What's new
October - December 2022

2022 is over! Looking forward to 2023

Despite the worldwide tragic events in 2022, IUPAP achieved decisive milestones:

1. The administrative restructuring of IUPAP is now completed with the Administrative Headquarter in Trieste and the Financial and Legal Headquarter in Geneva. The IUPAP Headquarter in Singapore is in the process of being liquidated and the funds have already been transferred to Geneva

The centenary celebration of the creation of IUPAP was a success with the Centenary Symposium on July 11th to 13th in Trieste and many celebration events worldwide

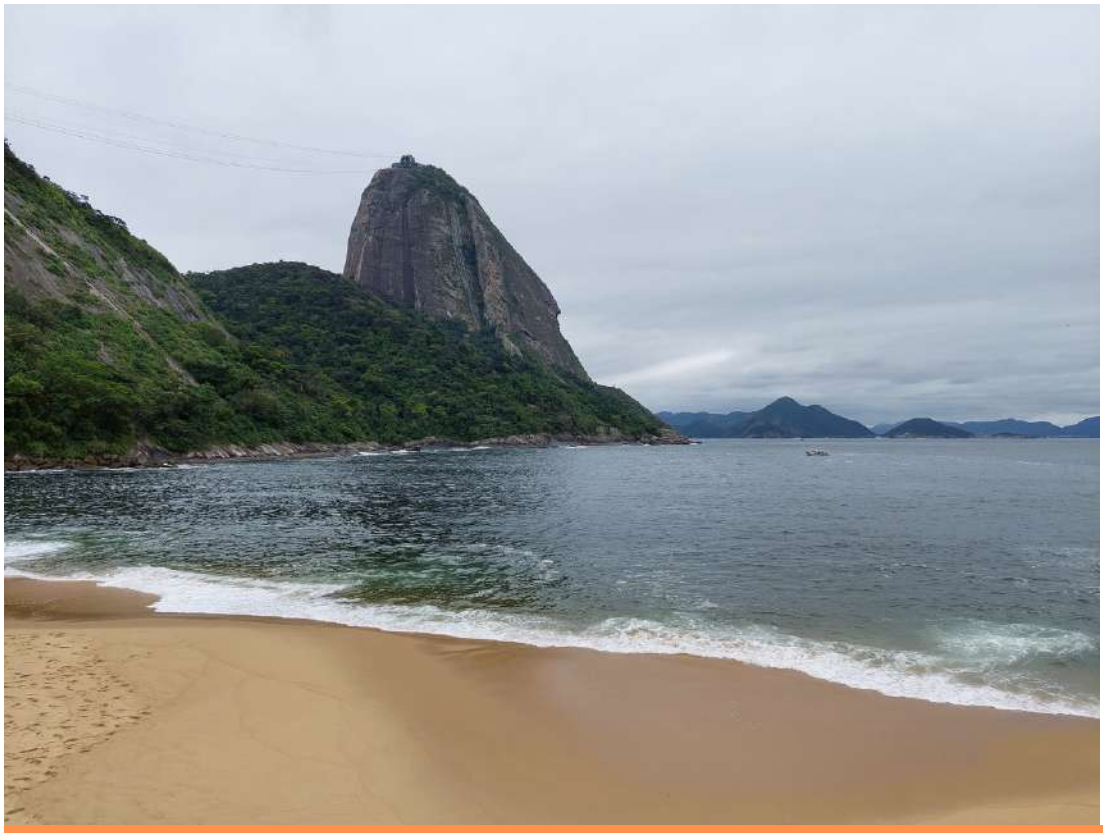
1. The centenary celebration was an opportunity to revisit the IUPAP archives and hopefully to store them in an appropriate and convenient manner.
2. The IUPAP centenary celebration was the first event of the International Year of Basic Sciences for Sustainable Development which was inaugurated on July 8th in UNESCO Headquarters in Paris. IUPAP is the leading Union of this International Year.
3. Many resolutions were adopted at the IUPAP GA on July 14th. I will only mention those which deal with the tragic invasion of Ukraine by Russian forces. The Russian military offensive was immediately condemned by IUPAP. Ukraine was admitted as a new IUPAP member. At the same time IUPAP acted to keep open the channel for scientific communication across all political and other divides and not to bar any scientist, especially from a member nation, from attending conferences and from participating to the affairs of the Union.

We want to thank our members and our corporate associate members for their support all along 2022. In 2023, despite the ongoing sad events in the world, IUPAP will continue "to assist in the worldwide development of Physics, to foster international cooperation in physics and to help in the application of physics toward solving problems of concern to humanity".

Long life to IUPAP!

Michel Spiro (President)
Jens Vigen (Secretary-General for Legal and Financial Affairs)
Silvina Ponce Dawson (President Designate)

Joint celebration of IUPAP's centenary and of the Latin American Center for Physics 60th anniversary



Pão de Açúcar and beach, near the premises of CBPF.

The Centenary of IUPAP was celebrated in Latin America and the Caribbean with a workshop that also commemorated the 60th anniversary of the Latin American Center for Physics (CLAF). Created in 1962 under the auspices of UNESCO, CLAF's views and actions concur with those of our Union in that they both seek to foster international cooperation in physics and link research in the discipline to the economic and social development of the region. The event took place at the Brazilian Center for Physics Research (CBPF) in Rio de Janeiro, Brazil, on November 7-9, 2022.

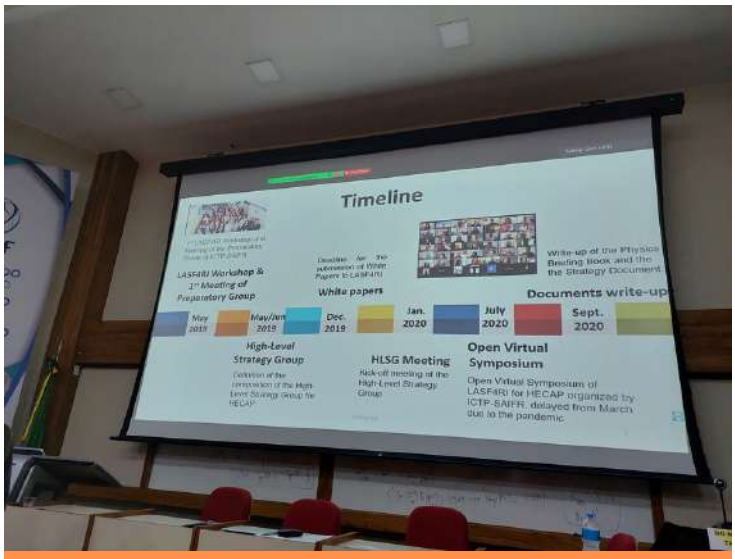
With about 50 participants from Argentina, Bolivia, Brazil, Chile, Costa Rica, Cuba, Mexico, Uruguay and Venezuela, the workshop combined talks about some of the strategic projects that are carried out in the region, physics talks and a panel on physics and science Latin America.

More specifically, Harry Westfahl Jr, director of the Brazilian Synchrotron Light Laboratory (LNLS), gave a talk on Sirius, the 4th-generation synchrotron light source of Brazil, one of the most advanced in the world, which hopefully will be part of the LAAAMP project. Rogério Rosenfeld from the Institute of Theoretical Physics at the State University of Sao Paulo (UNESP) and former president of the Brazilian Physical Society (SBF) talked about the recently created Latin American Association for High Energy, Cosmology and Astroparticle Physics (LAA- HECAP) which is directly involved in the definition of the first phase activities of the Latin America Strategy Forum for Research Infrastructure (LAS4FRI) that IUPAP is supporting and which will appoint an associate member to the IUPAP Commission on Particles and Fields (C11). Ulisses Barres, of the Brazilian Center for Physics Research (CBPF), talked about the Southern Wide-Field Gamma-ray Observatory (SWGO), a ground-based gamma-ray detector based primarily on water Cherenkov detector units that is planned to be deployed in the southern hemisphere, where no such instrument exists, at an altitude of 4.4 km or higher and which would cover an energy range from 100s of GeV to 100s of TeV. Right now, there are several candidates to host this new observatory, one of them in a lake in Peru about 4000 meters above sea level. Areas in Bolivia (La Paz), Chile (Atacama Astronomical Park), and Argentina (San Antonio de Los Cobres) are under consideration as well. Alberto Carramiñana from the National Institute for Astrophysics, Optics and Electronics of Puebla, Mexico, talked about the High Altitude Water Cherenkov Observatory (HAWC), another facility designed to observe gamma and cosmic rays between 100 GeV and 100 TeV, located at an altitude of about 4100 meters inside the Pico de Orizaba National Park in Mexico, of which SWGO would be an upgrade. Ilaria Fava, a communications specialist from the European Grid Initiative (EGI) Foundation talked about the aims of the foundation and about the memorandum of understanding that they have recently signed with CLAF to define a framework of collaboration among European and Latin-American scientists to establish sustainable distributed computing services to support their work.

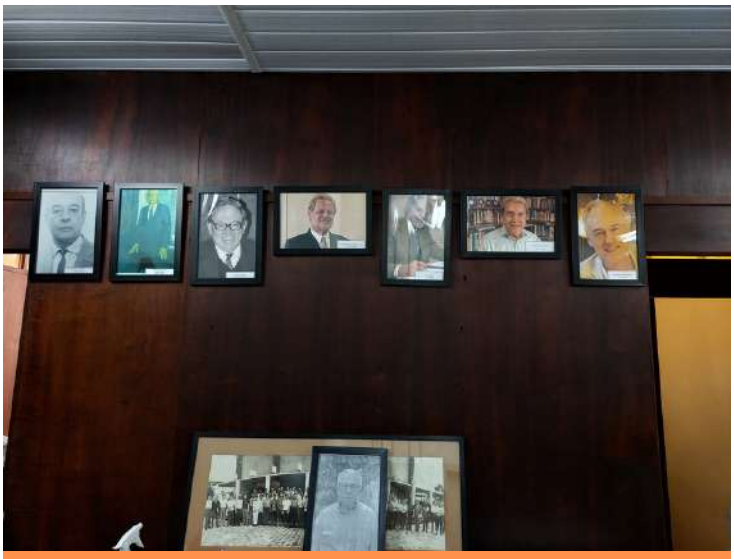
Nicolás Wschebor from Uruguay and Leopoldo Soto from Chile gave talks on the most recent developments on their areas of expertise, critical phenomena in condensed matter physics and the use of micro and nano-devices to probe plasma physics phenomena. I also gave a talk on the 100 years of IUPAP and its future perspectives in Latin America and the Caribbean.
The workshop was closed with a discussion panel on the future of physics and science in Latin American with the participation of the Director of CLAF, Luis Huerta, their former directors, Carlos Aragão and Carlos Trallero, the Director of CBPF, Márcio Portes de Albuquerque, a representative of the Brazilian Ministry of Science, Eneida Zanqueta and me, representing IUPAP.

Latin America and the Caribbean is a region with a great potential. This joint celebration has helped us think about future paths for IUPAP to strengthen its liaisons and contribute better to the development of physics and science in all the area.

Silvina Ponce Dawson,
IUPAP President Designate



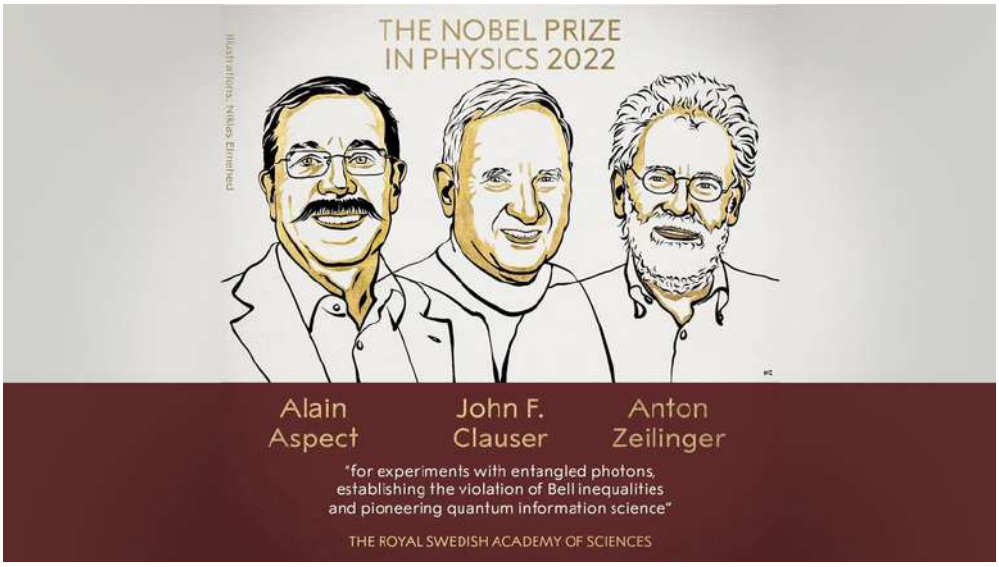
Timeline of events associated to the Latin American Forum for Research Infrastructure that IUPAP is supporting.


Former directors of CLAF.


High Performance computing facilities at CBPF associated to the European Grid Initiative.


CBPF building, by the campus of the Federal University of Rio de Janeiro in Brazil.

The Physics Nobel 2022: a remarkable journey of scientific discovery



The 2022 Nobel Prize in Physics recognized ground-breaking research that provided insights into the nature of reality and also helped establish the field of quantum information science. Alain Aspect, John F. Clauser and Anton Zeilinger each received an equal share of the award "for experiments with entangled photons, establishing the violation of Bell inequalities, and pioneering quantum information science".

The prize is the culmination of a remarkable journey of scientific discovery. As Alain Aspect put it, credit must go to Einstein and his colleagues for first realizing the strangeness of quantum entanglement and thereby raising questions about quantum theory itself. Can entangled quantum particles really be correlated in such a way that measurements on one instantly impacted the other no matter how far apart they are? Or are there some additional hidden variables that could explain this strange phenomenon?

In 1950, Wu Chien-Shiung and her student Irving Shaknov experimentally observed correlations between the polarizations of entangled photon pairs, as predicted by quantum theory. Subsequently in 1964, John Bell showed that any observed correlations between particles that could be attributed to local hidden variables must satisfy some mathematical constraints. But quantum mechanics predicted that entangled particles could violate those constraints.

As a young researcher, John Clauser was inspired to try and test Bell's theorem in an actual experiment. Would Bell's inequalities be violated and the predictions of quantum mechanics hold true, or would non-violation of the inequalities shake the foundations of quantum theory? Risking his career and facing skepticism from other physicists, he remained determined despite the challenging nature of the experiments. In 1969, Clauser, along with Michael Horn, Abner Shimony and Richard Holt proposed a version of Bell's theorem (now called the CHSH inequality after them) that was realizable in experiments. And in 1972, Clauser and Stuart Freedman performed the first test of Bell's theorem. They found that the Bell-CHSH inequality was indeed violated. Quantum mechanics was not toppled.

A decade later Alain Aspect spectacularly confirmed the violation by closing previous experimental loopholes. Since then, increasingly accurate Bell-CHSH tests have been performed, eliminating further experimental loopholes that might allow a local realistic interpretation of the results. In 2015, Anton Zeilinger's team reported a violation of Bell's theorem in an experiment that decisively closed all the main loopholes simultaneously.

One of the most exciting aspects of quantum entanglement is its use as a resource for quantum computing and quantum communication, including novel protocols such as quantum teleportation. The Zeilinger group was the first to realize quantum teleportation of a single qubit, and perform long-distance quantum teleportation over 144 kilometres. In a series of beautiful experiments with entangled photons, they also demonstrated a number of applications and tools in quantum information processing, including teleportation of entanglement, quantum cryptography, multiqubit entanglement and quantum computation.

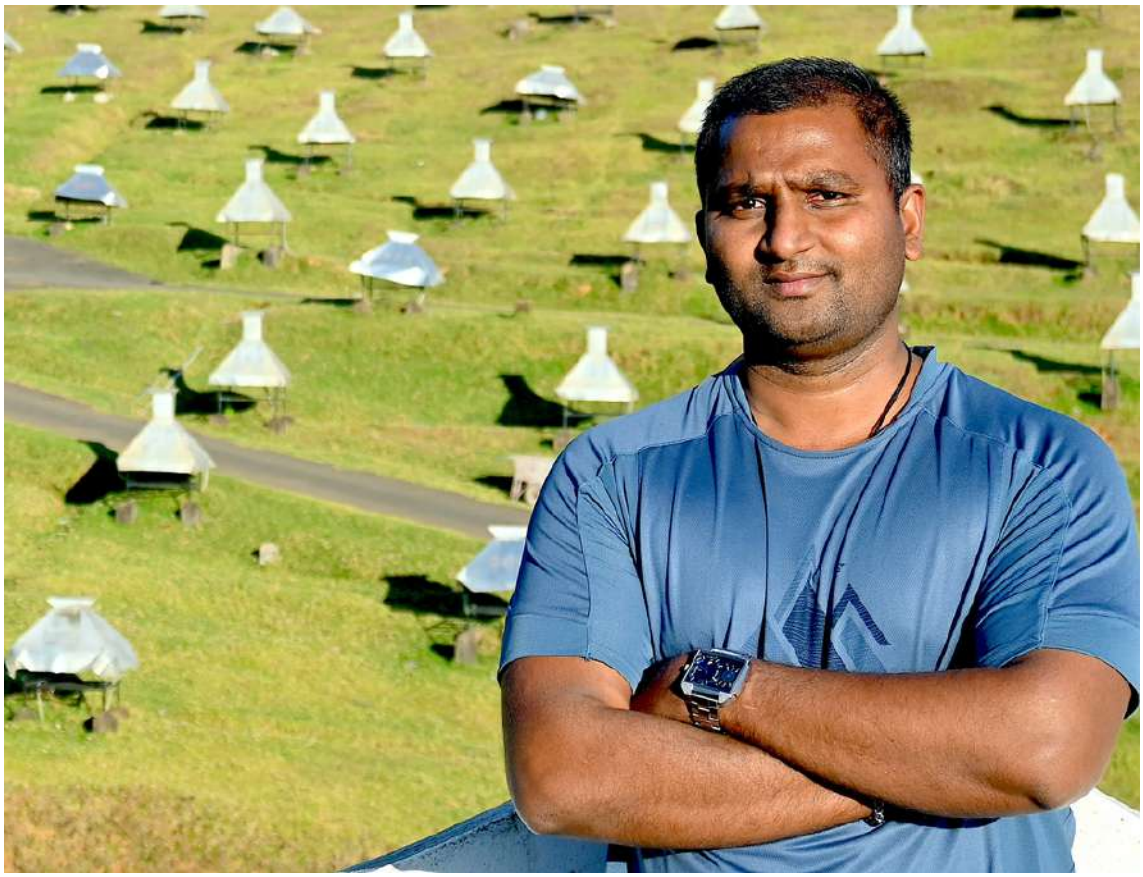
These experiments have helped kickstart the field of quantum information science and have laid the groundwork for the potential development of large-scale quantum computers and a possible future quantum internet. The rapid and exciting growth of this field has spurred IUPAP to pass a resolution to create a Working Group on Quantum Science and Technology (WG19) to analyze the creation of a new IUPAP Commission on Quantum Information Science and Technology.

John Clauser, Alain Aspect and Anton Zeilinger's work has confirmed both the weirdness and the wonder of quantum mechanics. Zeilinger describes it as one of the most beautiful theories ever invented. Furthermore, the potential of quantum computing and communication has ignited the imagination of the public and is inspiring the next generation of quantum scientists. IUPAP congratulates the 2022 Nobel laureates on their richly deserved recognition.

Shohini Ghose,
WG19 Chair

Meet our team: Hari Haran

In the coming months, we will introduce you to some of the people who make up our team, as well as some of the IUPAP members. **We start with Hari, who has been taking care of the website for a long time.**



Dear Hari, could you please introduce yourself?

I am Dr. Hari Haran Balakrishnan working as a scientific staff in Tata Institute of Fundamental Research (TIFR), India. I am a core member of GRAPES-3 experiment which is a field station of TIFR. The GRAPES-3 experiment is a ground based cosmic ray observatory that studies the Universe at different energies. I am a physicist and a full-time researcher primarily uses GRAPES-3 data. My core areas of research span into thunderstorm physics, solar and near Earth phenomenon, and cosmic ray physics. In addition, I am also maintaining the high-performance computing facility in GRAPES-3.

How did you learn about IUPAP and how do you think an early career physicist like you can benefit from IUPAP?

I was introduced to IUPAP by the former chair of commission C4: Astroparticle Physics, Prof. Sunil Gupta, who was also the Principal Investigator of GRAPES-3 experiment. He mentored me since I was a Junior Research Fellow in GRAPES-3. Though, my association started two years ago, I got many occasions to closely interact with many eminent scientists such as Prof. Bruce McKellar, Prof. Michel Spirio, Prof. Silvina Ponce Dawson, Dr. Jens Vigen, Prof. Rudzani Nemutudi, and many more. Being a physicist, it was important for me to keep me updated with the ongoing research activities and conferences in all streams of physics. Also, I found that the structure of IUPAP provides a strong platform for the researchers to interact and offers early career scientist prize in multiple streams to motivate the young researchers.

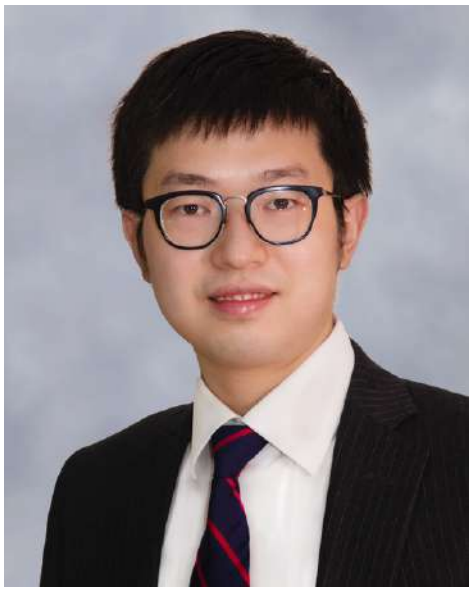
What is your contribution to IUPAP and especially to the IUPAP website?

Though I got a formal physics education, I have special interests in learning about software programs, operating systems, web servers, etc. which helped me to develop the GRAPES-3 web page. During the change of IUPAP administrative office from NTU, Singapore to ICTP, Italy, there were technical challenges in migrating the old IUPAP website from NTU servers to commercial service providers. Also, Prof. Dawson proposed to redesign the IUPAP website which is active now. A team consists of Prof. Dawson, Prof. Gupta, and me, having located at far ends of the globe, had a close interaction with the developers to provide various inputs to finalize and launch the IUPAP website before the 30th IUPAP General Assembly. Along with Prof. McKeller, a web based application for voting process of General Assembly was redesigned which was crucial in selecting the new members of various commissions, working groups, and the council.

What did you enjoy most in your collaboration with IUPAP?

The IUPAP recently celebrated its centenary. I was lucky to be part of the centenary symposium in which I could see the involvement and dedication of many people that helped in evolution of IUPAP over time for the benefit of physics community. I am extremely delighted to say that even my minimal contribution is helping to spread the science among the community which I would love to continue. Thanks to the colleagues Ms. Maitri Bobba from NTU and Prof. Sandro Scandolo, Mr. Francesca, Ms. Cecilia Cressi, Ms. Paola Rodari, and Mr. Clement Onime from ICTP for their support and kindness.

IUPAP Early Career Scientist Prize on Structure and Dynamics of Condensed Matter 2023 - Commission 10



Dr. You Zhou

"For his contribution on discoveries of Wigner crystals in 2D materials and studies of their quantum phase transitions."

You Zhou is an Assistant Professor in the Department of Materials Science and Engineering at the University of Maryland, College Park. His current research focuses on investigating and controlling the behaviors of electrons and excitons and their novel phases in van der Waals heterostructures. He received his B.S. in Physics from Peking University and his Ph.D. in Applied Physics from Harvard in 2015. He was a postdoctoral fellow at Harvard University between 2015 and 2020. He is a recipient of the NSF CAREER Award and the Department of Energy Early Career Award.

for 2023

Thank you