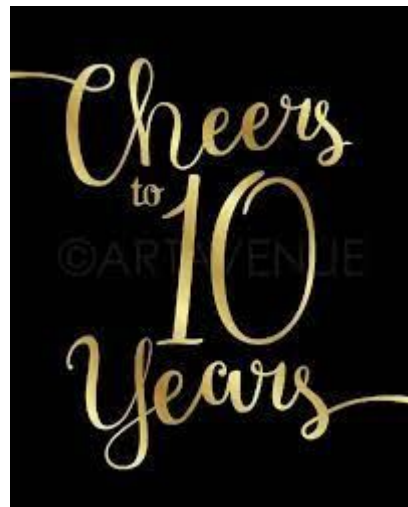


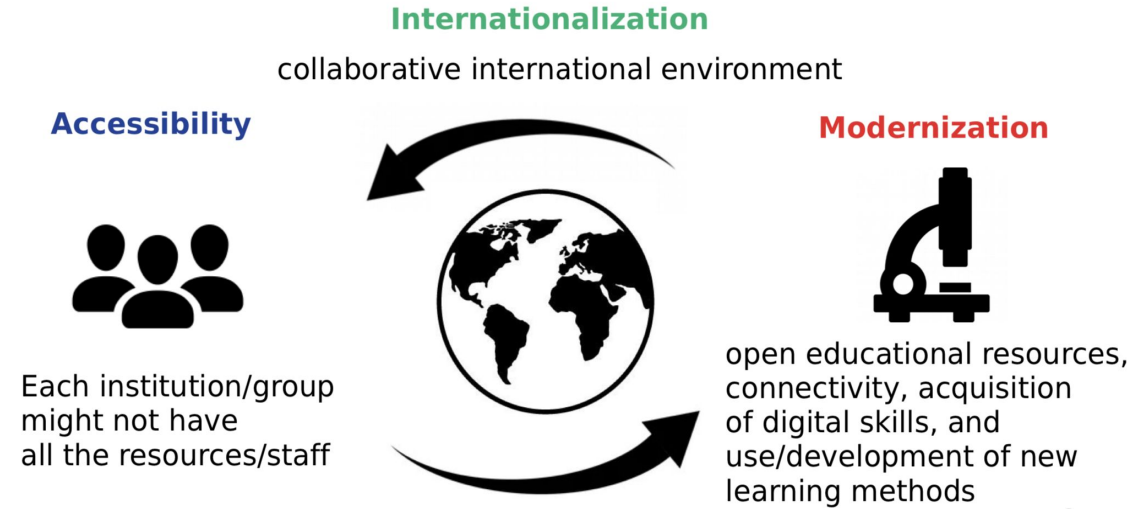
High energy physics across Latin America

Reina Camacho Toro (LPNHE/CNRS)
on behalf of many people who plan, ran and supported
these activities

PWF10, November 22nd, 2022



This is a story about creating virtual research and learning networks



Sánchez, A., and Atlas Collaboration. "The CEVALE2VE case." PoS ICHEP2016 (2016) 322

Caicedo, M., et al. "Virtual research and learning communities in Latin America: The CEVALE2VE case." Interiencia 42.11 (2017): 733-738

3

And how Physics Without Frontiers has supported our efforts:

- PWF roadshows Latin America-wide (2016-2020)
- Advanced lectures on Theoretical physics (2022-2024)

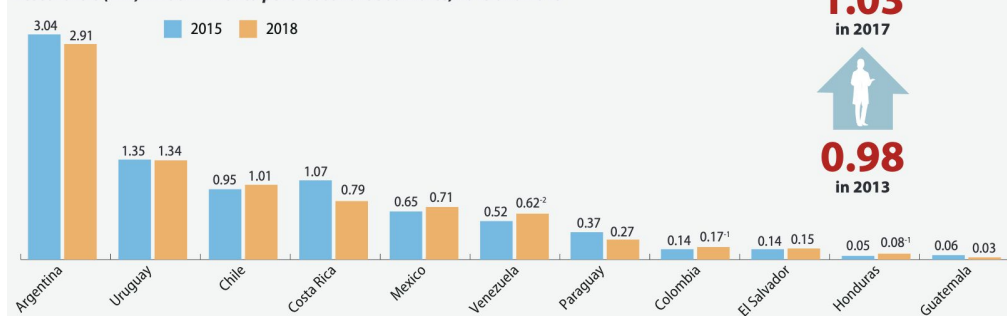
Physics in Latin America

- About 20 million square kilometers
- 33 countries
- >650 million people and around 0.001% are researchers (<10% with PhD)
- <0.70% of GDP spent in science in average
- Solid physics schools created in the 40's and 50's
- Very heterogeneous development
 - *"In addition to the economic and social development challenges that face individual countries, regional disparities in the capacity for scientific advancement"*

UNESCO Science report 2021

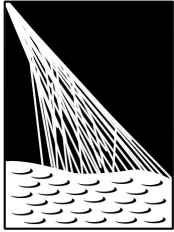
Figure 7.4: Trends in human resources in Latin America

Researchers (FTE) in Latin America per thousand labour force, 2015 and 2018



HECAP context in Latin America

High energy, cosmology and astroparticle physics community has **grown in Latin America in the last decades**



PIERRE
AUGER
OBSERVATORY



High Energy Physics
Latin American European
Network



The European Particle
physics Latin America
NETwork



Latin American Giant
Observatory



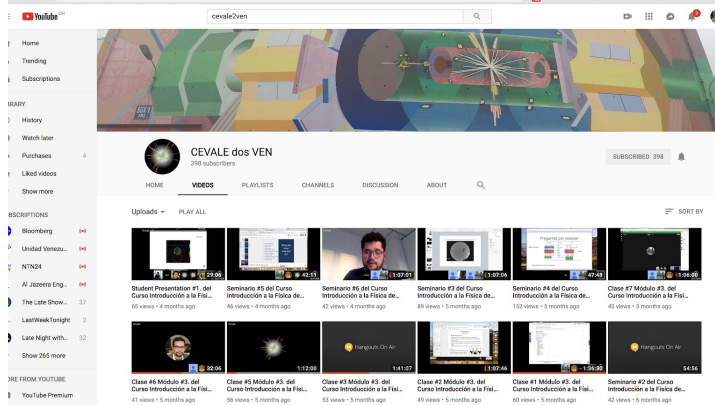
The HECAP **development is nuanced and variable country-by-country, but it has huge potential** thanks to:

- Critical mass of teachers/researchers in several universities
- Diversity of interests and skills
- A young generation with potential and eagerness to learn
- Collaborative work make us stronger

CEVALE2VE (Virtual Center of HEP Studies)



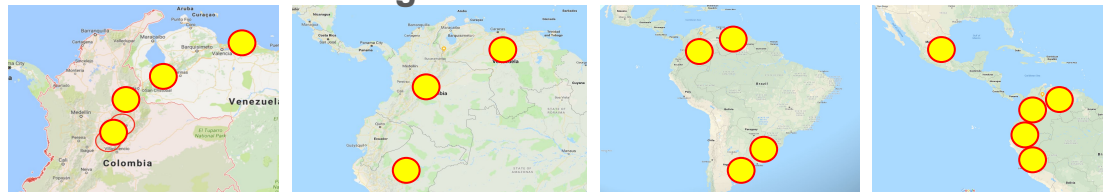
...ción de Ada Peña para la Revista Persea. Mu
colaboradores faltan en esta foto!



- **What?**
 - Promote the scientific dissemination, education and research of HEP
- **How?**
 - **4 editions of a postgraduate 60-hours course “Introduction to Particle Physics” (2014-2019)**
 - producing **>120 hours of online** audio-visual content and ~12K view of our videos...All open access
 - **+120 students** (~20 participated in international schools, 6 in master's programs and 7 in doctoral programs)
- Initially created by a group of Venezuelans doing postdoctoral studies
- Extended to institutions in Colombia and Peru. In addition, researchers from other countries such as Colombia, Ecuador and Mexico have joined as instructors. **In big part thanks to PWF**

Physics without Frontiers Latin-American roadshows

- **PWF opened the opportunity for:**
 - [Annual visits](#) to Venezuela, Colombia, Ecuador, Peru, Argentina, Uruguay, Mexico, Guatemala, Honduras, Dominican Republic
 - Seminars, conferences
 - Hands-on sessions where the students analyse LHC open data
 - Career and opportunities sessions in HEP
 - [Master thesis co-direction projects as well!](#)
- **Increased and strengthen the network and reach more students and teachers in the region**



2016

The 1st edition of the PWF-LA

The first edition took place in six institutions in five cities in Colombia and Venezuela

2017

The 2nd edition of the PWF-LA

Three countries visited: Peru, Colombia and Venezuela. Peruvian students started to follow the CEVALE2VE course

2018

The 3rd edition of the PWF-LA

Four countries visited: Argentina, Uruguay, Colombia and Venezuela.

2019

The 4th edition of the PWF-LA

Five countries visited: Ecuador, Peru, Colombia, Venezuela and Mexico.

Physics without Frontiers Latin-American roadshows



“The experience taught us the importance of working in collaboration with other researchers in the country, as well around the world, to efficiently perform this task. At the USB the students are looking forward to repeating this fascinating experience.” — Manuel Morgado (5th year physics undergrad, USB)

Physics without Frontiers Latin-American roadshows



Bucaramanga,
Colombia 2019

FÍSICA SIN FRONTERAS

EL CERN
VISITA
URUGUAY

LUNES 1 DE OCTUBRE 2018, 18 H, PARANINFORME DE LA UNIVERSIDAD DE LA REPÚBLICA, Av. 18 de Julio 1824
 MARTES 2 DE OCTUBRE 2018, 18 H, AULARIO MAJESIRA, FACULTAD DE INGENIERÍA, Herrera y Resaly 565
 "El LHC y el corazón de la materia: ¿cómo viajando con el béisbol de Wigg?"
 "Física de partículas y el LHC: ciencia y tecnología que cambia nuestra mundo"

MÉRCOLES 3 DE OCTUBRE 2018, 18:30 H, IPEP - CFE, Julio 3320
 "Noticias del viaje continuo: El LHC y el corazón de la materia"

Además actividades para estudiantes de ciencias e ingeniería y profesores de secundaria
 Más información en: bit.ly/cv2018
 Contacto: cern-uruguay@gmail.com

INVITADOS
 María Castellón es investigadora del Centro Nacional de Investigación
 Nuclear (CNIN) en el laboratorio (LHC) en el laboratorio de partículas
 física desde el 2006. Es licenciada en Física de la Universidad de los
 Andes en Bogotá, Venezuela y Doctora en Física de la Universidad
 Pierre Curie, Courmancy, Francia.

Carlos Lombardi es profesor de la Universidad Antonio Bello en
 Bogotá, Colombia y es investigador de partículas física desde el
 2006. Ha sido investigador en la Universidad de Santiago de Chile
 y en la Universidad Nacional de Córdoba.



Uruguay 2018

"At the Universidad Industrial de Santander Bucaramanga-Colombia, we have benefited a lot from the effort of CEVALE2VE team, with students from our emerging Astroparticle group participating in the two editions of their Particle and Detector Physics Course as well as the PWF program. From the lectures, the projects, and the interaction with the instructors we have profited from their first hand experience in detector physics and data analysis. We immediately applied these skills to several local projects, in particular our Muon Telescope to study volcanic inner structure in Colombia. Thanks to this group of enthusiastic and dedicated young researchers, our group has become very active in astroparticle field."

LA-CoNGA physics



Latin American alliance for
Capacity building in Advanced physics

LA-CoNGA physics

[LA-CoNGA physics website](https://laconga.physics.rrss.es/)

@lacongaphysics in RRSS

- Co-funded by the European Commission **Erasmus+**.
- **Modernization of the education system** based on:
 - Virtual learning platform
 - Remote teaching laboratories
 - Scientific and technical internships
- **Proof of concept:** one year of common and inter-institutional master's degree at LA universities.
- Initial stage: 2020-2024
- Network strengthen thanks to PWF support!



UAN
UNIVERSIDAD
ANTONIO NARIÑO



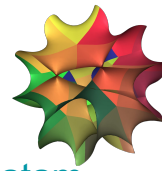
UNIVERSITÉ
TOULOUSE III
PAUL SABATIER



The Abdus Salam
International Centre
for Theoretical Physics



Advanced Lecture on Theoretical Physics



<https://pwf-ve.danielgalviz.com/>



@PhysicsLatam



@PhysicsLatam

- Project led by Daniel Galviz (YMSC-Tsinghua University, ICTS) with ICTP-PWF and Universidad de Los Andes (ULA, Venezuela)
- Series of Lectures on Theoretical Physics **For Latin American students**
- Mentor students, career opportunities



The Abdus Salam
International Centre
for Theoretical Physics
Physics Without Frontiers



UNIVERSIDAD
DE LOS ANDES
VENEZUELA

Ecuaciones de Dispersión

Los matemáticos han definido un espacio que se parece bastante. Es el espacio de todas las posibles superficies de Riemann con cuatro punturas (puntos especiales). Lo malo es que es un espacio de dimensión 1 y no dos como lo es el espacio de invariantes cinemáticos.

Fairlie-Roberts '72 (Unpublished), Gross-Mende '88, Witten '04, Fairlie '08, Makeenko-Olesen '09, F.C. '12, F.C.-He-Yuan '13

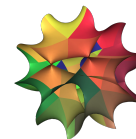
PWF-QFT
2022

ADVANCED Lectures ON THEORETICAL PHYSICS

PWF-QFT
2022

ADVANCED Lectures ON THEORETICAL PHYSICS

Advanced Lecture on Theoretical Physics



Participant List for QFT Course



Gabriel Barrios
(University of San Carlos of
Guatemala, GT)



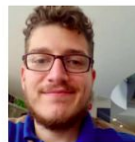
Geraldine Cabrera
(University of Colima, MX)



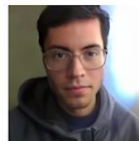
Juan Cabrera
(National Autonomous
University of Mexico, MX)



Kevin Cortés
(University of Antioquia, CO)



Salim Davila
(University of Los Andes, VE)



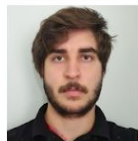
Fernando García
(Yachay Tech University, EC)



Allan Hurtado
(University of San Carlos of
Guatemala, GT)



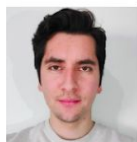
Rafael Medina
(University of Los Andes, VE)



David Ochoa
(Complutense University of
Madrid, ESP)



Goosline Pereira
(University Simón Bolívar, VE)



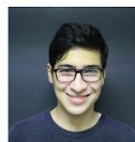
Cristian Gallegos
(Autonomous University of
Nuevo León, MX)



Jonnathan Pineda
(Yachay Tech University, EC)



Fabian Simijaca
(Federal University of Ceará,
BR)



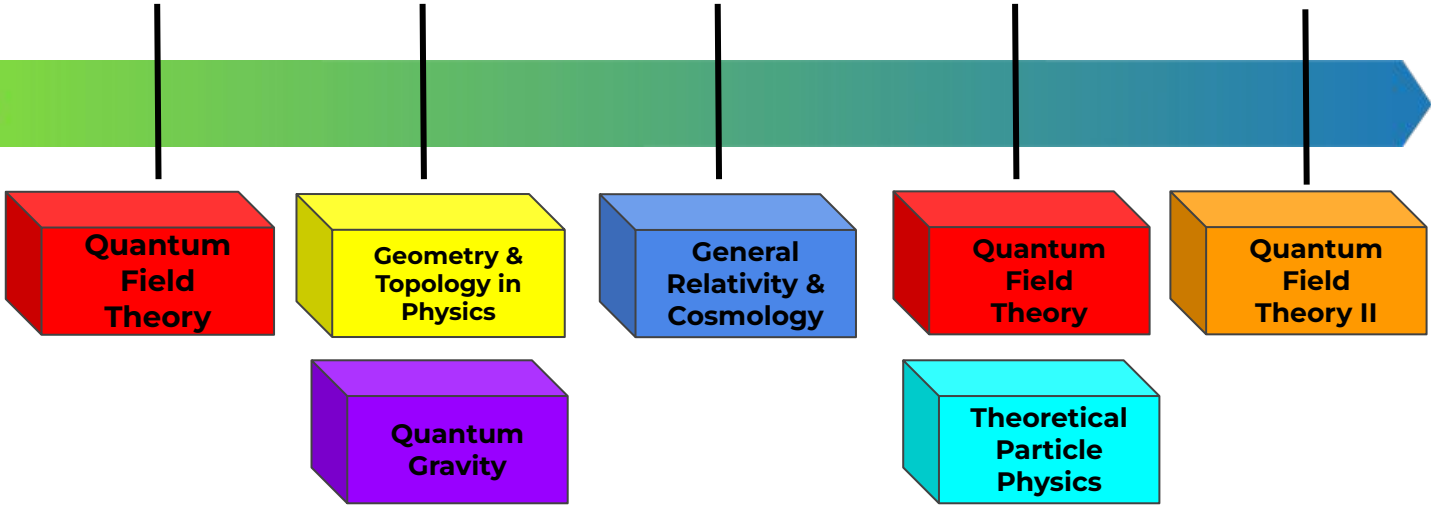
Héctor Verduzco
(University of Colima, MX)

- Great list of lectures and special guest lecturers (check the backup!)
- An effort led by enthusiastic young researchers in the field
- Courses with final exam and homeworks, therefore valid to obtain credit units in their universities

Advanced Lecture on Theoretical Physics

- Many more exciting lectures in the next months
- Mark your calendar!

Sept 2022-Feb 2023 March - July 2023 June - Sept 2023 Sept 2023 -Jan 2024 March - July 2024



Advanced Lecture on Theoretical Physics



Applications are open NOW!

<https://indico.ictp.it/event/10109/>

ICTP The Abdus Salam
International Centre
for Theoretical Physics
Physics Without Frontiers IAEA

LECTURES ON THEORETICAL PHYSICS
FOR LATIN AMERICAN STUDENTS

FROM MARCH 7TH 2023 | 10-12 (GMT-4)

Quantum Gravity

LECTURER: RUBEN CAMPOS DELGADO
BCTP (UNIVERSITÄT BONN)

The course will be taught in English
everyone interested is encouraged to apply

INTRODUCTORY MASTER CLASS

PROF. GASTON GIRIBET (NEW YORK UNIVERSITY, USA) PROF. JUAN PEDRAZA (IFT MADRID, ES)

WEBSITE:
<https://indico.ictp.it/event/9996/>

Applications until 28th February:
<https://forms.gle/mY24eyMwx6ssLhVDA>

ICTP The Abdus Salam
International Centre
for Theoretical Physics
Physics Without Frontiers IAEA

LECTURES ON THEORETICAL PHYSICS
FOR LATIN AMERICAN STUDENTS

FROM MARCH 15TH 2023 | 10-12 (GMT-4)

GEOMETRY AND TOPOLOGY IN PHYSICS

LECTURER: DANIEL GALVIZ
YMSC (Tsinghua University)
ICTS (Tata Institute of Fundamental Research)

SPECIAL GUEST LECTURERS

Prof. Anamaria Font (Central Univ. of Venezuela) Prof. Mauricio Romo (Tsinghua University)

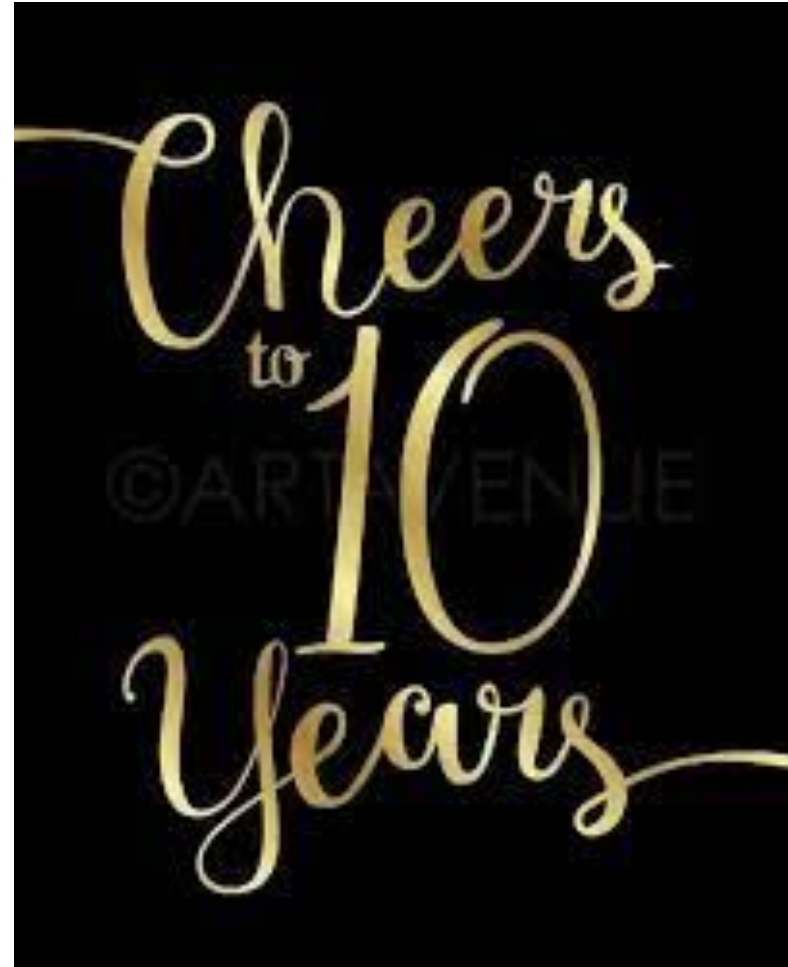
Prof. Xenia de la Ossa (University of Oxford)

Website:
<https://indico.ictp.it/event/10094/>

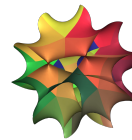
Applications until 28th February:
<https://forms.gle/fnWHX4duReopomPB9>

THANKS!

- Cheers to many more years motivating and training physics and mathematics university students worldwide
- For more networks, collaboration and interesting science!



Advanced Lecture on Theoretical Physics

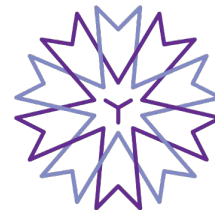


Project Coordinator & Lecturer

Daniel Galviz

YMSC (Tsinghua University)

ICTS (Tata Institute of Fundamental Research)



丘成桐数学科学中心
YAU MATHEMATICAL
SCIENCES CENTER



INTERNATIONAL
CENTRE *for*
THEORETICAL
SCIENCES

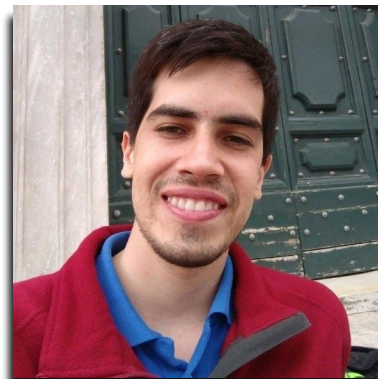
TATA INSTITUTE OF FUNDAMENTAL RESEARCH



Lecturer

Ruben Campos Delgado

(Bethe Center for Theoretical Physics & Uni Bonn, DE)



Lecturer

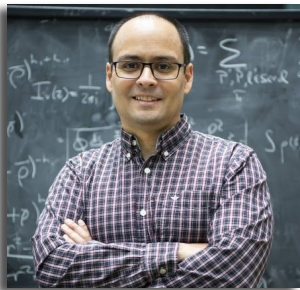
Esteban Chalbaud

LIP-Coimbra (University of Coimbra)
CERN (ATLAS)

Prof. Alejandra Castro
(University of Cambridge)



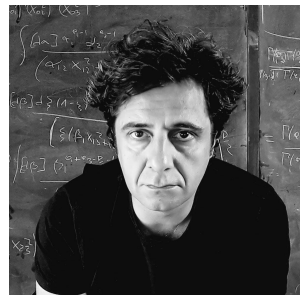
Prof. Freddy Cachazo
(Perimeter Institute, CA)



Prof. Anamaría Font
(Central Univ. of Venezuela)



Prof. Gaston Giribet
(New York University, USA)



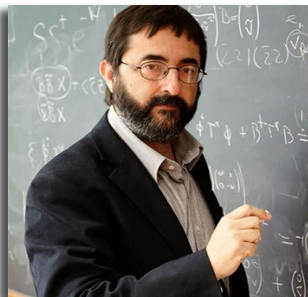
Prof. Xenia de la Ossa
(University of Oxford, UK)



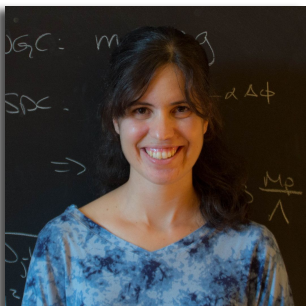
Special Guest Lecturers (World experts in their field)

And more...

Prof. Fernando Quevedo
(University of Cambridge)



Prof. Irene Valenzuela
(CERN, CH)



Prof. Mauricio Romo
(Tsinghua University)



Prof. Juan Pedraza
(IFT Madrid, ES)



Prof. Iván Contreras
(Amherst College)



PhD Student and PostDocs are also speakers

And more...

Gender balance :D



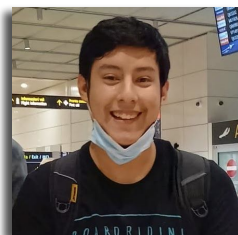
Aya Abouelela
(BCTP & Uni Bonn, DE)



Kasia Budzik
(Perimeter Institute, CA)



Iván Burbano Aldana
(UC Berkeley, USA)



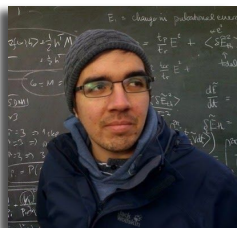
Isai Davila
(ICTP, IT)



Judith Perez
(IFT UAM-CSIC, ES)



Santiago Quintero
(Centre for Quantum
Mathematics SDU, DK)



Jonathan Lozano
(University of Baja California)



Pooja Malik
(LMU Munich & MCQST, DE)



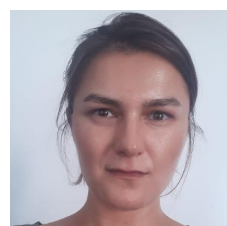
Olalla Olea
(Sorbonne University, FR)



Daniel Segal
(NASA FINESST Fellow & CU
Boulder, USA)



Carolina Cuesta-Lazaro
(AIFI (MIT) / CFA (Harvard),
USA)



Nikolina Šarčević
(Newcastle University, UK)