



IUPAP Inter-Commission Symposium Physics research for a sustainable planet

facing the major challenges that endanger earth as we know it

Afternoons of 12 and 13 October 2024
Hainan China and virtual

An event co-organised by C19 and WG21

Co-chairs: Prof. Nithaya Chetty, Prof. Pietro Ubertini

Organising Committee:

Prof. Li Lu, Prof. Igle Gledhill, Prof. Xiaoyan Shen

Humankind faces major challenges that endanger our future and civilization as we know it. Global challenges for humanity include sustainable development and global warming, energy, natural resources, pollution, clean water and the uncontrolled development of artificial intelligence. Solving these problems requires scientific researchers, politicians and decision makers to talk and to listen to each other, and needs scientists to raise public awareness.

It also requires scientists to learn how to clearly explain their science in a way that can be understood by non-experts. We live in an interconnected world where complex problems can only be solved in interdisciplinary collaborations and addressing these problems from very different angles. Scientists should therefore learn to think out of their own narrow field and interact with other communities. IUPAP has an enormous potential to play a leading role in such an enterprise. Its diversity from biophysics to nuclear and astrophysics covers all major branches of physics. Run by the physics community itself, it is independent and free. Each community might not have much impact. But if all branches get together and speak with one voice, it could make a major difference.



IUPAP Commission C19



2024 • 2033
International Decade of
Sciences for Sustainable
Development



12:46 PM → 1:30 PM **Bus transfer from Hilton Haikou to conference centre** ⌚ 44m

1:30 PM → 6:00 PM **Inter-Commission Symposium: Physics Research for a Sustainable Planet**

Convener: Prof. Irvy Gledhill (U. Witwatersrand, South Africa)

1:30 PM **Opening of the Inter-Commission Symposium** ⌚ 1m

1:31 PM **Welcome address** ⌚ 5m

Speaker: Prof. Xiaoyan Shen (Director of International Collaboration for CPS)

1:36 PM **Welcome from IUPAP** ⌚ 4m

Speaker: Dr Michel Spiro (IUPAP President)

1:40 PM **The intention of this Symposium** ⌚ 5m

Speaker: Prof. Pietro Ubertini (Chair C19)

1:45 PM **WG21 and the topics of this Symposium** ⌚ 5m

Speaker: Prof. Nithaya Chetty (Chair WG21)

1:50 PM **Introduction** ⌚ 1m

1:51 PM **Introduction: International Decade of Sciences for Sustainable Development**

Speaker: Dr Michel Spiro (IUPAP President)

2:10 PM **Physics for a sustainable planet** ⌚ 30m

Speaker: Prof. Giorgio Parisi (Sapienza University of Rome)

2:40 PM **Questions** ⌚ 10m

Speaker: Dr Michel Spiro (Université Paris-Saclay (FR))

2:50 PM **Climate change and geohazards** ⌚ 1m

2:51 PM **Short and long term evolution of the climate** ⌚ 20m

Speaker: Prof. Ines Camilloni (Vice-Chair, IPCC Working Group I)

3:11 PM **Geohazard monitoring: Earthquakes, tsunamis, volcano, etc.** ⌚ 20m

Speaker: Prof. Gad el-Qadi (National Research Institute of Astronomy and Geophysics, Egypt)

3:31 PM **Energy for the future** ⌚ 1m

3:32 PM **Chinese magnetic confinement fusion development for a sustainable planet** ⌚ 20m

Speaker: Prof. Jiangang Li (Vice President CPS, Chief Scientist of EAST, Experimental Advanced Superconducting Tokamak)

3:52 PM **Future energy: Solar, hydrogen, e-fuels and nuclear** ⌚ 20m

Speaker: Prof. Jon Samseth (Chair, SCOPE, Scientific Committee of Problems of the Environment)

4:12 PM **Coffee break** ⌚ 18m

4:30 PM **New technologies and materials for future development** ⌚ 1m

4:31 PM **Sustainable development: a contradiction in terms** ⌚ 19m

Speaker: Prof. Halina Rubinsztein-Dunlop (U. Queensland, Australia)

4:50 PM **Open questions and discussion** ⌚ 1m

4:51 PM **Open questions and discussion with the audience** ⌚ 30m

Speaker: Prof. Irvy Gledhill (U. Witwatersrand, South Africa)

5:21 PM **Prepare to catch bus for banquet** ⌚ 39m

2:00 PM → 6:01 PM

Joint activities: Inter-Commission Symposium and interdisciplinary prizes

Convener: Silvina Ponce Dawson

2:15 PM

Opening of the second day ⌚ 4m

Speaker: Silvina Ponce Dawson

2:19 PM

Nuclear weapons production, control, and threat ⌚ 1m

2:20 PM

Where have all our good minds gone? ⌚ 25m

Speaker: Prof. Ana María Cetto

2:45 PM

Artificial Intelligence ⌚ 1m

2:46 PM

Gen AI? - What is the influence of AI on the young generation of scientists? ⌚ 20m

Speaker: Cyrus Walther

3:06 PM

Physics for the people: Academia and school, research and schooling ⌚ 1m

3:07 PM

Environmental injustice and the need for physics for and by the people ⌚ 25m

Speaker: Prof. Geraldine Cochran

3:32 PM

Coffee break ⌚ 28m

4:00 PM

Questions and discussion ⌚ 1m

4:01 PM

Open questions and discussion with the audience ⌚ 34m

Speaker: Prof. Sunil Gupta (Facilitator)

4:35 PM

Concluding remarks ⌚ 1m

4:36 PM

Concluding remarks ⌚ 8m

Speaker: Prof. Silvina Ponce Dawson

4:44 PM

End of the Inter-Commission Symposium ⌚ 1m

4:45 PM

Short break ⌚ 15m

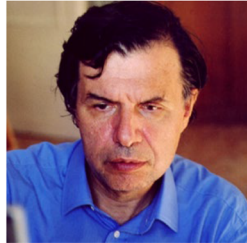
5:00 PM

Book launch: Globalizing Physics: One Hundred Years of the International Union of Pure and Applied Physics

⌚ 30m

Confirmed Speakers

In order of appearance



Giorgio Parisi is an Italian theoretical physicist, whose research has focused on quantum field theory, statistical mechanics and complex systems. His best known contributions are the QCD evolution equations for parton densities, obtained with Guido Altarelli, known as the Altarelli–Parisi or DGLAP equations, the exact solution of the Sherrington–Kirkpatrick model of spin glasses, the Kardar–Parisi–Zhang equation describing dynamic scaling of growing interfaces, and the study of whirling flocks of birds. He was awarded the 2021 Nobel Prize in Physics jointly with Klaus Hasselmann and Syukuro Manabe for groundbreaking contributions to the theory of complex systems, in particular "for the discovery of the interplay of disorder and fluctuations in physical systems from atomic to planetary scales".



Ines Camilloni is Professor at the Department of Atmospheric and Ocean Sciences of the University of Buenos Aires and Senior Researcher of the Center for Atmosphere and Ocean Research (CIMA). She is Vice-Chair of IPCC's Working Group I that examines the physical science underpinning past, present, and future climate change. She is also member of different committees and panels: World Commission on the Ethics of Scientific Knowledge and Technology of UNESCO, the Ethical Framework for Climate Intervention Advisory Board of the American Geophysical Union, the Scientific Advisory Committee of the Inter-American Institute for Global Change Research and the Interim Scientific Steering Group of the WCRP Lighthouse Activity on Climate Intervention Research.



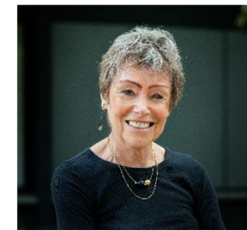
Prof. Gad Mohamed El-Qady is a Professor of Applied Geophysics working in the area of application of geophysical techniques for, but not limited to, environmental investigations, archaeological, geotechnical, groundwater, and geothermal investigations. Prof. El-Qady was President of the National Research Institute of Astronomy and Geophysics (NRIAG) from 2019 to 2024, and was Vice President from 2018 to 2019. During 2017 he was the acting president of the National Institute of Oceanography and Fisheries, Egypt. From 2013 to 2014, he was coordinator of the international relations of the Egypt-Japan University of Science and Technology. He was the science and cultural attaché of Egypt in Japan from 2010 to 2013. His PhD is from Kyushu University, Japan, in 2001. He is an active member of the Egyptian Geophysical and is the managing editor of the Journal of NRIAG. He was a working group committee member of IAGA, the International Association of Geomagnetism and Aeronomy, Division VI - Electromagnetic Induction in the Earth and Planetary Bodies from 2008 to 2016.



Prof. Jiangang Li is the Director of the Energy Research Institute, Hefei National Science Center, China. He is a Member of the Chinese Academy of Engineering, and Professor of the Institute of Plasma Physics, Chinese Academy of Science. He has worked in the field of fusion research for over 40 years. His main efforts have focused on plasma wave interaction, plasma wall interaction, and reactor design. He joined the EAST project, the Experimental Advanced Superconducting Tokamak, in 1998, and has led its construction and experimental program since 2000. He has concentrated on the Chinese fusion engineering DEMO reactor design and R&D during the past few years. He is the project leader of the Comprehensive Research Facility for Fusion Technology.



Jon Samseth is a professor of physics at Oslo Metropolitan University, and a research scientist at SINTEF, the largest research institution in Norway. Prof Samseth is a specialist in energy physics as well as materials physics. He has previously worked at the nuclear research reactor in Norway using neutrons as an investigative tool to study the structure of soft matter. In recent years he has focused on renewable energy and has been managing one of the large EU Horizon-funded projects on wind energy. Internationally, he has worked with UNEP on several topics in their yearbooks and been involved in working groups in IUPAP. He is currently the president of SCOPE, a scientific organization that focuses on emerging environmental issues. SCOPE is a member of the ISC, the International Science Council. In SCOPE he has been involved in assessments of bioenergy. Professor Samseth is an elected member of the Norwegian Academy of Technological Sciences.



Halina Rubinsztein-Dunlop is Professor of Physics in the School of Mathematics and Physics at the University of Queensland. She was educated at the University of Gothenburg and Chalmers University of Technology, Gothenburg in Sweden. Halina is a Director of Translational Research Laboratory of ARC CoE for Engineered Quantum Systems and was for 9 years Head of School of Mathematics and Physics. Recently, she took on the role of Deputy Director of a newly awarded Australian Research Council Centre of Excellence in Quantum Biotechnology. At the University of Queensland Halina leads large research groups in experimental quantum atom optics, laser micromanipulation and biophotonics. She also leads programs in both ARC Centre of Excellence.

Halina's many awards include being a Fellow of Australian Academy of Science, and of SPIE and Optica (former OSA). Halina was awarded Officer in the General Division (AO) of the Order of Australia (2018) for distinguished service to laser physics and nano-optics as a researcher, mentor and academic, to the promotion of educational programs, and to women in science. Her

other awards include Australian Optical Society W.H. (Beattie) Steel Medal, 2018 and 2018 UNSW Eureka Prize for Excellence in Interdisciplinary Scientific Research, 2019 Lise Meitner Award of German and Austrian Physical Society, OSA C.E.K. Mees Medal, AIP Harrie Massey Medal, Moyal Medal, 2024 Honorary Doctor of Science Degree (Honoris Causa), University of Glasgow and 2024 SPIE Directors' Medal. Halina is also actively involved in promotion of women in science, and in the promotion of educational programs.



Ana María Cetto has a Master in Biophysics from Harvard, and Master and Ph.D. in Physics from UNAM, the National Autonomous University of Mexico. She does research on the foundations of quantum mechanics at the Institute of Physics and teaches at the Faculty of Sciences, UNAM. She has published 25 books and 296 scholarly papers, and has been inter alia Director of the Faculty of Sciences, the Museum of Light and the Mexican Journal of Physics. She is a co-founder of the Third World Organization for Women in Science (OWSD), and has served as a consultant to UNESCO for the World Conference on Science, member of the Governing Board of the United Nations University, and Secretary General of the International Council for Science. She is the founding President of LATINDEX,

past President of the Mexican Physical Society (SMF), head of the project Lights over the City, holder of the UNESCO Chair on Diplomacy and Heritage of Science at UNAM, and Chair of the UNESCO Global Open Science Steering Committee. She has received, among others, the national awards for the Development of Physics (2002) and for Scientific Research from the SMF (2012), the UNESCO Kalinga Prize for the Popularization of Science in 2023, and the Oganesson Prize in 2024. In 2003 she was named Woman of the Year in Mexico. A chair at the University of Guadalajara and the optics museum at the Centro de Investigaciones en Óptica, A.C. are named after her. As a member of the Executive Committee of the Pugwash Conferences she participated in the 1995 Nobel Peace Prize and as Deputy Director General of the IAEA she participated in the 2005 Nobel Peace Prize.



Cyrus Walther is the Past-President of the International Association of Physics Students and Past-Chair of IUPAP Affiliated Commission 5, where he advocates for the young generation of physicists. He is Vice-Chair of IUPAP Working Group 16 "Physics and Industry", working on the IUPAP Corporate Associate Membership program, and honored with the Fellowship of the International Science Council, ISC, representing the global community of Physics students and advancing science for the global public good. Mr. Walther is an astroparticle physicist performing his Ph.D. at TU Dortmund University in Germany with his focus on high-energy gamma-ray astronomy. His research focus lies in Active Galactic Nuclei as well as in machine learning algorithms for high-energy astroparticle physics with past research involvement in the high-

energy particle physics experiment ATLAS. He serves on the Executive Committee of the

Commission on Data of the ISC with focus on the areas of young scientist involvement, the impact of data science on sustainability and the advancement of research assessment on data and AI. In the American Physical Society, Mr. Walther serves in the Forum on International Physics Outreach Committee and represents his university as one of five German Student Ambassadors in the APS Student Ambassador network.



Geraldine L. Cochran is an Associate Professor of Physics at The Ohio State University. Cochran is a Fellow of the American Physical Society (APS) and a Fellow of the American Association of Physics Teachers (AAPT). Cochran has extensive experience conducting equity-oriented physics education research that spans multiple levels of physics education including high school curricula, introductory collegiate level curricula, assessment in graduate education, and mentorship within the physics workforce. Cochran also investigates the experiences of marginalized people at various points in the academic pathway in physics, and interventions and programs aimed at making physics more equitable. Cochran is a member of the Inclusive Graduate Education Network research hub and a co-Principal Investigator on the National Science Foundation-funded Inclusive Graduate Programs in Physics project.

Hosts and organisers

In order of appearance



Xiaoyan SHEN specializes in experimental elementary particle physics at colliders, offline computing, Monte Carlo simulations, particle detectors, and data analysis. SHEN has been the Spokesperson (from 2011 to 2018) of the BESIII experiment in Beijing (an experiment at Beijing Electron-Positron Collider, and an international collaboration of more than 500 physicists from 17 countries in Asia, US, and Europe). Since 2019, she has been the executive committee member of BESIII. Under her leadership, BESIII achieved fruitful results on the precision test of the Standard Model of particle physics, including the discovery of the $Z_c(3900)$ structure, a candidate for the four-quark state. The $Z_c(3900)$ was named the top Physics News by the American Physical Society in 2013. SHEN was awarded the Outstanding Young Scientist by Chinese National Science Foundation (NSFC) in 2006, and Xie Xide Physics Prize (top physics prize given to a woman), Chinese Physical Society in 2015. She was IUPAP C11 member from 2013-2015. SHEN has graduated 35 Ph.D.'s., 5 Masters, and supervised 17 postdoctoral fellows. SHEN serves as the deputy director of the Experimental Particle Physics Division in the Institute of High Energy Physics.



Michel Spiro is a French physicist. He has been President of IUPAP since September 2019. It was on his initiative that the International Year of Basic Sciences for Development was launched, and he was the Chair of the Steering Committee of IYBSSD 2022-2023. He was an engineer at the French Atomic Energy Commission (CEA), where he carried out work in particle physics. In particular, he participated in the discovery of the intermediate W and Z bosons at CERN. He also participated in the GALLEX experiment for the detection of solar neutrinos and the EROS experiment for the search for dark objects. He has also held managerial responsibilities, as Director of the Department of Astrophysics, Nuclear and Particle Physics and Associated Instrumentation (DAPNIA) at the CEA, and Director of the National Institute of Nuclear and Particle Physics (IN2P3) of the CNRS, the Centre national de la recherche scientifique. He was Chairman of the CERN Council from 2010 to January 2013. He also contributed towards the proclamation on August 25, 2023, by the United Nations General Assembly, of an International Decade of Sciences for Sustainable Development 2024 to 2033. In this framework he chairs the Earth-Humanity Coalition during the year 2024.



Prof. Pietro Ubertini graduated *Laurea cum Laude* at University "La Sapienza", Rome, Italy, in 1973. In the 1970s-1990s, he was Principal Investigator of several stratospheric Balloon-Borne experiments in the field of high energy astronomy flown from Italy, India, USA, Brazil and Australia. From 2005 to 2012 he served as Director of the Space Astrophysics Institute in Rome, and from 2007 to 2009 was Member of the Scientific and Technical Committee of the Italian Space Agency. He is a Former President of the International Astronomical Union Division B: Facilities, Technologies and Data Science. At present he is Associate Director of Research at Istituto Nazionale di Astrofisica and Agenzia Spaziale Italiana. He is Vice-President of COSPAR (Committee on Space Research) and the Italian National Representative at the Council; and has been Principal Investigator (PI) of the IBIS gamma ray telescope on board the INTEGRAL ESA satellite, and deputy PI of the Limadou CSES-02 Sino-Italian program. From 2012 to 2016, he was Director of the newly born Institute for Space Astrophysics and Planetology of the National Institute for Astrophysics. He is Chairman of the IUPAP (Union of Pure and Applied Physics) Commission 19 Astrophysics, as well as a member of the Space Astronomy Technical Committee of IAF (the International Astronautical Federation).



Nithaya Chetty is Dean of the Faculty of Science at the University of Witwatersrand in Johannesburg, South Africa. He is the past President of the South African Institute of Physics, and former Deputy Director of the South African National Institute of Theoretical Physics. He served as the Deputy Chief Executive Officer of the South African National Research Foundation overseeing the Astronomy portfolio. He is a member of Academy of Science of South Africa and the Royal Society of South Africa. He is Vice President of the International Union for Pure and Applied Physics responsible for Membership and Development, and Chair of the IUPAP Working Group 21 Physics for Climate Change Action and Sustainable Development. His research interests focus on the theoretical foundations of quantum mechanical energy density, and theoretical studies of two-dimensional graphene-related materials. He is a past recipient of the National Research Foundation President's Award, and a two-time winner of the American Fulbright Fellowship, initially for graduate studies at the University of Illinois at Urbana-Champaign in 1985, and then subsequently for sabbatical leave twenty years later. Chetty helped found the African School for Electronic Structure Methods and Applications, which is now in its 16th year of operations. He is a strong advocate for academic freedom in South Africa.



Silvina Ponce-Dawson is President Designate for IUPAP in the 2021-2024 term. She is a Full Professor, University of Buenos Aires, and Higher Researcher, CONICET, the National Scientific and Technical Research Council of Argentina. She is Divisional Associate Editor for Physical Review Letters; Associate Editor, Editorial Board of Biophysics for Frontiers; and a Member of the Liaison Committee of the ISC Regional Focal Point for Latin America and the Caribbean. Her main research interests are in biological physics and nonlinear dynamics. She authored over 100 scientific papers. She advised 14 Licenciatura and 10 PhD theses and is advising another 6. She has been involved in numerous activities to help reduce the gender gap in science. She was Chair (2011-2014) of IUPAP's Working Group on Women in Physics and IUPAP's Gender Champion (2017-2019).

She was member of the Executive Committee of the Gender Gap in Science Project and in charge of its Latin American chapter. She co-edited a book on the gender gap in STEM in Latin America. She is member of the advisory committee for the Program on Gender Equality of the Argentinian Ministry of Science. She is the mother of two and grandmother of three.



Sunil K. Gupta is the Dr. Raja Ramanna Fellow and former Senior Professor at the Tata Institute of Fundamental Research, Mumbai, India. After his Ph.D. from the University of Bombay he joined the Tata Institute of Fundamental Research, Mumbai in 1976. He set up the largest astroparticle physics experiment, GRAPES-3, in India and developed new instruments that have applications in other areas such as nuclear and atomic physics and space sciences. He built a 30+ member collaboration of Indian and Japanese scientists that has made notable discoveries in the areas of space weather and atmospheric physics besides astroparticle physics. He has worked at leading international centres of research in the USA, Europe, and Japan. He led the team which discovered the transient weakening of Earth's protective magnetic field during a solar storm in 2016, and in 2019 discovered that thunderstorms produce a voltage of more than one billion volts and possess energy to power a large city for an hour. He has had a long association with IUPAP, having served on Commission C4, Astroparticle Physics, for a decade, including as Chairman. He was awarded O'Ceallaigh medal in 2023.



Ivy (Igle) Gledhill is Honorary Adjunct Professor of Flow Physics at the University of the Witwatersrand, South Africa. Her post-doctoral work was at the University of California, Los Angeles, on simulation of magnetic confinement of plasma, and at Stanford University on simulation of space shuttle physics. Returning to South Africa, she specialised in transonic computational fluid dynamics at the Council for Scientific and Industrial Research, and contributed as a computational physicist within multidisciplinary collaborations including rational drug design, ocean engineering, and coal mine safety.

She is a Past President of the South African Institute of Physics, SAIP, and chaired IUPAP Working Group 5 on Women in Physics. She served on the executive of the Gender Gap in Science project, initiated through the International Science Council, involving eight scientific unions. She is a Vice-President of the Network of African Science Academies, Interim Vice President of the Academy of Science of South Africa, and a Fellow of the SAIP and of the APS. She serves on the South Africa-UNESCO Science Sector Committee, and the World Cultural Council Interdisciplinary Committee. She was awarded a D.Sc. (honoris causa) by Rhodes University in 2024, and was the recipient of a National Science and Technology Forum award for science diplomacy in Africa. She is co-founder and Secretary of IUPAP Working Group 21.



Dr. Li Lu is a researcher specialized in electron transport experiments at low temperatures in the Institute of Physics, Chinese Academy of Sciences (IOP, CAS). He obtained a B.S. degree from Nanjing University in 1982, a Ph.D. from IOP in 1992. He was a visiting scientist at UC Berkeley during 1992-1995, and became a full professor of IOP in 1996. His current research interest is in topological quantum states and devices at ultralow temperatures.

Dr. Li Lu currently serves as the executive council member of the Chinese Physical Society (CPS), and the liaison of CPS with IUPAP. He also served as the deputy chair and then the chair of the Committee of Low Temperature Physics, CPS during 2001-2018, and served as a member of C5, IUPAP during 2002-2008. He was the founding director of the Laboratory of Physics under Extreme Conditions, IOP during 2002-2004, and the deputy director general of IOP during 2006-2012. He became a fellow of the American Physical Society in 2012.



Image credit Marian de Pontes, inspired by “The Pale Blue Dot”,
from NASA: a view of earth through Saturn’s rings taken by Voyager 1 in 1990.