Leopoldina
Nationale Akademie
der Wissenschaften

Curriculum Vitae Professor Dr Ignacio Cirac

Image: Markus Scholz | Leopoldina

Name: **Juan Ignacio Cirac**
Born: **11 October 1965**

Research Priorities: quantum information theory, quantum optics, physics of many-particle systems, atomic physics

Juan Ignacio Cirac is a Spanish physicist. He developed methods to describe and control the world of atoms, molecules, and photons with the laws of quantum mechanics.

Academic and Professional Career

2022 - 2023	Executive Director, Max Planck Institute of Quantum Optics, Garching, Germany
2018	Hanna Visiting Professor, Stanford University, Stanford, USA
2015	Distinguished Visiting Professor, Institute for Theoretical Physics, Spanish National Research Council (CSIC), Madrid, Spain
2014 - 2015	Executive Director, Max Planck Institute of Quantum Optics, Garching, Germany
2005 - 2007	Executive Director, Max Planck Institute of Quantum Optics, Garching, Germany
since 2002	Honorary Professor, Department of Physics, Technische Universität (TU) München, Munich, Germany
since 2001	Director, Department Theory, Max Planck Institute of Quantum Optics, Garching, Germany
1996 - 2001	Professor, Institute of Theoretical Physics, Leopold-Franzens-Universität Innsbruck, Innsbruck, Austria
1993 - 1994	Research Associate, Joint Institute for Laboratory Astrophysics, University of Colorado at Boulder, Boulder, USA

1991 - 1996	Professor, Section of Applied Physics, Universitad de Castilla-La Mancha, Ciudad Real, Spain
1991	PhD in Physics, Complutense University of Madrid, Madrid, Spain
1989 - 1991	Fellow, Section of Optics, Complutense University of Madrid, Madrid, Spain
1988	Degree in Theoretical Physics, Complutense University of Madrid, Madrid, Spain

Functions in Scientific Societies and Committees

since 2021	Member, International Advisory Committee, Grant Extreme Universe, Kyoto University, Kyoto, Japan and Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan
since 2020	Member, Scientific Committee, Fundació LA CAIXA, Valencia, Spain
since 2020	Member, Scientific Advisory Board, Weizmann Institute of Science, Rehovot, Israel
since 2020	Member, Scientific Advisory Board, Institute of Atomic and Molecular Sciences (IAMS), Academia Sinica, Taipei, Taiwan
since 2019	Co-Sprecher, Munich Center for Quantum Science and Technology (MCQST), Munich, Germany
2016 - 2020	Member, Advisory Board, Fundació LA CAIXA, Valencia, Spain
since 2016	Spokesperson, International Max Planck Research School Quantum Science and Technology, Munich, Germany
since 2015	Member, Advisory Board, Institute for Interdisciplinary Information Sciences, Tsinghua University, Beijing, China
since 2012	Member, Advisory Board, Russian Quantum Center, Moscow, Russia
since 2012	Member, Advisory Board, Annalen der Physik
since 2012	Chair, Scientific Advisory Board, ICFO – The Institute of Photonic Sciences, Barcelona, Spain
since 2011	Member, Review Panel, Quantumscience and Technology (QSIT), Swiss National Science Foundation (SNF), Switzerland
since 2010	Member, Scientific Committee der Fundación, Banco Bilbao Vizcaya Argentaria (BBVA) Frontiers of Knowledge, Bilbao, Spain
since 2008	Member, Advisory Board, Centro de Ciencias de Benasque, Benasque, Spain
2007 - 2009	Member, xQIT Visiting Committee, Massachusetts Institute of Technology (MIT), Cambridge, USA
2007 - 2008	Member, CIAR Review Panel, Toronto, Canada

since 2007 Member, Scientific Advisory Board, Centre of Quantum Technology, National University of Singapore, Singapore, Singapore

2007 - 2010 Member, Advisory Board, Institute for Theoretical Atomic Molecular and Optical Physic (ITAMP), Harvard University, Cambridge, USA

2005 - 2011 Associate Editor, Review of Modern Physics

2005 - 2008 Member, International Advisory Board, Quantum Information Processing Interdisciplinary Research Collaboration (QIP IRC), Engineering and Physical Sciences Research Council, Swindon, UK

2005 - 2008 Member, Curatorium, Institute of Quantum Optics and Quantum Information (IQOQI), Austrian Academy of Science, Innsbruck, Austria

2005 - 2007 Executive Director, Max Planck Institute for Quantum Optics, Garching, Germany

2002 - 2005 Associate Editor, Revista Española de Física

since 2001 Founding Managing Editor, Quantum Information and Computation

2000 - 2003 Associate Editor, Physical Review A

Project Coordination and Membership in Collaborative Research Projects

Since 2019 Spokesperson, Clusters of Excellence (EXC) "Munich Center for Quantum Science and Technology (MCQST)", German Research Council (DFG), Munich, Germany

since 2019 Applicant, Project "Quantum Information Protocols with limited resources", DFG

2007 - 2015 Head, Subproject "Nuclear Spins in Quantum Dots", Collaborative Research Centres (SFB) 631, DFG, Germany

2006 - 2019 Participating Researcher, EXC "Nanosystems Initiative Munich (NIM)", DFG, Germany

2006 - 2013 Applicant, Research Unit (FOR) "Quantum Simulations with Quantum Optical Systems", DFG, Germany

2003 - 2011 Head, Subproject "Theory of Many-particle Entanglement and its Application in Solid-State Systems", SFB 631, DFG, Germany

2003 - 2005 Applicant, Project "Theoretical and experimental research on the transmission of information through quantum channels operations ", DFG, Germany

Honours and Awarded Memberships

2021 Falling Walls Breakthrough Award in Physical Sciences, Falling Walls Foundation, Berlin, Germany

2020 Honorary Member, Col·legi d'Economistes de Catalunya, Barcelona, Spain

2020	Member, Bavarian Academy of Sciences and Humanities (BAdW), Munich, Germany
2019	Honorary Doctorate, University of Buenos Aires, Buenos Aires, Argentina
2019	Micius Quantum Prize (together with Peter Zoller), Micius Quantum Foundation, Shanghai, China
2019	John Stuart Bell Prize, University of Toronto, Toronto, Canada
2017	Max Planck Medal, German Physical Society (DPG), Germany
since 2017	Member, National Academy of Sciences Leopoldina, Germany
2017	Gran Gresol Prize, Fundació Gresol, Reus, Spain
since 2016	Member, Real Academia de Ciencias Exactas, Físicas y Naturales de España (RAC), Spain
2016	Honorary Doctorate, Universidad Europea, Madrid, Spain
2016	Profesor Distinguido, Institute of Mathematical Sciences (ICMAT), Madrid, Spain
2015	Honorary Medal, Garcia Cabrerizo Foundation, Madrid, Spain
2015	Hamburg Prize for Theoretical Physics, Joachim Herz-Stiftung, Hamburg, Germany
2015	Honorary Doctorate, Universitat Politècnica de València, Valencia, Spain
since 2015	Corresponding Member, Real Academia de Ciencias de Zaragoza, Saragossa, Spain
2015	Honorary Doctorate, Universitat de València, Valencia, Spain
since 2014	Honorary Member, Spanish Optical Society (SEDOPTICA), Spain
2014	Honorary Doctorate, Universidad de Zaragoza, Saragossa, Spain
2014	Visiting Miller Professorship Award, University of California (UC) Berkeley, Berkeley, USA
since 2013	Corresponding Member, Academia de Ciencias y Artes, Barcelona, Spain
2013	Wolf-Prize, Wolf Foundation, Herzlia Pituach, Israel
2013	Honorary Medal, Niels-Bohr Institute, Copenhagen, Denmark
2013	David Ben Gurion-Medaille, Ben Gurion University of the Negev, Beersheba, Israel
2011	Gran Cruz de la Orden del Dos de Mayo de la Comunidad de Madrid, Madrid, Spain
2010	Premi Nacional de Pensament i Cultura Científica, Government of Catalonia, Barcelona, Spain
2010	Benjamin Franklin Medal, Franklin Institute, Philadelphia, USA
2009	Honorary Medal, Universidad Complutense de Madrid, Madrid, Spain
2009	Distinguished Research Chair, Perimeter Institute, Waterloo, Canada

2009	Carl-Zeiss-Humboldt Research Award, Carl-Zeiss-Stiftung, Stuttgart, Germany
2008	BBVA Foundation Frontiers of Knowledge Award for Basic Science, BBVA Foundation Frontiers of Knowledge, Bilbao, Spain
2007	Honorary Scientific Member, Academia de Ciencias de la Región de Murcia, Murcia, Spain
2007	National Blas Cabrera Prize for Physical, Material and Earth Sciences, Premio Nacional, Ministerio de Ciencia e Innovación, Spain
2007	Honorary Doctorate, Universitat Politècnica de Catalunya BarcelonaTech (UPC), Barcelona, Spain
2006	6th International Quantum Communication Award, Tamagawa Academy (K-12) Tamagawa University, Tokyo, Japan
2006	Prince of Asturias Award for Technical and Scientific Research, The Princess of Asturias Foundation, Madrid, Spain
2005	Honorary Doctorate, Universidad Castilla-La Mancha, Ciudad Real, Spain
2005	Quantum Electronics Prize, European Physical Society (EPS)
since 2003	Corresponding Member, Austrian Academy of Sciences, Austria
since 2002	Corresponding Member Member, Real Academia de Ciencias, Madrid, Spain
2002	Medalla de la RSEF, Real Sociedad Española de Física, Madrid, Spain
since 2002	Member, American Physical Society, USA
2001	Felix-Kuschenitz Price, Austrian Academy of Sciences, Austria
1992	Premio Nacional a Investigadores Noveles, Real Sociedad Española de Física, Madrid, Spain

Research Priorities

Juan Ignacio Cirac is a Spanish physicist. He developed methods to describe and control the world of atoms, molecules, and photons with the laws of quantum mechanics.

Some of Juan Ignacio Cirac's work describes how quantum mechanical properties can be used safely and efficiently for the transmission and storage of information. This is a prerequisite for the development of quantum computers, with which computing operations would be performed much faster than before. Thus, quantum computers could simplify the research in databases and revolutionize the security of data transmission.

Juan Ignacio Cirac developed concepts like quantum repeaters, calculations by dissipation, as well as quantum networks and quantum logic gates that are based on collisions. He further contributed

to development of an information theory that is based on quantum mechanics.

Juan Ignacio Cirac and his research team also developed methods to cool down atoms or to polarise nuclear spins in quantum dots with which to utilize their quantum behaviour. With that, they created new theoretical tools to characterize and quantify entanglement, which is an important property in quantum mechanics that is the foundation for most phenomena and applications. With this technology, they researched methods with which many-particle systems can be described in new ways. These methods not only provided immensely capable numeric algorithms for the study of quantum systems, but they can also be applied to other areas of physics.