

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

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on behalf of the LA-CoNGA consortium

**COMHEP 2022**

*Villa de Leyva, December 1st, 2022*



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



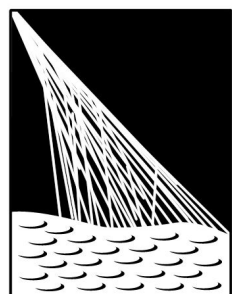
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de la Unión Europea





# 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



The HECAP development is variable country-by-country. The potential in the region is huge thanks to:

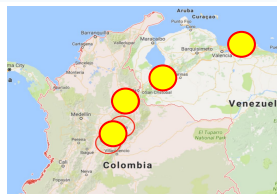
- Critical mass of teachers/researchers in several universities
- Diversity of interests and skills
- A young generation with potential and eagerness to learn
- Collaborative work make us stronger



# Several outreach and education activities

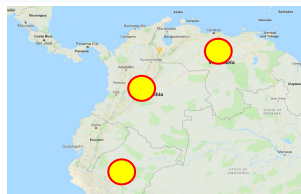


- Leading to the creation of a community... Just to name a few
  - Masterclasses IPPOG
  - Virtual course of introduction to particle physics from CEVALE2VE
  - Roadshows with the support of Physics Without Frontiers-ICTP
  - And many others in the region...



2016

**The 1<sup>st</sup> edition of the PWF-LA**  
The first edition took place in six institutions in five cities in Colombia and Venezuela



2017

**The 2<sup>nd</sup> edition of the PWF-LA**  
Three countries visited: Peru, Colombia and Venezuela. Peruvian students started to follow the CEVALE2VE course



2018

**The 3<sup>rd</sup> edition of the PWF-LA**  
Four countries visited: Argentina, Uruguay, Colombia and Venezuela.



2019

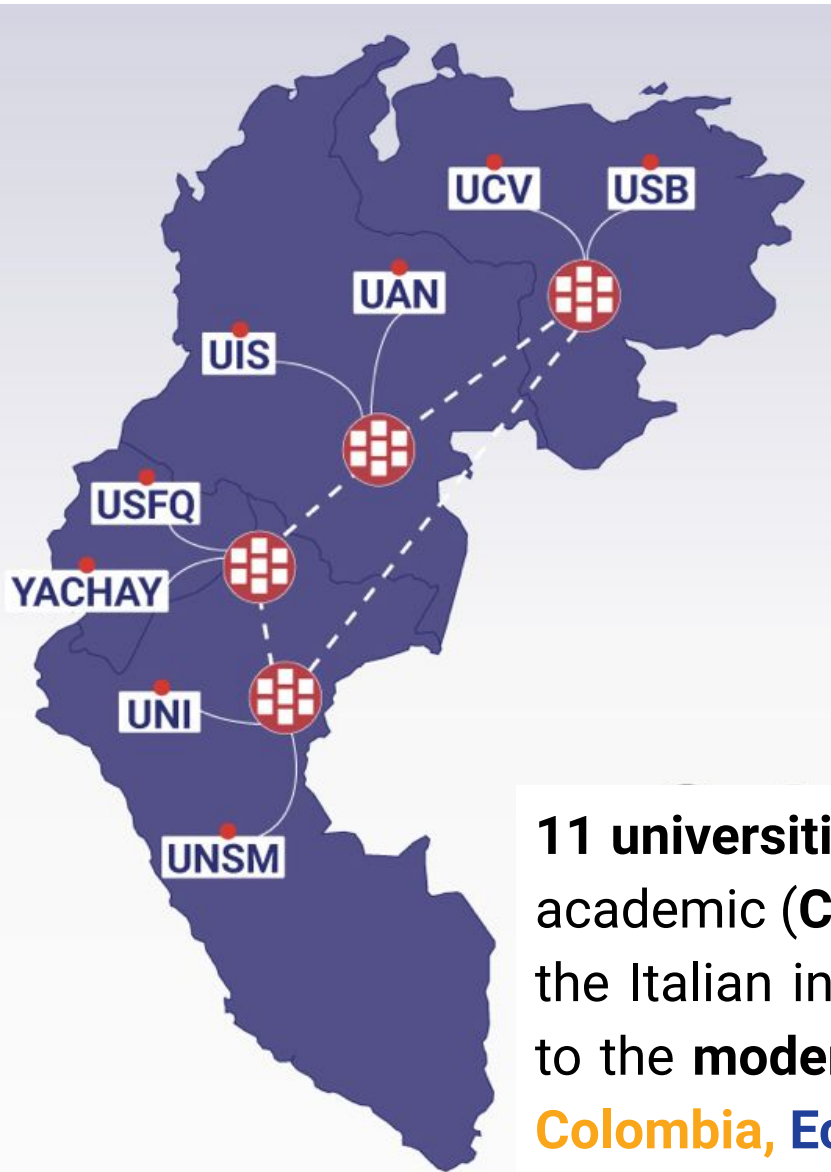
**The 4<sup>th</sup> edition of the PWF-LA**  
Five countries visited: Ecuador, Peru, Colombia, Venezuela and Mexico.







# 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, 900 k€ budget. Officially started in January 2020**



**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 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**
  - **Instrumentation**
  - **Advanced Physics**, two streams: High Energy Physics and Complex Systems

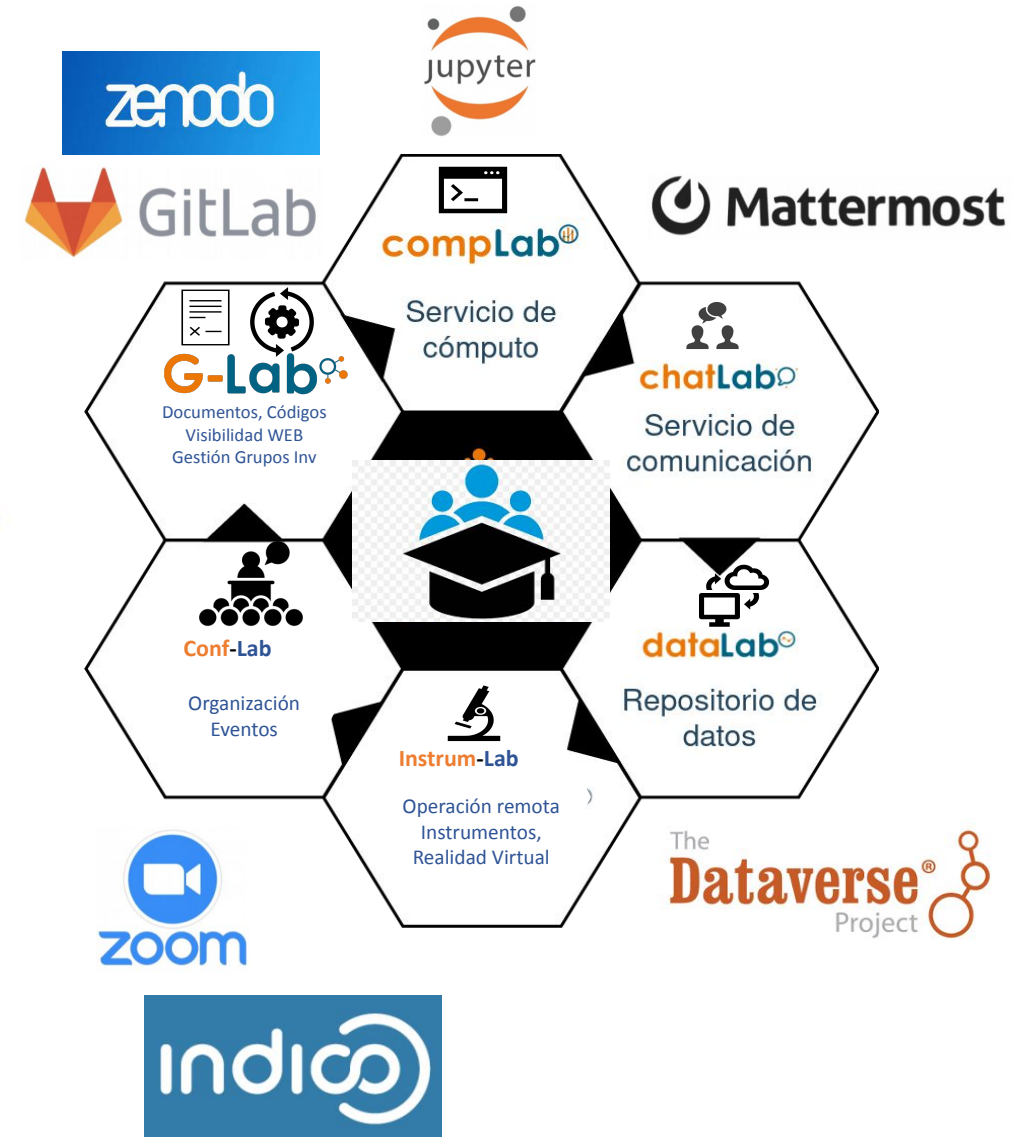
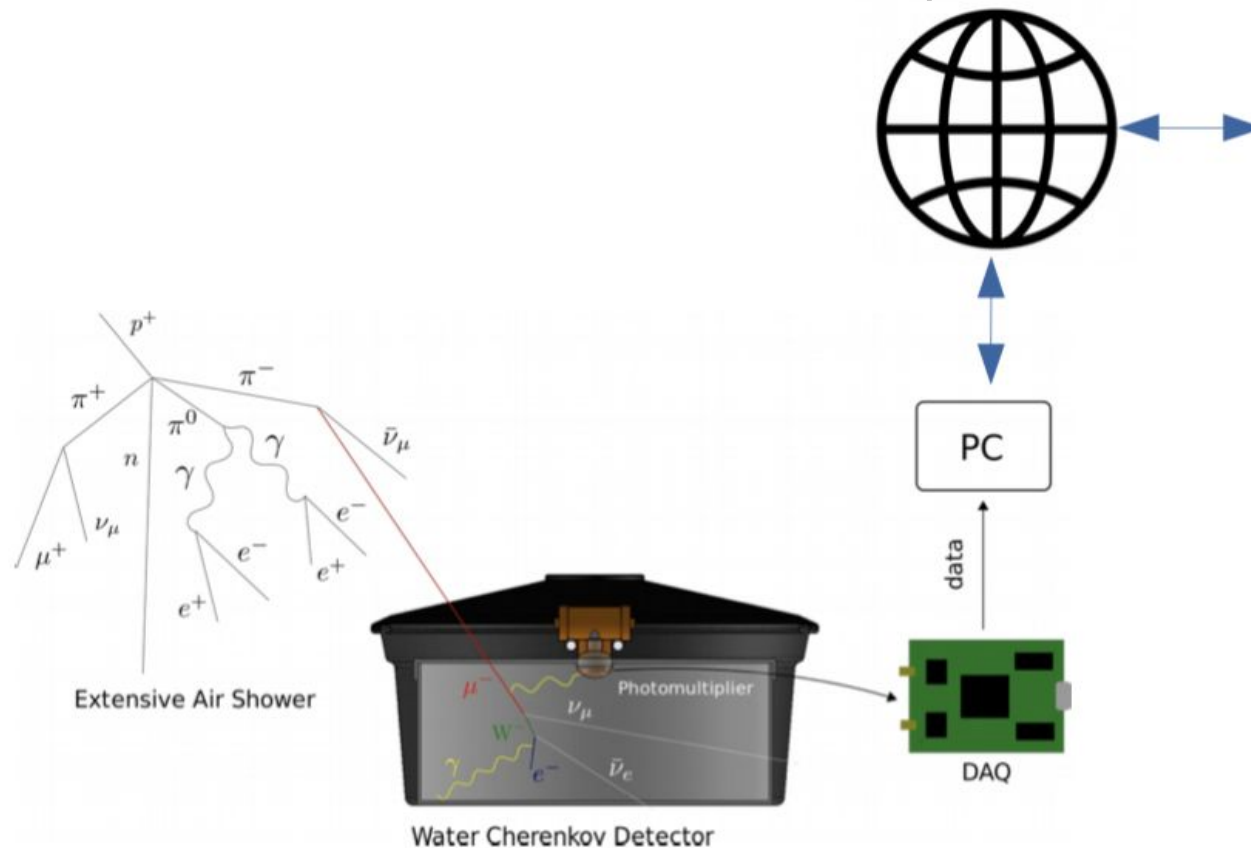






# Proof of concept: methodology and tools (2/2)

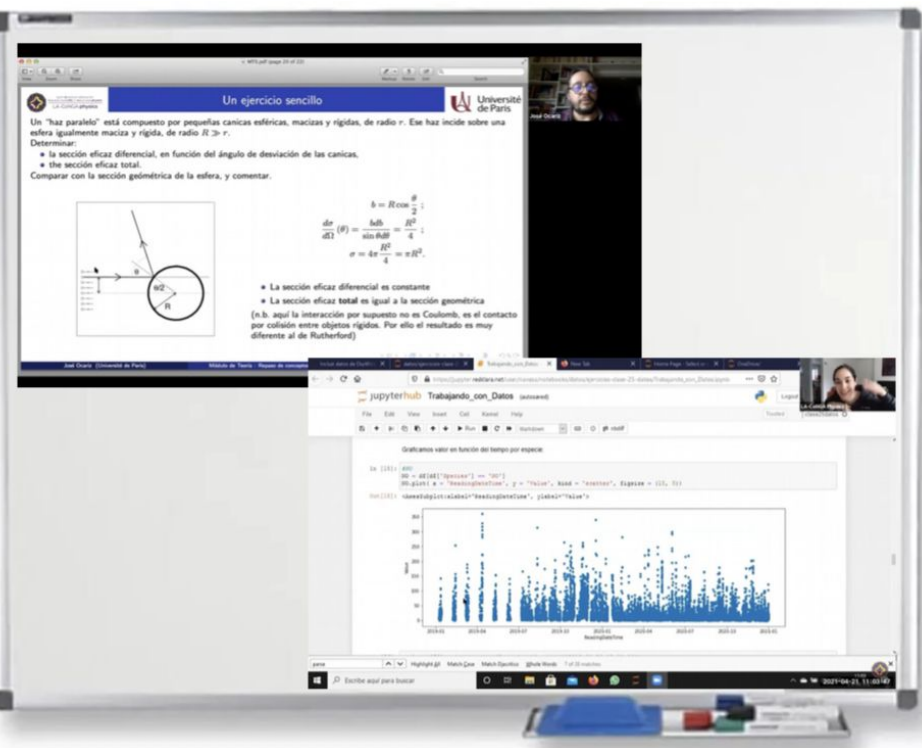
- An e-learning open-access platform
- Courses are thought partly remotely from Latin America, partly from Europe
- Good practices of science reproducibility
- Remote access interconnected instrumentation labs
- Teaching material in Spanish
- 3-months research and/or industrial internships





# LA-CoNGA physics in 2021

- **30 instructors** from Latin America and Europe
- More than **50 students** from 4 countries completed at least one full course
  - 9 students validated their internships
- More than **100 classes** available open access (videos, documents, notebooks, datasets...)
- But also challenges like COVID, difficulties in accessing universities (instrumentation from home) and internet connection from home



LA-CoNGA physics  
International  
Network  
School

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







# LA-CoNGA physics in 2022

- **Around the same number of students** during the first part of the year
- **Instrumentation labs installed** in 6 out of 8 universities:
  - **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
- 12 internships started in September 2022. In-person mobility for the first time!
- The 2022 cohort will meet next week in Santa Marta for the second LA-CoNGA physics Network School



 **2<sup>nd</sup> LA-CoNGA physics International Network School**

**5 - 7 diciembre 2022**  
Universidad del Magdalena  
Universidad Antonio Nariño  
Santa Marta - Colombia

 Cofinanciado por el programa Erasmus+ de la Unión Europea





# 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, discussion tables about capacity building in HECAP in different events and contexts

- A community with values:

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



**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

**CILAC** 2021  
FORO ABIERTO DE CIENCIAS LATINOAMÉRICA Y CARIBE

LA-CoNGA physics presenta  
Ciencia abierta, infraestructura compartida y redes de colaboración

**el reto de la nueva educación superior**

**SESIÓN TEMÁTICA**

Yuma Inzolia UNESCO-IESALC  
Luis Elícer Cadenas RedCLARA  
Fernando Quevedo LASFARI  
Bianca Amaro LA Referencia  
Reina Camacho LA-CoNGA physics  
Rafael Anta BID

**Miércoles 28 de abril 2021 | 14:00 GMT**  
9:00am (Bogotá) / 10:00am (Caracas)  
11:00am (Sao Paulo) / 16:00pm (Madrid / París)

IESALC  
CLARA  
LASFARI  
LA Referencia  
LA-CoNGA physics  
BID





# LA-CoNGA physics: next steps

- After a very positive mid-term report **a one year extension has been approved**
  - Consolidate the training of technical staff for new instrumentation remote labs
  - Working with CAEN and e-pysteme to improve the front-end of our remote instrumentation labs
  - Put in place citizen science projects with high-schools
  - Establish new bilateral and multilateral agreements between the network's institutions
- **Beyond 2023:**
  - Exploring funding possibilities and new alliances with other institutions interested
  - Consolidation of our e-learning platform to scale-up. Work in collaboration with RedCLARA

[ESPECTROSCOPIA GAMA](#) ▶

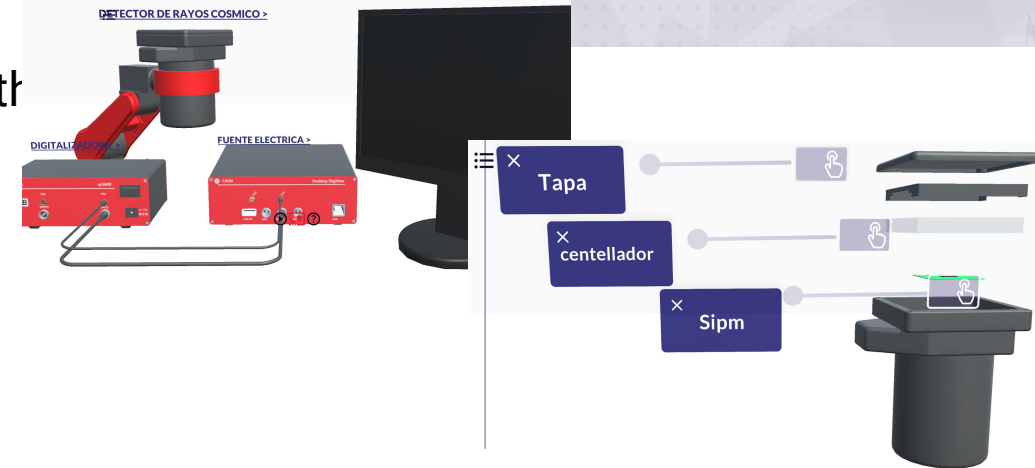
[RAYOS COSMICOS](#) ▶

[CONFIGURACIÓN SIPM](#) ▶

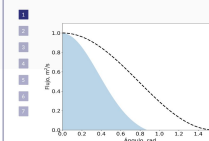
## DETECCION DE RAYOS COSMICOS

La radiación cósmica, descubierta por Víctor Hess en 1912, incluye todas las partículas cargadas y núcleos provenientes del espacio exterior. Los rayos cósmicos "primarios" están compuestos por núcleos pesados, protones (~90%) y helio (~10%), pero también electrones, neutrinos, fotones, algunos núcleos ligeros y antimateria (positrones y antiprotones). Estas partículas son aceleradas por fuentes astrofísicas y al interactuar con la atmósfera terrestre, producen principalmente los rayos cósmicos "secundarios": piones, kaones y lluvias electromagnéticas. Los muones y los neutrinos son productos de la cadena de desintegración de los mesones cargados, mientras que los electrones y los fotones se originan en las desintegraciones de los mesones neutros.

[MPEZAR](#) ▶



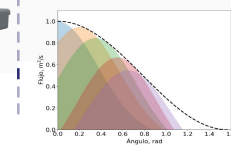
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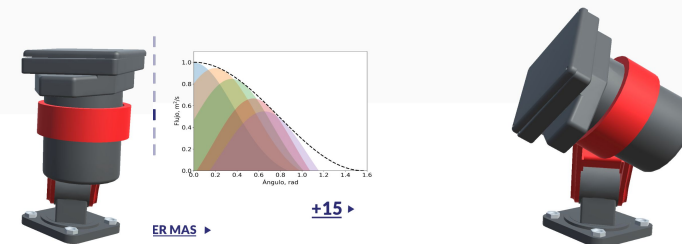
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<http://laconga.redclara.net>



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lacongaphysics



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Capacity buildiNG in Advanced physics

LA-CoNGA physics



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## Internationalization

collaborative international environment

### Accessibility



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



### Modernization



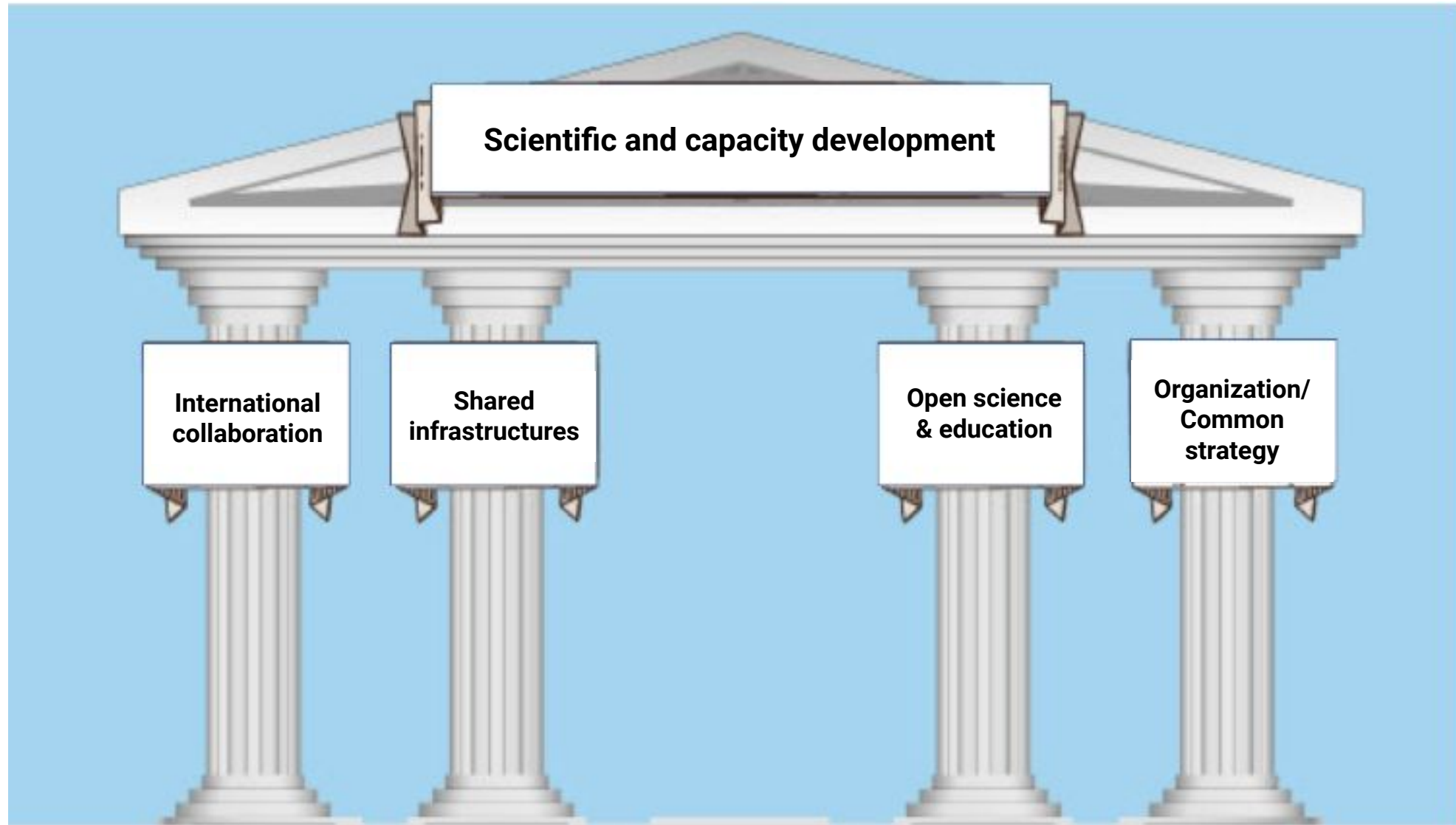
open educational resources, connectivity, acquisition of digital skills, and use/development of new learning methods

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



# 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*

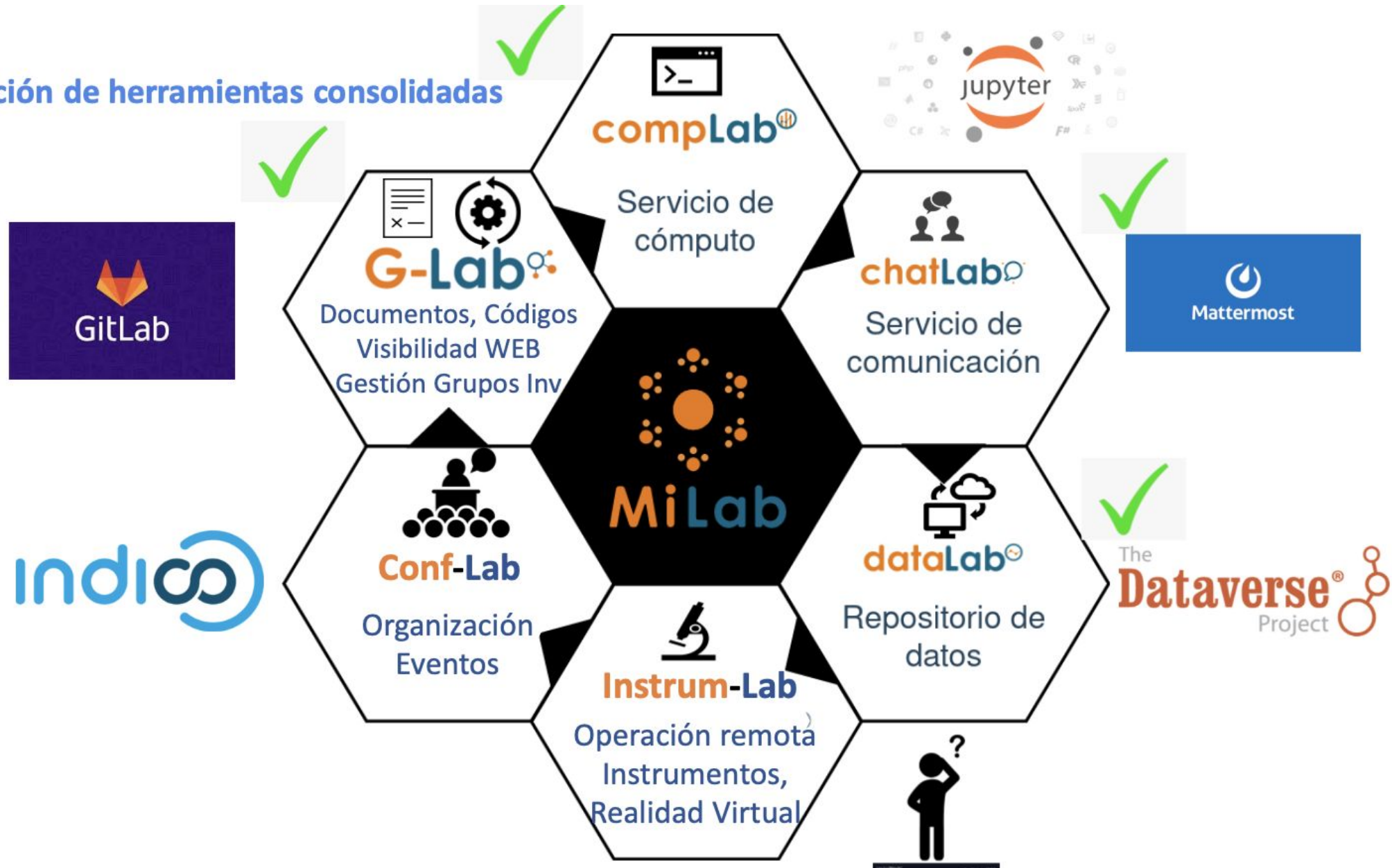




# Next steps: miLAB

## MiLAB

### Integración de herramientas consolidadas





# Our vision and values

- We strengthen a **sustainable, dynamic, collaborative, interconnected, and diverse** virtual research and learning network of Latin American and European researchers in advanced physics
- With close ties to the **productive sector**, which leads the development of science and technology in the region
- Contributing to the modernization, accessibility, and internationalization of higher education systems in the region
- Using of technology in educational environments to enhance learning
- Applying **good scientific practices** and **gender equality**
- We envision similar experiences in other disciplines

