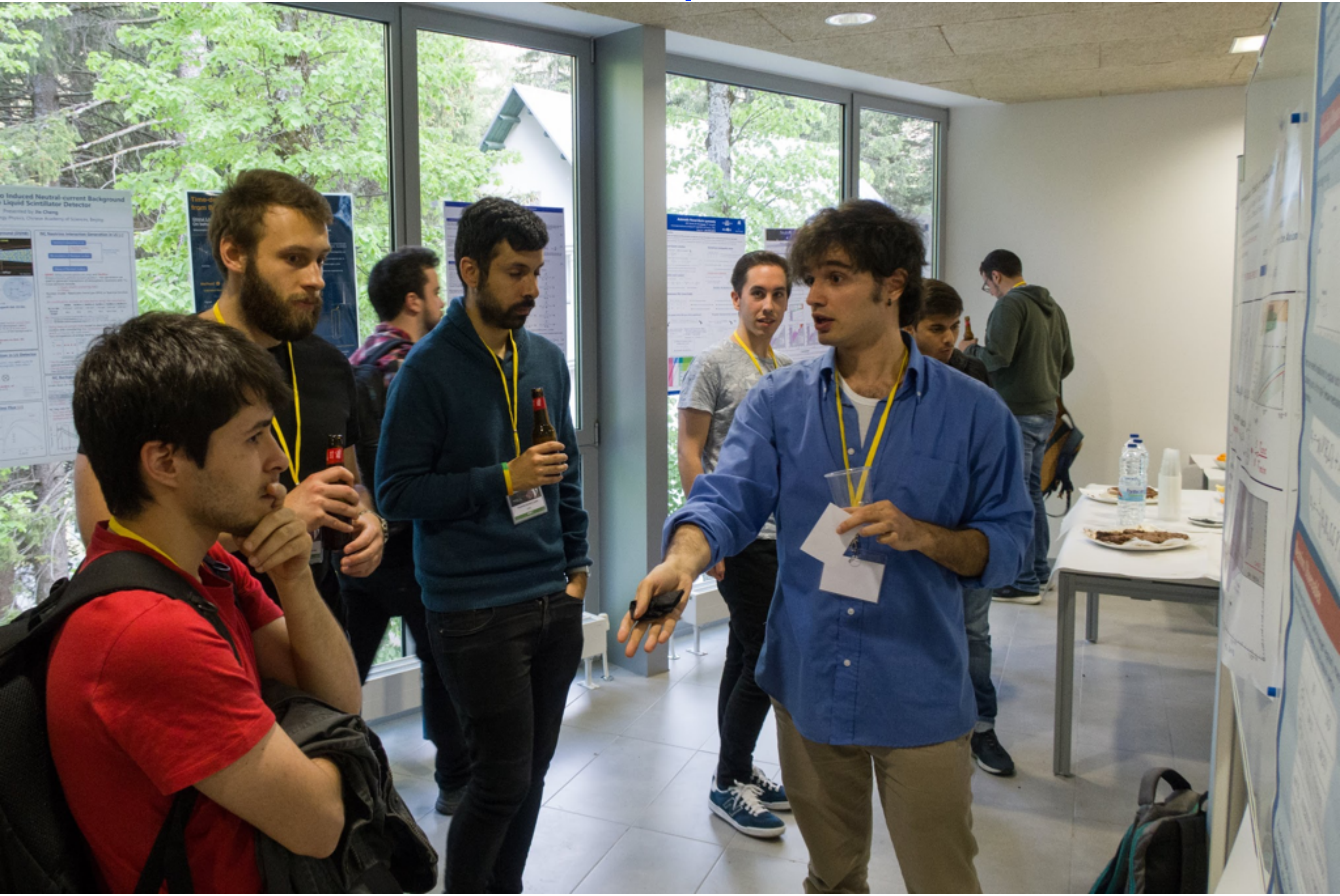
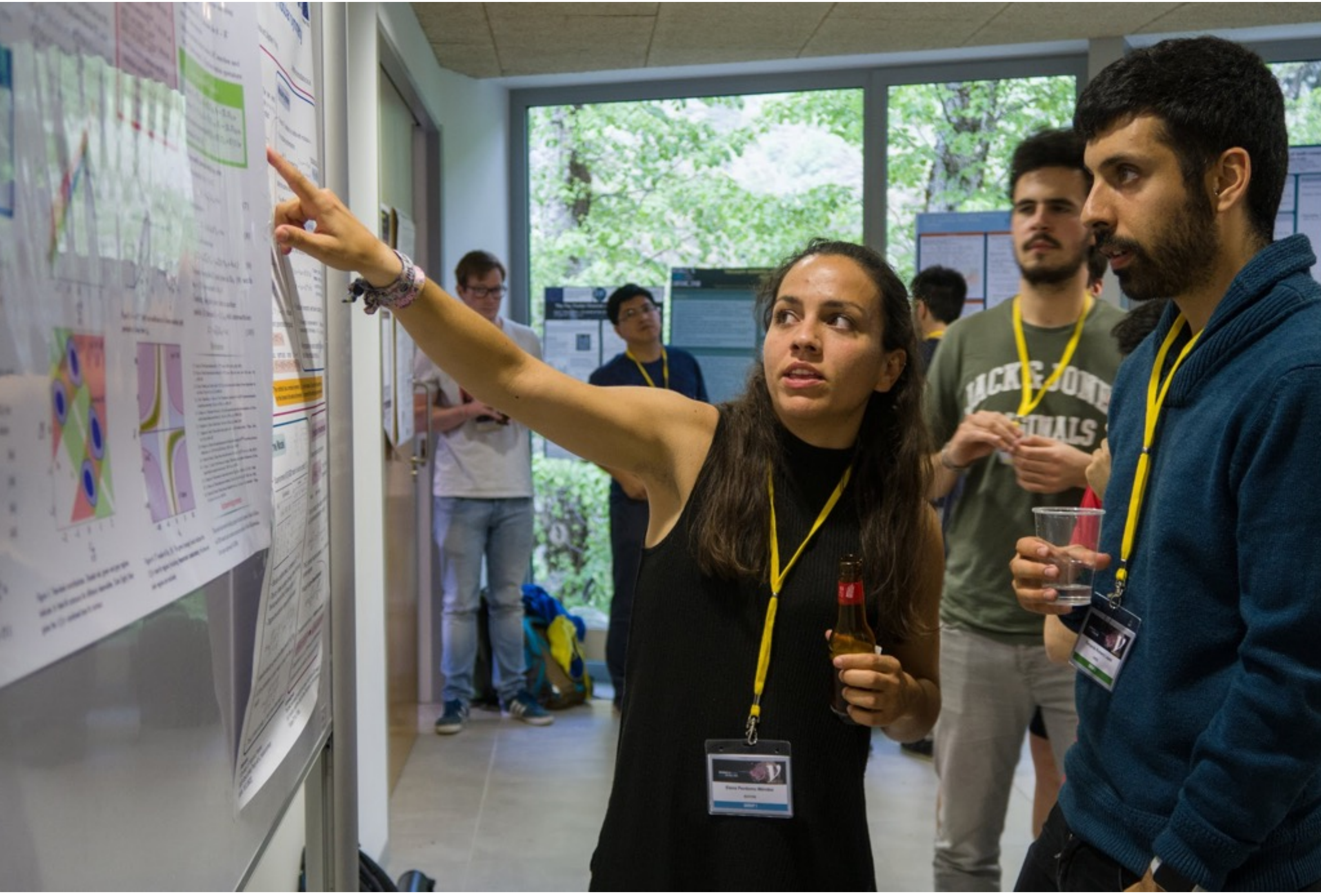


Last week: School poster session



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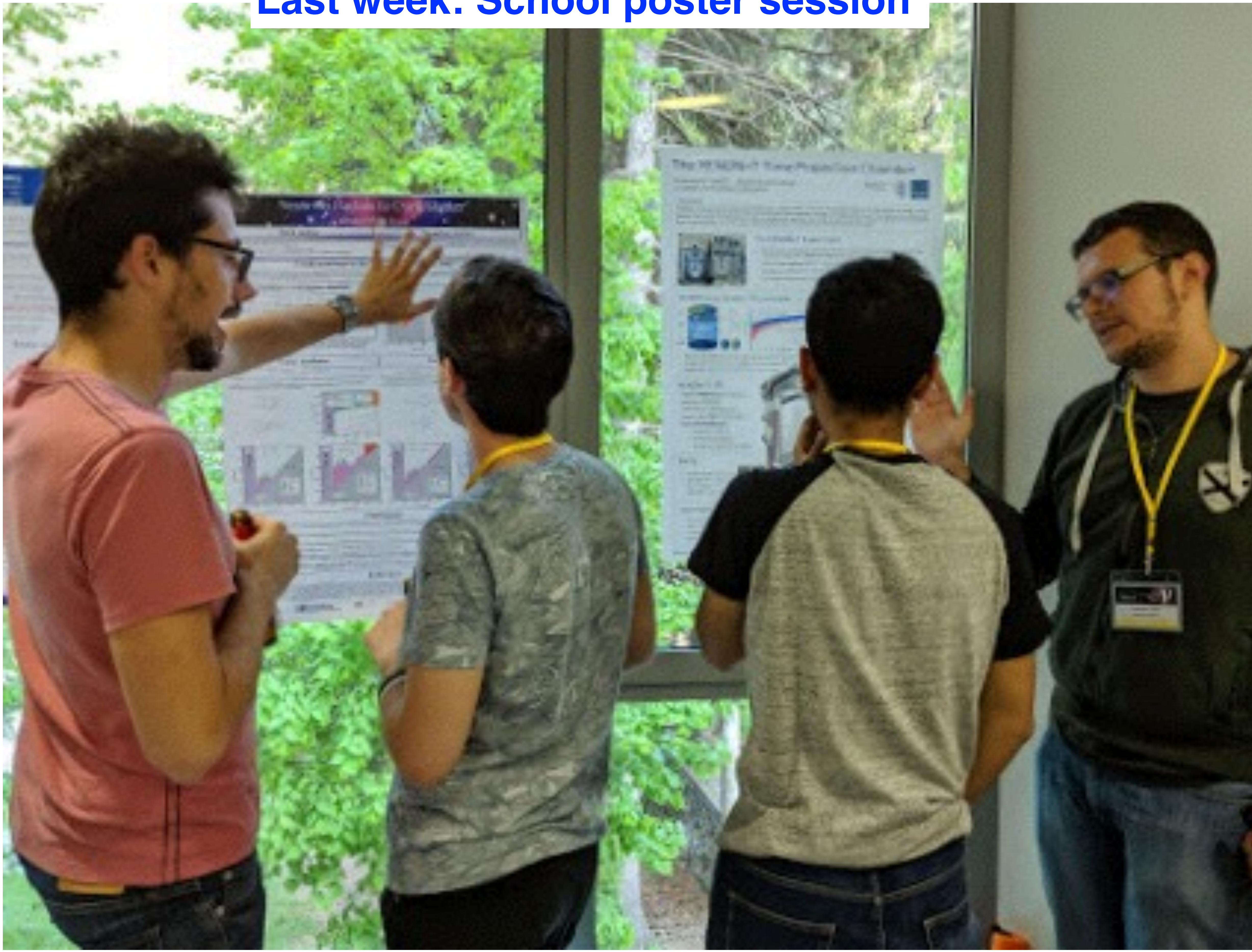


Last week: entering Canfranc underground lab

Last week: enjoying social life.. and excellent food

Canfranc vintage train station

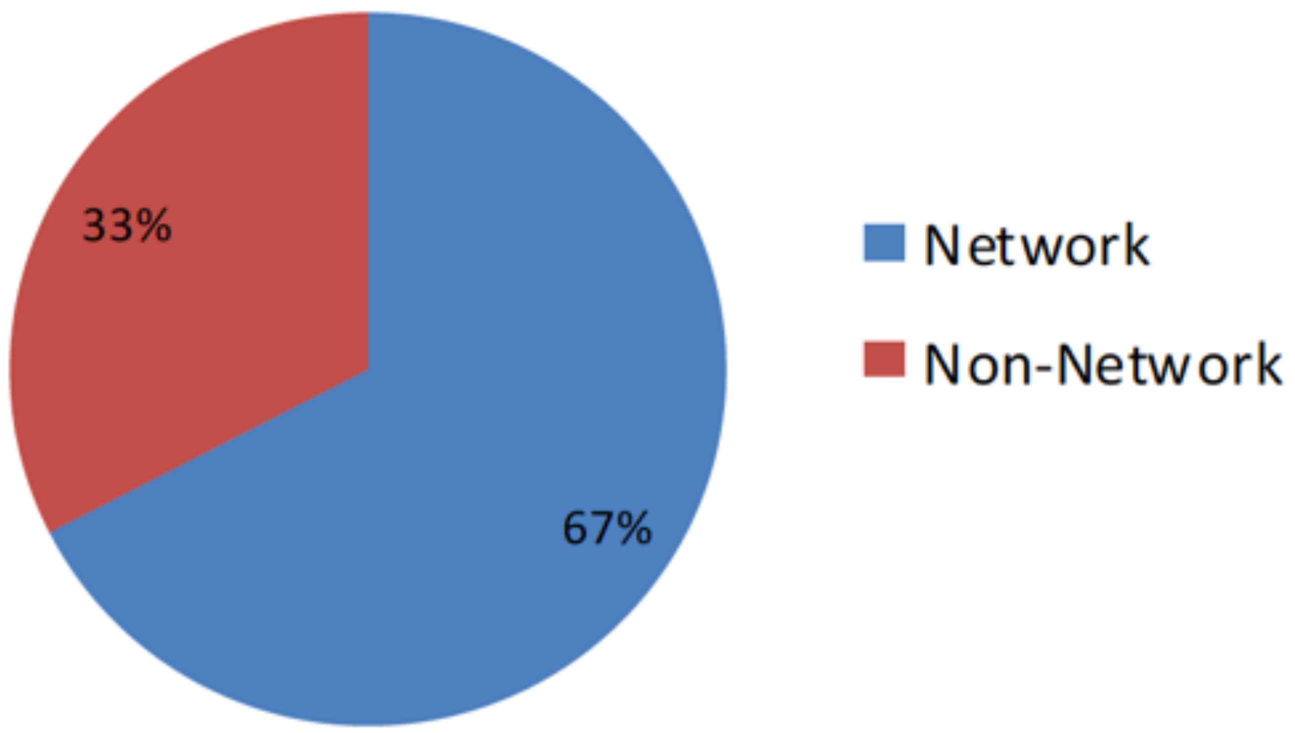
Canfranc vintage train station

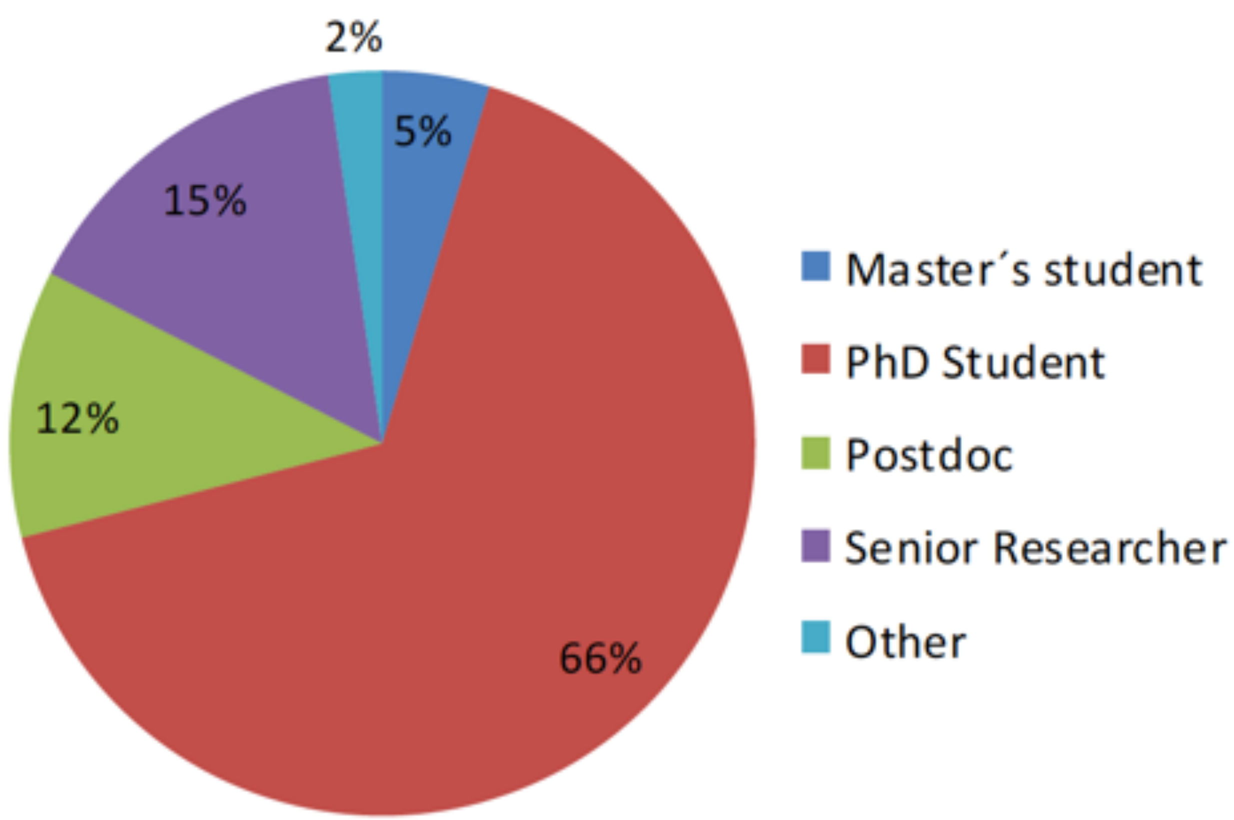
Visiting Jaca cathedral

Visiting Jaca cathedral

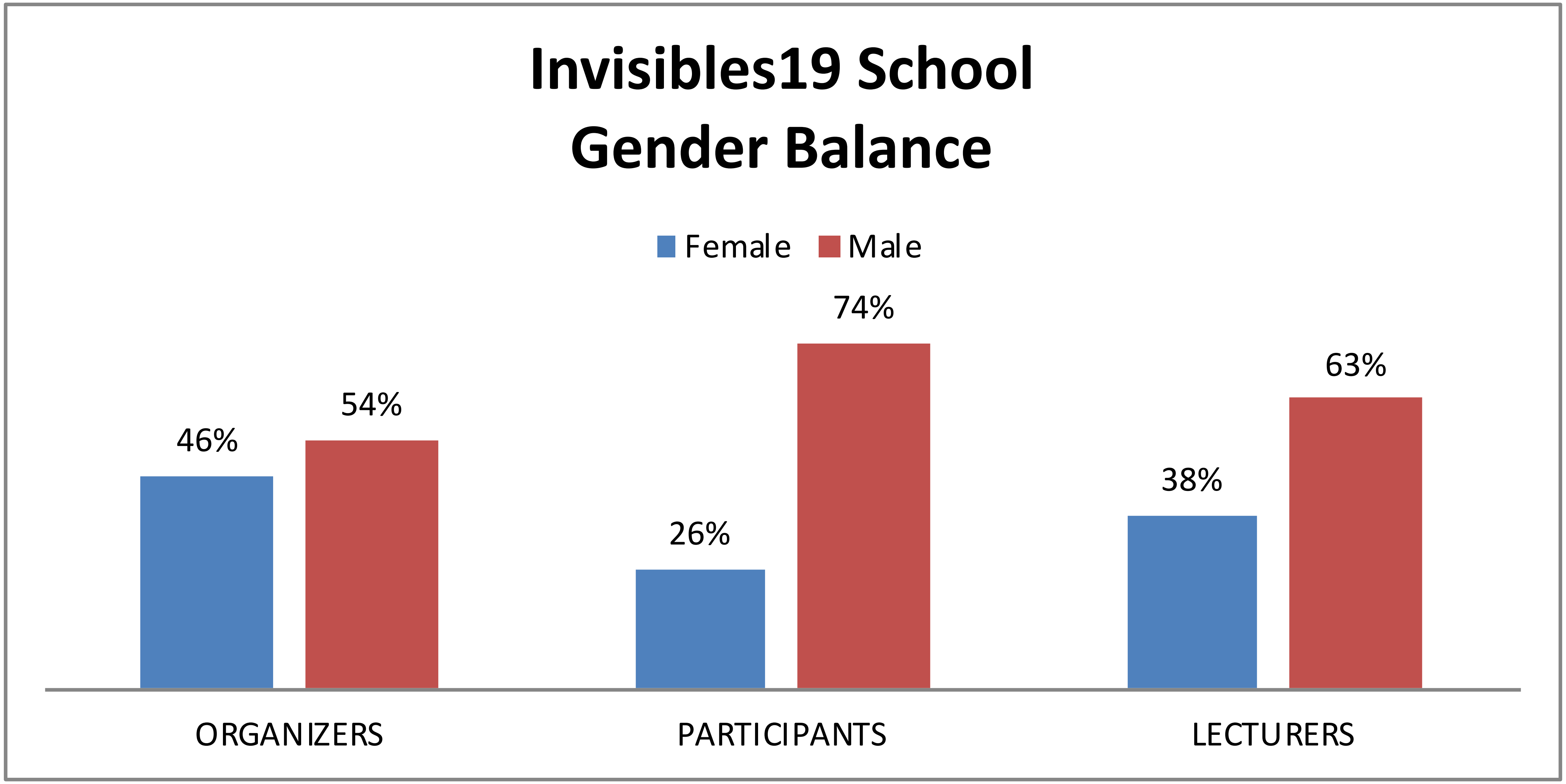
Invisibles19 School, Canfranc

18 countries represented



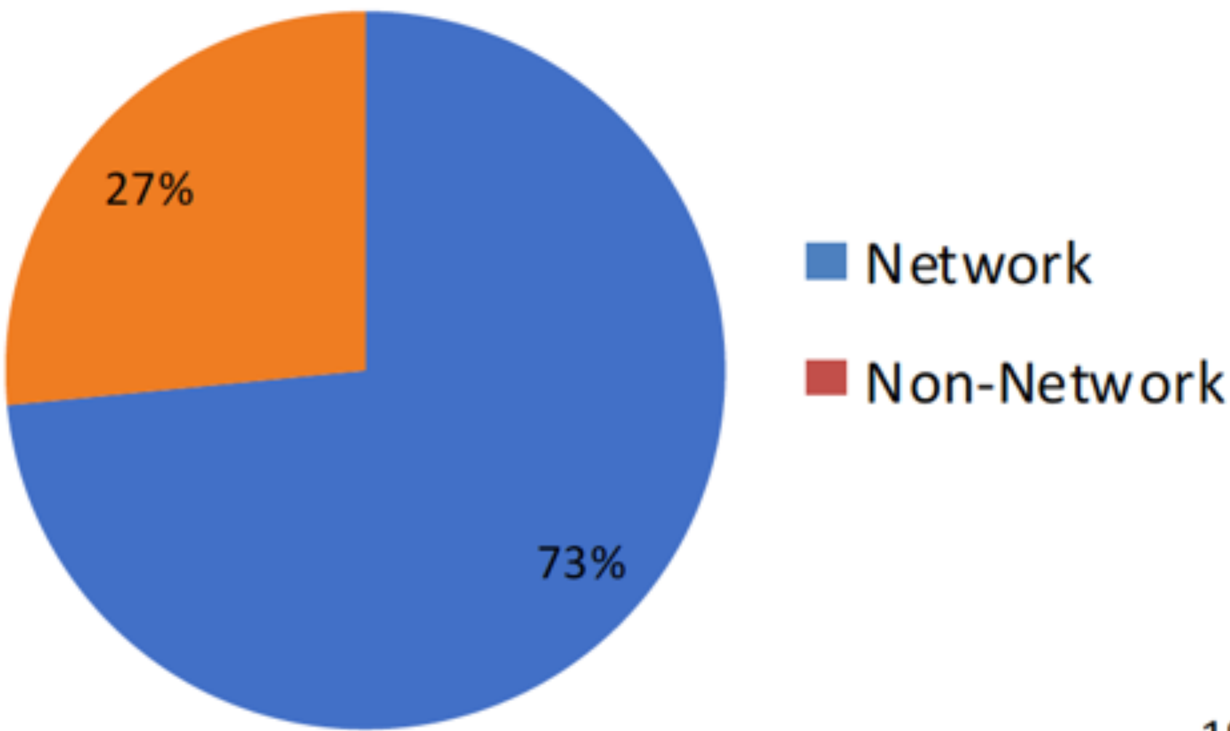


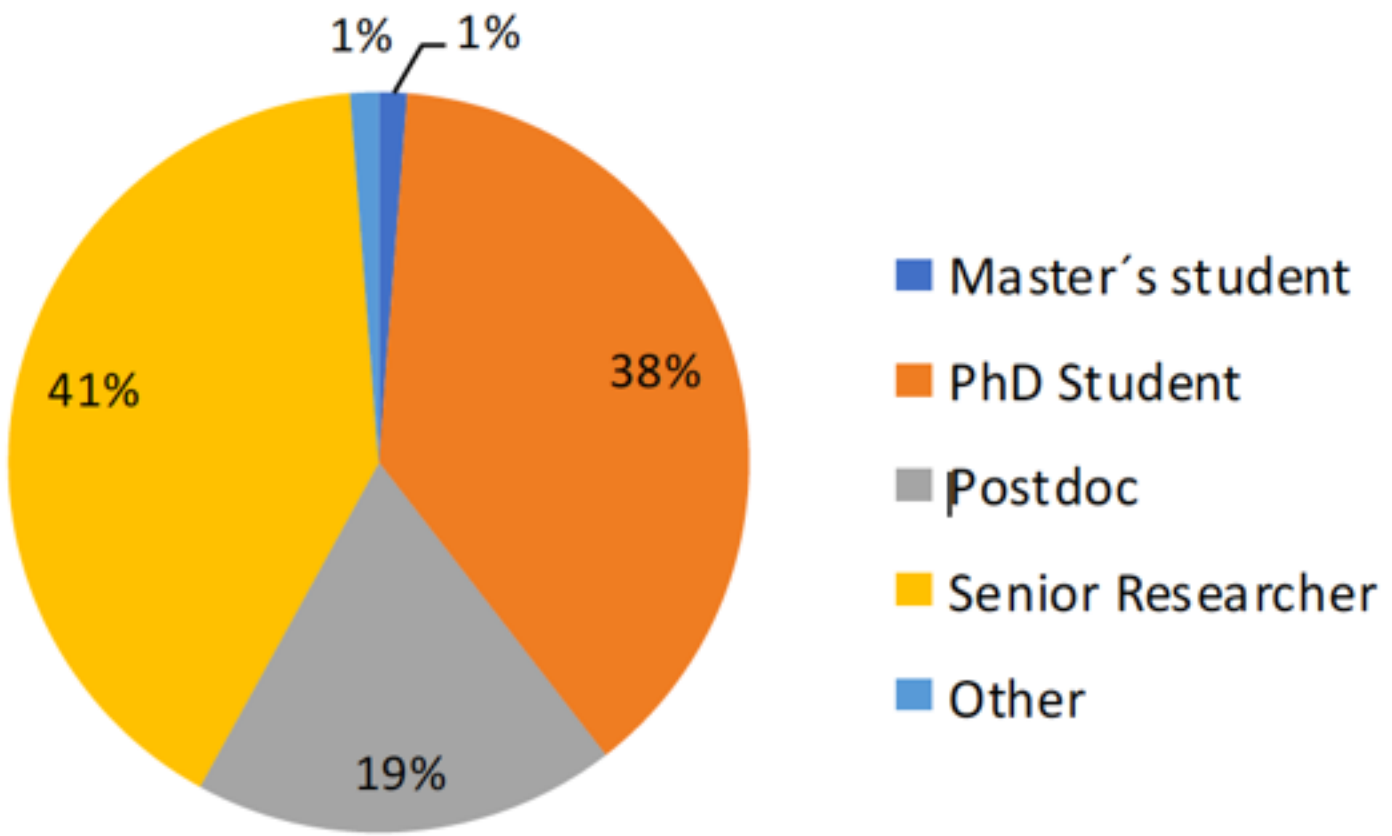
Invisibles19 School, Canfranc



Invisibles19 Workshop, Jardin Botánico, Valencia

23 countries represented





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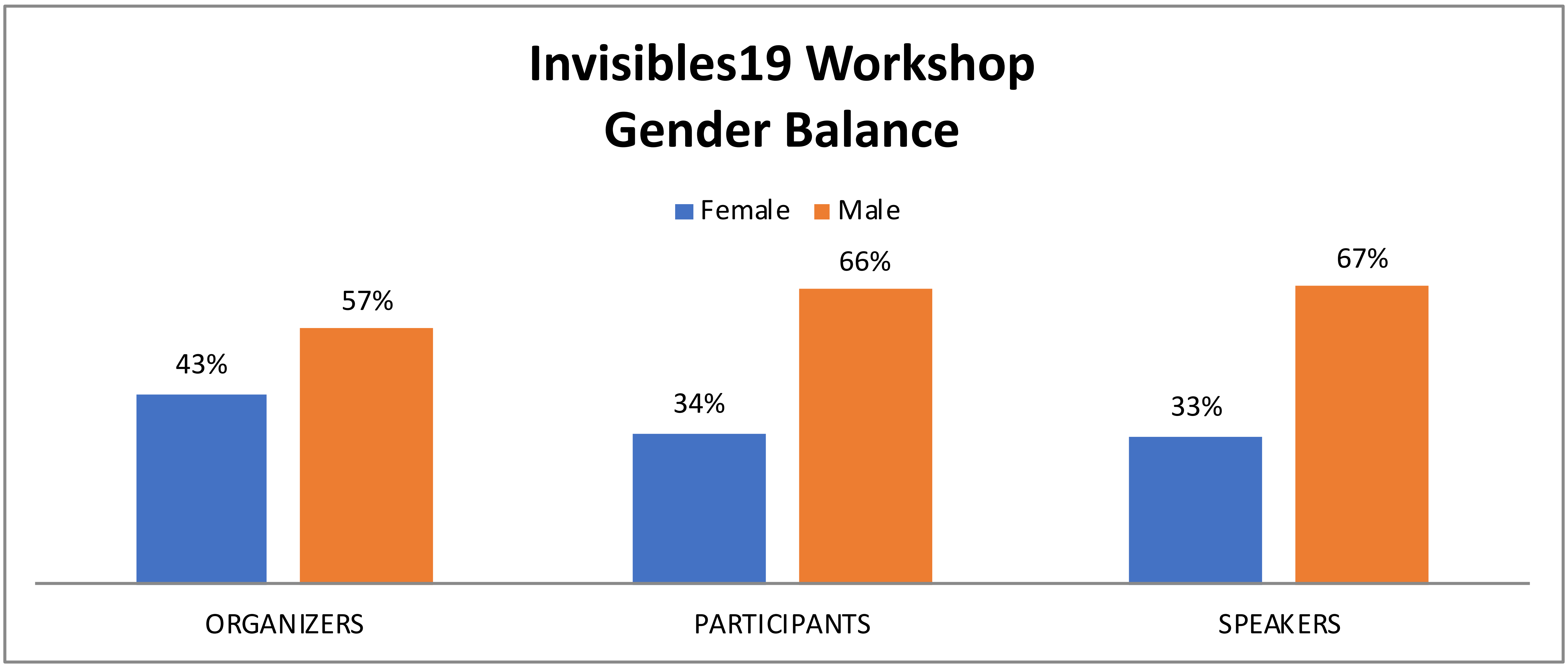

2020 Invisibles School and Workshop

temptatively in UK

nodes: SOTON (Univ. of Southampton)
and

UDUR

*** School in Southampton**

*** Workshop in Durham**

probably by mid July 2020

Chairs: Steve King and Silvia Pascoli

Thank you very much to all of you (and specially non-network members) for participating in Invisibles 2019

Let us enjoy the physics!

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