

Latin-American alliance for Capacity buildiNG in Advanced physics (LA-CoNGA physics): an open science education collaboration between Latin America and Europe for High Energy Physics

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on behalf of the LA-CoNGA consortium

31st International Symposium on Lepton Photon Interactions at High Energies
Melbourne, July 17-21, 2023



Latin American alliance for
Capacity building in Advanced physics
LA-CoNGA physics



Cofinanciado por el
programa Erasmus+
de la Unión Europea





Internationalization

collaborative international environment

Accessibility



Each institution/group might not have all the resources/staff



Modernization



open educational resources, connectivity, acquisition of digital skills, and use/development of new learning methods

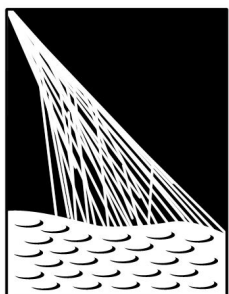
Sánchez, A., and Atlas Collaboration. "The CEVALE2VE case." PoS ICHEP2016 (2016) 322

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

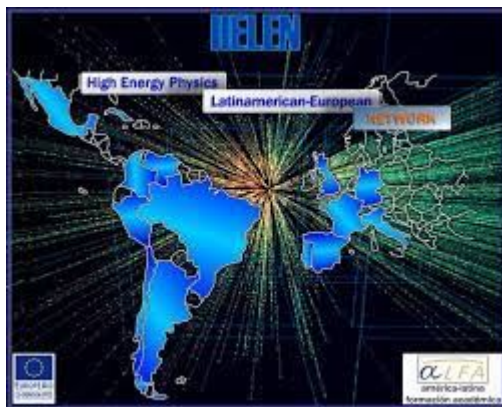


HECAP context in Latin America

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



PIERRE
AUGER
OBSERVATORY



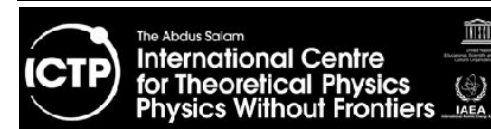
High Energy Physics
Latinamerican European Network



The European Particle
physics Latin America NETwork



Latin American Giant
Observatory



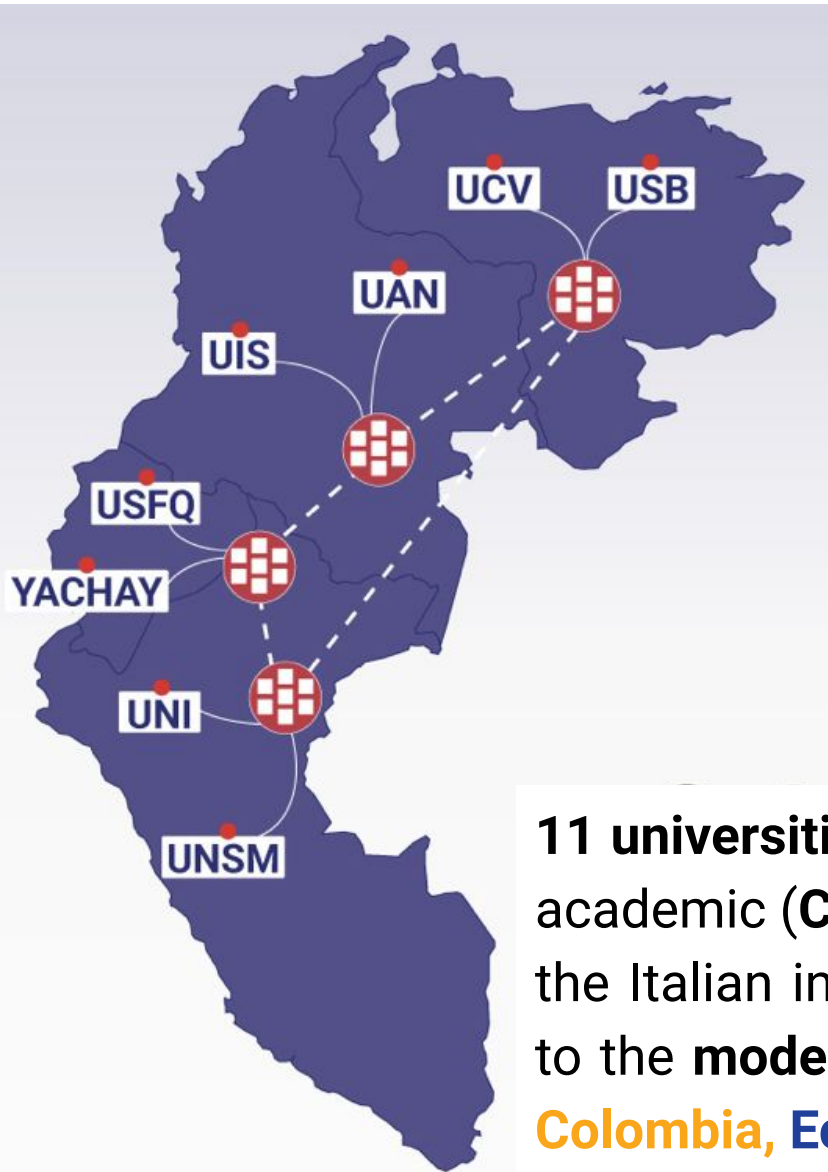
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The HECAP development is nuanced and variable country-by-country, but it has huge potential thanks to:

- 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



What is LA-CoNGA physics?



An **Erasmus+CBHE (Capacity Building in Higher Education)** project co-funded by the European Commission's Education, Audiovisual and Culture Executive Agency:

- Responding to the strategy of the participating institutions and the capacity building in higher education strategy promoted by the EU
- **Initially a 3-years project. Officially started in January 2020 (extended 1 extra year due to COVID/pandemic)**



11 universities from Latin America and Europe join efforts with other scientific and academic (**CERN, CNRS, DESY, ICTP, IRFU, RedCLARA**) and **industrial** partners (like the Italian instrumentation company CAEN & data science start-ups) to contribute to the **modernisation, accessibility and internationalisation of higher education in Colombia, Ecuador, Perú and Venezuela**



Program Partners in Europe:

- Université Paris Cité (UPC), France (Coordinator)
- Université Paul Sabatier Toulouse, France (UPS)
- Technische Universität Dresden (TUD), Germany

Program Partners in Latin America:

- Colombia : UIS (Bucaramanga), UAN (Bogotá)
- Ecuador : Yachay Tech (Ibarra), USFQ (Quito)
- Peru : UNI, UNMSM (Lima)
- Venezuela : UCV, USB (Caracas)

Associated Partners:

- International research centers: CERN and ICTP
- National research centers: CNRS (FR), CEA (FR) DESY (GE)
- Industrial partners in Latin America and Europe
- Other academic partners in the Americas





Proof of concept: methodology and tools (1/2)

- A one year specialization (Master-level) common/cross-institutional for 8 institutions in Latin America
- Worked with the participating universities to have credits recognised for the course(s) followed by students
- **Key subjects of study**, skills highly in demand inside and outside academia:
 - **Data Science**, emphasis in science reproducibility. Exercices based on open-access datasets
 - **Instrumentation**
 - **Theory**, a common conceptual field theory framework and two streams: High Energy Physics and Complex Systems

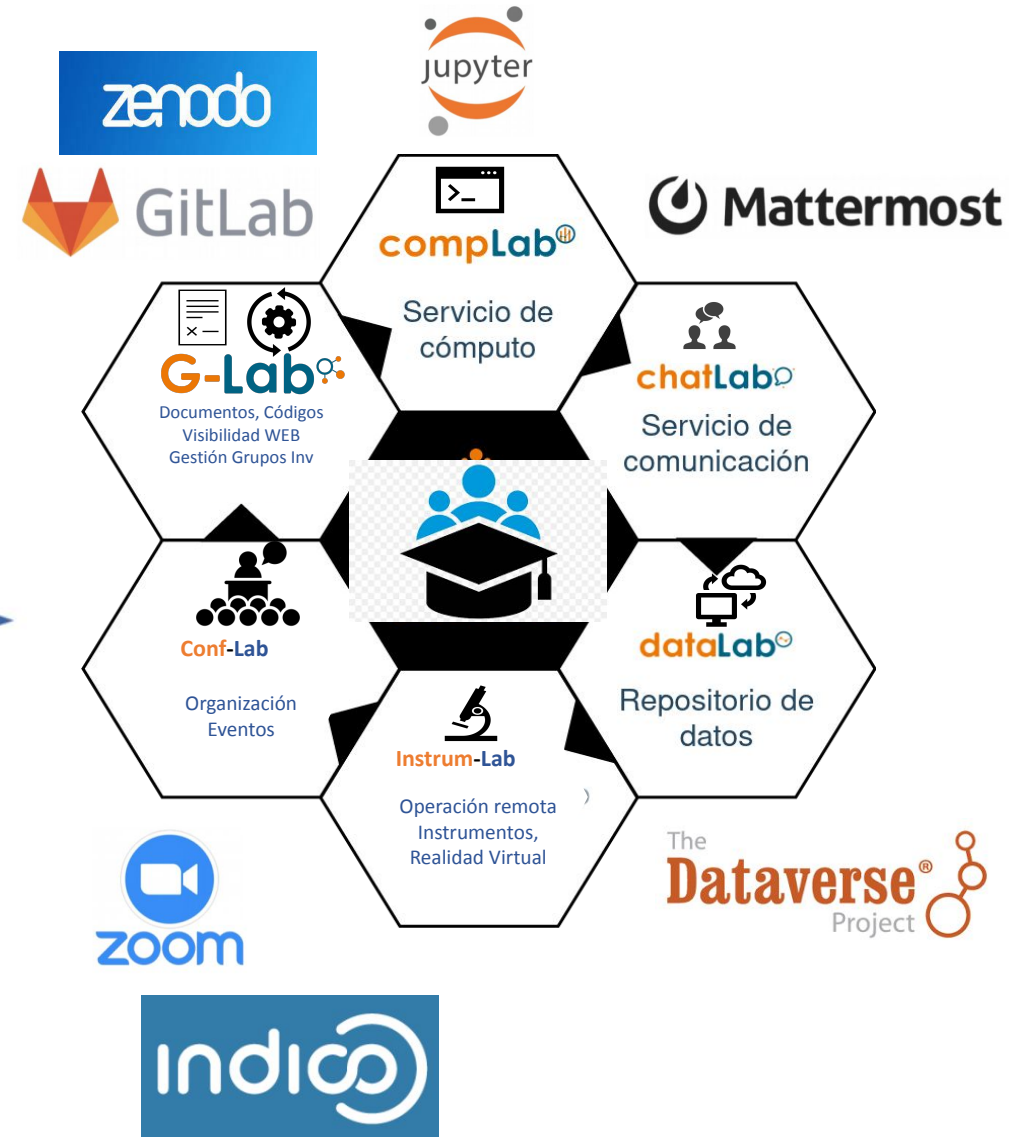
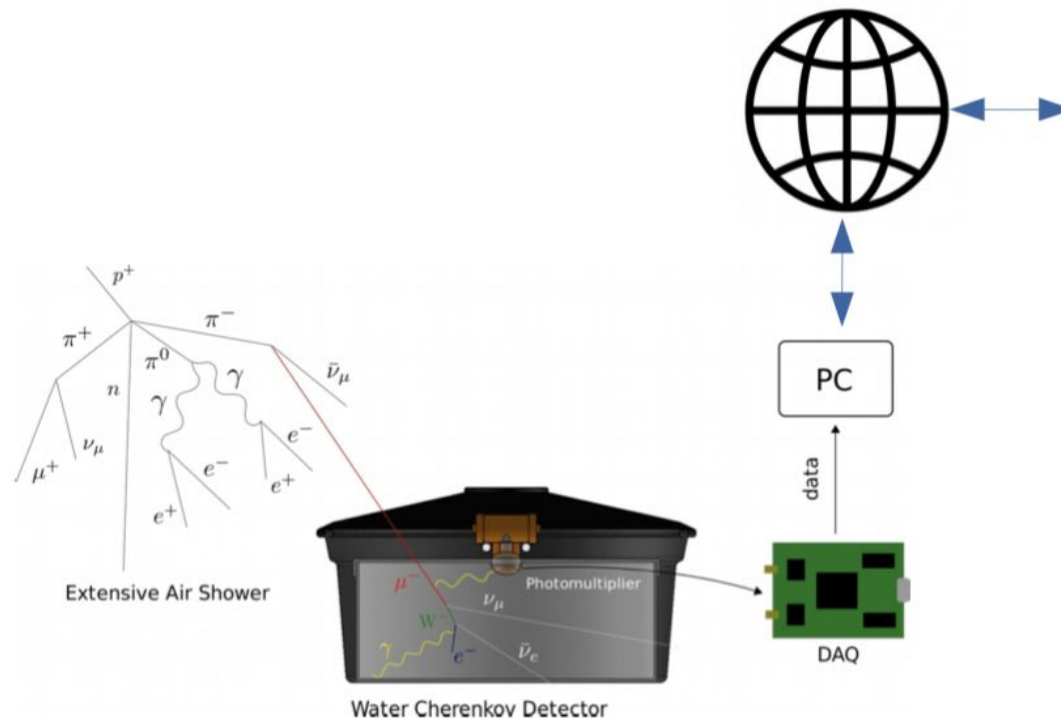
An innovative syllabus for the region!





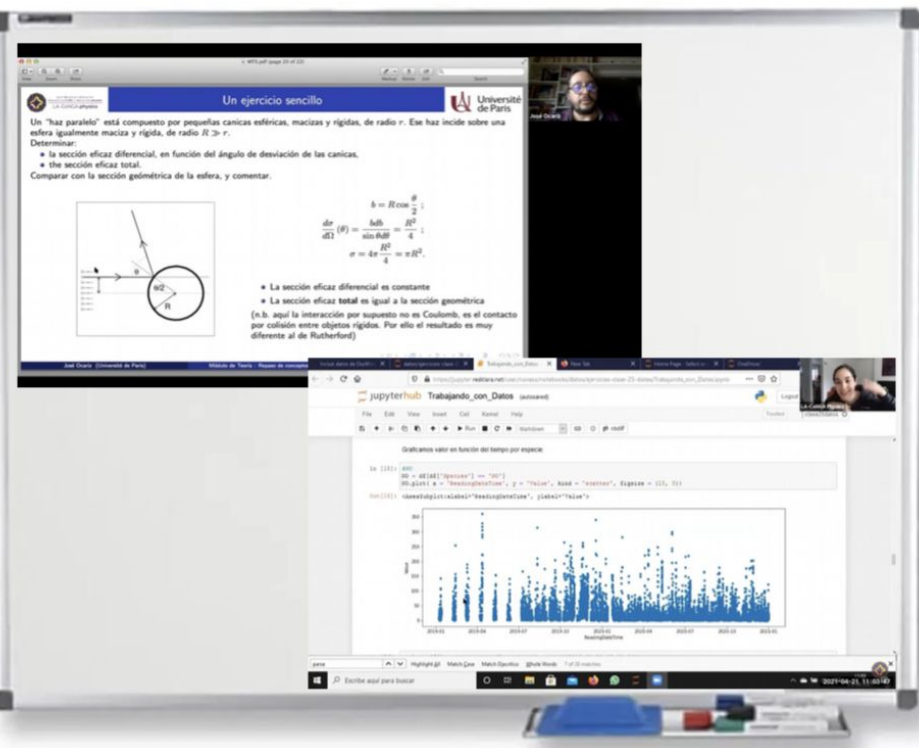
Proof of concept: methodology and tools (2/2)

- An e-learning open-access platform
- Courses are thought partly remotely from Latin America, partly from Europe
- A mix of synchronous and asynchronous activities
 - With extra academic support: individual mentorships, discussion forums, office hours, discussion sessions
- Remote access interconnected instrumentation labs
- [Teaching material in Spanish](#) (open access material)
- 3-months research and/or industrial internships

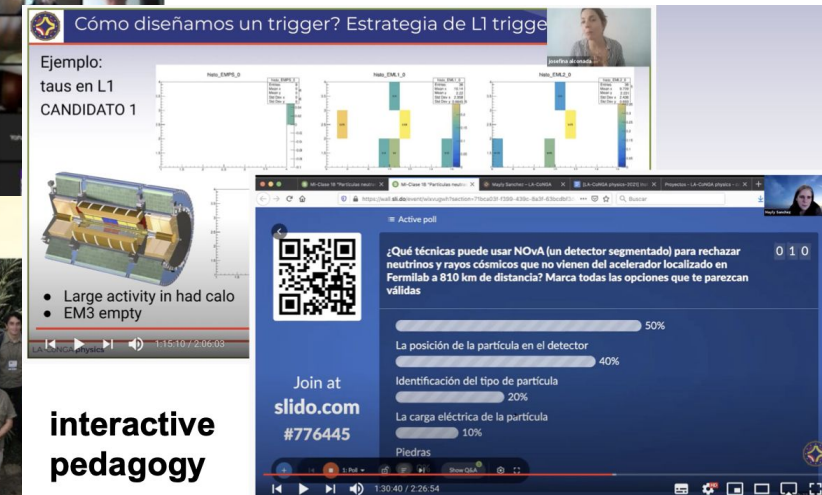


LA-CoNGA physics: courses

- **LA-CoNGA physics community is composed by 3 cohorts so far: 2021, 2022, 2023**
- **30 instructors** from Latin America and Europe
- More than **50 students** from 4 countries completed at least one full course in each cohort
 - Between 10-15 students in internships each year
- More than **200 classes** available open access (videos, documents, notebooks, datasets...)
- **But also challenges** like COVID, difficulties in accessing universities (instrumentation from home), internet connection bandwidth and postgraduate time dedication conditions in the region



6 - 8 diciembre 2021
Universidad Industrial de Santander
Bucaramanga - Colombia



The screenshot shows a Slido presentation slide titled 'Cómo diseñamos un trigger? Estrategia de L1 trigger'. The slide includes a diagram of a particle detector and a list of bullet points: 'Large activity in had calo' and 'EM3 empty'. Below the diagram, there is a QR code and a poll question: '¿Qué técnicas puede usar NOvA (un detector segmentado) para rechazar neutrinos y rayos cósmicos que no vienen del acelerador localizado en Fermilab a 810 km de distancia? Marca todas las opciones que te parezcan válidas'. The poll options are: 'La posición de la partícula en el detector' (50%), 'Identificación del tipo de partícula' (40%), 'La carga eléctrica de la partícula' (20%), and 'Piedras' (10%). The slide also includes a 'Join at slido.com #776445' link and a timer showing 1:30:40 / 2:26:54.

interactive
pedagogy



LA-CoNGA physics: interconnected instrumentation

- **Instrumentation labs currently installed** in all universities in Latin America:
 - **Unique interconnected network of instruments** including CAEN kits for Nuclear Physics experiments, National Instruments laboratory toolkits, air-quality monitoring stations for high-school science labs and computing stations
 - **First on-site laboratory practices took place in 2022**
 - Consolidating the **training of technical staff** for new instrumentation remote labs in 2023
 - Working with partners (CAEN and e-pysteme) to **improve the front-end** of our remote instrumentation labs:
<https://grupohalley.gitlab.io/labs/>





LA-CoNGA physics: internships

- Two kind of internships to strengthen the collaborations: towards Europe and intrarregional
- Some scientific outputs:
 - Fernández, N., et al. [Eur. Phys. J. B 96, 68](#) (2023)
 - Daniel Suarez Urango et al. [2307.06257](#) [gr-qc]

Pasantías de investigación
1^{er} Cohorte

Colaboración y acceso a laboratorios internacionales

Estudio fenomenológico del tamaño del skyrmion

David Leonardo Ramos
Universidad Industrial de Santander, Colombia
Tutoría: Luis Núñez
Universidad Industrial de Santander, Colombia
Tutoría: Pierre Pujol
Université Toulouse III - Paul Sabatier, Francia
Institución: Université Toulouse III - Paul Sabatier

Análisis para encontrar el centro de chubascos de partículas en MATHUSLA

Omar Moisés Asto Rojas
Universidad Nacional de Ingeniería, Perú
Tutoría: Javier Solano
Universidad Nacional de Ingeniería, Perú
Tutoría: Juan Carlos Arteaga Velázquez
Universidad Michoacana de San Nicolás de Hidalgo, México
Tutoría: Karen Salome Caballero Mora
Universidad Autónoma de Chiapas, México
Experimento: MATHUSLA en el CERN

Caracterización de la señal de rayos asociados a eventos ELVES

Jorge L. Perea
Universidad Industrial de Santander, Colombia
Tutoría: Luis Núñez
Universidad Industrial de Santander, Colombia
Tutoría: Roberto Mussa
Istituto Nazionale di Fisica Nucleare Sezione di Torino, INFN en Italia
Laboratorio: Observatorio Pierre Auger

Grafeno: interacciones entre defectos topológicos y grados de libertad electrónicos

Nicolás Fernández
Universidad Nacional Mayor de San Marcos, Perú
Tutoría: Teófilo Vargas
Universidad Nacional Mayor de San Marcos, Perú
Tutoría: Pierre Pujol
Université Toulouse III - Paul Sabatier, Francia
Institución: Université Toulouse III - Paul Sabatier

Observación de la Modelación del flujo de rayos cósmicos galácticos con los ciclos solares

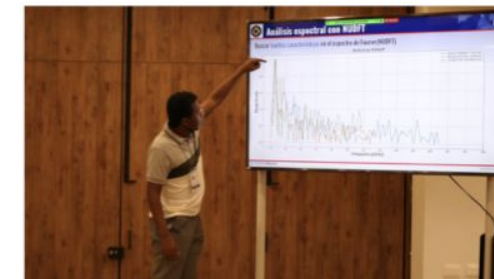
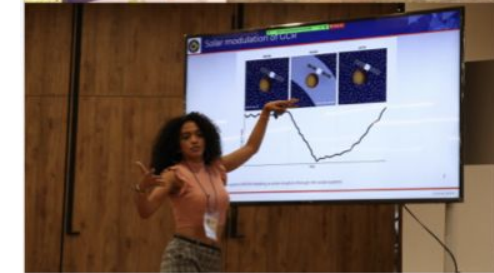
Jennifer Grisales
Universidad Industrial de Santander, Colombia
Tutoría: Luis Núñez
Universidad Industrial de Santander, Colombia
Tutoría: Roberto Mussa
Istituto Nazionale di Fisica Nucleare Sezione di Torino, INFN en Italia
Laboratorio: Observatorio Pierre Auger

Estudio de las incertidumbres sistemáticas del alineamiento global del detector AFP mediante eventos exclusivos de dos muones

Carlos Andrés Pinzón
Universidad Antonio Nariño, Colombia
Tutoría: Gabriela Navarro
Universidad Antonio Nariño, Colombia
Tutoría: Marek Tasevsky
Czech Academy of Sciences, República Checa
Experimento: ATLAS en el CERN

Estudiantes Tutores Laboratorios internacionales

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LA-CoNGA physics: beyond the courses

- Capacity is built beyond the zoom and lab rooms
 - **Other academic activities:** cycle of seminars, mentorships
 - **Scientific outreach:** workshops about science communication
 - **Transversal to other communities:** hackaton co-Afina 2022, citizen science projects with high-schools in the region

- A community with values:

- Collaboration
- Diversity
- Open access
- Responsibility
- Innovation
- Respect



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Seminarios
LA-CoNGA physics

Lunes 18 de octubre de 2021
14:00 (Col, Ec, Pe), 15:00 Ve, 19:00 UTC
Transmisión en el canal de YouTube de LA-CoNGA physics

Buscando la materia oscura en el Gran Colisionador de Hadrones
Dilia María Portillo Quintero
Postdoctoral researcher TRIUMF (CA)

#SeminariosLACoNGA #AuLACoNGA



LA-CoNGA physics
hackathon
Datos Abiertos en América Latina 2022
#CoAfina2022



Mujeres que hacen Física

Historias de mujeres académicas en América Latina y Europa: trayectoria y vida

#QueremosSerMás

11 febrero 2022 | 9h00 Col - Per - Ecu / 10h00 Ven / 15h00 CET

Día Internacional de la Mujer y la Niña en la Ciencia

Moderado por:
Reina Camacho Toro (CNRS, Francia)
Joany Manjarrés (TU-Dresden, Alemania)

Invitadas que hacen vida científica en Ecuador, Colombia, Suiza y Francia

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Sigue la actividad via
YouTube
LA-CoNGA Physics



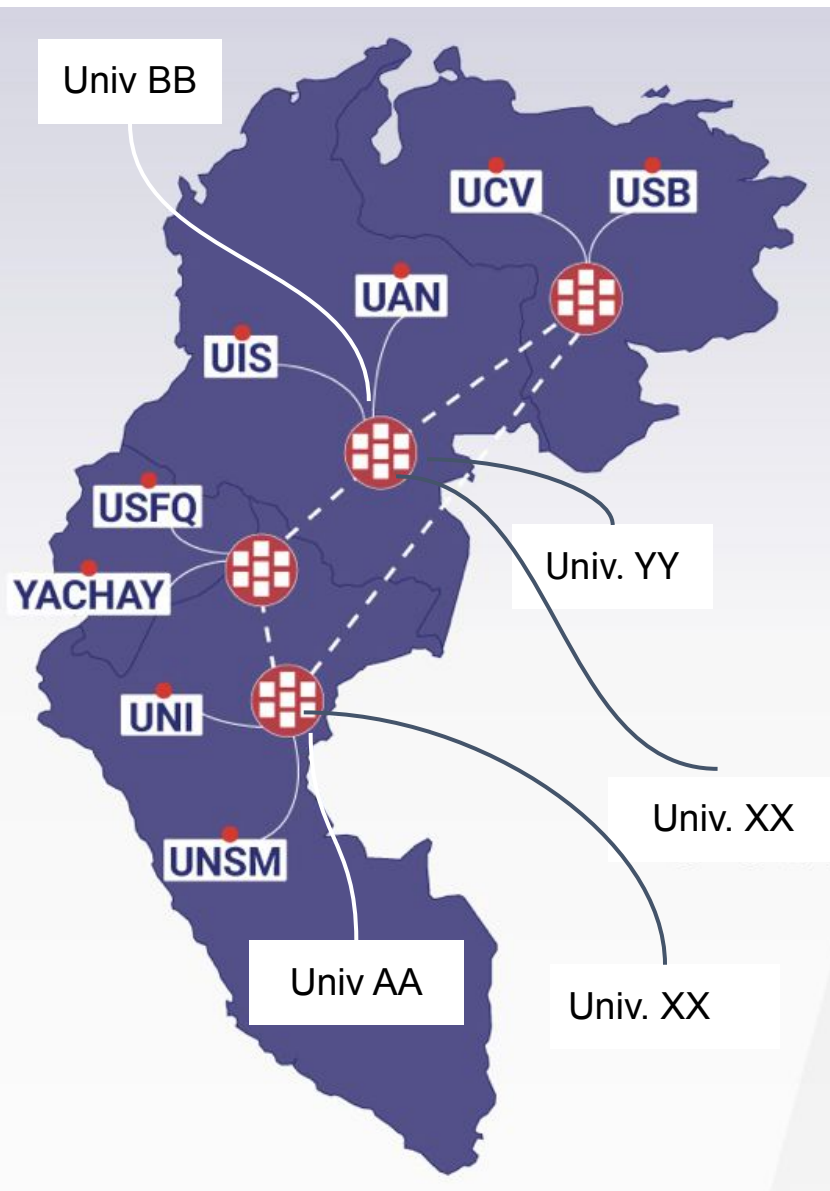
LA-CoNGA physics
presenta **#Higgs10**

Testimonios y reflexiones:
una conversación con América Latina
15 julio 2022 | 09:00 Co, Ec, Pe; 10:00 Ve; 14:00 UTC

Antes y después de un gran descubrimiento 2012-2022



LA-CoNGA physics beyond 2023



- Scientific and capacity building based on:
 - International collaboration
 - Shared infrastructures
 - Open resources
 - Organization/common strategies
- But without forgetting to adapt to local realities in the work/teaching dynamics!
- Current objective: **ensure the sustainability** beyond initial funding period and **continue contributing to the capacity building, talent pipeline and intraregional and European-Latin american networking**



<http://laconga.redclara.net>



contacto@laconga.redclara.net



lacongaphysics



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LA-CoNGA physics

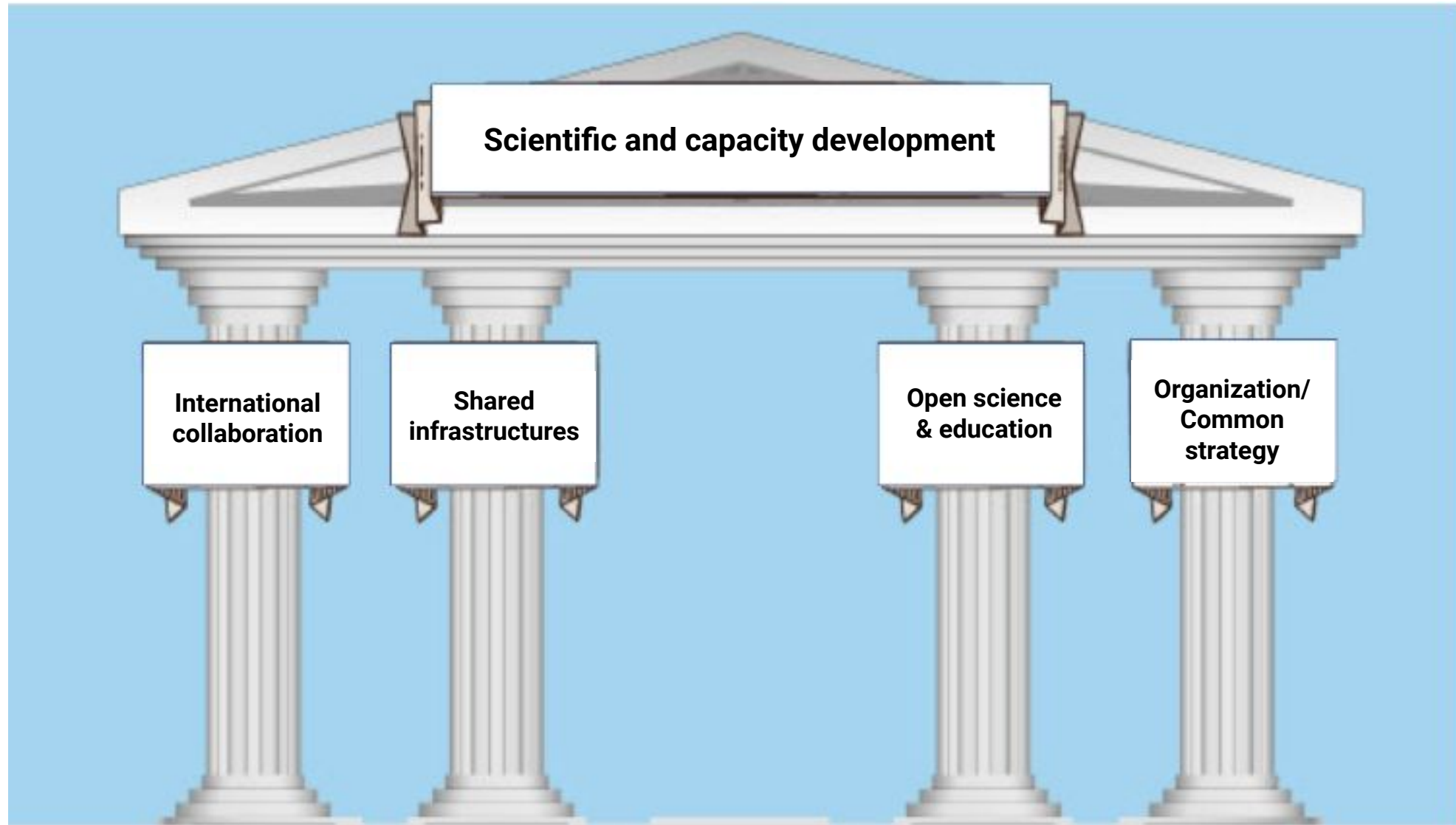


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What do we need to advance scientific and capacity development



**Applies to current scientific challenges in general, not only particle physics, cosmology and astrophysics! e.g. COVID, climate change, etc*