



CURRICULUM VITAE

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Personal information

- Born : Brussels (Belgium), April 8, 1965
- Citizenship : Belgian
- Married, 3 children

Education

1987 M. Eng. in Electronics and Telecommunication (5-year programme), ULB, with highest honors.
1988 M. Sc. in Theoretical Physics, ULB, with highest honors.
1993 Ph. D. in Physics, ULB, with highest honors.
1995 Habilitation to teach at university level (*Agrégation de l'enseignement supérieur*), ULB.

Employment history

1988-1993 Ph. D. student in Physics, ULB
(*Note : it includes a 1-year leave of absence for compulsory military service.*)
1993-1995 Postdoctoral research associate (Marie Curie fellow), Division of Theoretical Physics, University of Paris XI, Orsay (France).
1995-1998 Postdoctoral research fellow (2 y) and senior research fellow (1 y), California Institute of Technology, Pasadena (USA).
1998-2009 Associate Professor, Ecole polytechnique de Bruxelles, ULB.
2009-present Full Professor, Ecole polytechnique de Bruxelles, ULB.
Teaching Quantum Mechanics, Information and Coding Theory, Quantum Information.
2001-present Director of the Centre for Quantum Information and Communication (QuIC), ULB.

Fellowships

- FNRS doctoral research fellowship, Fonds National de la Recherche Scientifique, 1988-1993.
- Marie Curie individual fellowship, European Union, 1993-95.
- Caltech research / senior research fellowship, California Institute of Technology, 1995-98.
- NATO grant for scientific research, 1996.

Awards, prizes, and honors

- Caltech President's Fund Award (California Institute of Technology), 1997.
- Alcatel-Bell Scientific Prize (awarded by the FNRS), 1999.
- Fulbright Advanced Research/Lecturing Award, 1999.
- Prize of the Wernaers Fund (awarded by the FNRS), 2000.
- Marie Curie excellence award (awarded by the EC), 2006.
- Nominated by the Grand Jury for the Descartes Prize for Transnational Collaborative Research as the coordinator of the European FP6 project COVAQIAL, 2007.
- Elected member of the Royal Academies for Science and the Arts of Belgium, 2009.

Visiting positions

- Visiting Scholar, Institute for Quantum Information, California Institute of Technology (USA), regular one-month visits in Summer 1999-2005.
- Visiting Associate, Information and Computing Technologies Research Section, JPL, NASA (USA), from August to October 1999 (3 months); one-month visits in Summer 2000, 2001, and 2002.
- Visiting Professor at the Institut Henri Poincaré (Paris) from January 9 to February 3, 2006, invited to give a course in the programme “*Quantum information, computation and complexity*”.
- Visiting Professor at the Katholieke Universiteit Leuven, April 3 – 14, 2006, invited to give a course on “*Quantum optics and quantum information*”.
- Professor of the course “*Introduction à l’information quantique et au calcul quantique*”, 2009, Collège Belgique (Royal Academies for Science and the Arts of Belgium).
- Visiting Professor (sabbatical semesters) at the Center for Extreme Quantum Information Theory, Massachusetts Institute of Technology, Cambridge (USA), from November 2008 to February 2009 (4 months) and from September 2010 to January 2011 (5 months).
- Visiting Professor (sabbatical semester) at the Center for Quantum Networks, University of Arizona, Tucson (USA), from September 2022 to December 2022 (4 months).

Scientific production

- Author of 168 articles in peer-reviewed journals, including 32 letters in *Physical Review Letters*, 2 articles in *Reviews of Modern Physics*, 1 article in *Proc. Natl. Acad. Sci. USA*, and 6 articles in *Nature Research* journals including 1 letter in *Nature*.
- Author of a chapter in the first book devoted to *Quantum information with continuous variables* published by *Kluwer* (2002).
- Co-editor of a book on this field published by *Imperial College Press* (2007).
- Author of 9 popular science articles, including 5 in the renowned French magazine *La Recherche* (1 in a special issue devoted to Einstein’s legacy and the year of physics 2005, and 2 in a special column treating *Quantum teleportation*, co-signed with G. Brassard, C. Crépeau, and N. Gisin).
- Co-author of 2 patents.
- Presented many invited talks and contributed talks at international conferences, including several guest lectures or courses at international schools or training workshops (e.g., Les Houches, Cargèse, Oberurgl, Newton Institute in Cambridge, ICTP Trieste, EMFCSC Erice, etc.).

High-impact research achievements

- Uncovered the significance of negative information in the quantum formulation of Shannon information theory (quantum conditional and mutual entropies, quantum channel capacities, entropic Bell inequalities);
- Invented the adiabatic quantum search algorithm (first quantum algorithm by adiabatic evolution with a proven quantum speed-up);
- Developed the first continuous-variable (Gaussian) quantum cloning and quantum cryptographic protocols, pioneering the area of continuous-variable quantum information processing;
- Established the fundamental quantum limit on information transmission via (Gaussian) bosonic channels, extending Shannon’s most famous channel capacity formula to the quantum regime;
- Discovered a quantum two-photon interference effect in the amplification of light, which is a timelike counterpart of the fundamental Hong-Ou-Mandel effect in an active optical medium;
- Uncovered the existence of anomalous boson bunching, namely that the (multimode) bunching of partially distinguishable bosons may beat that of fully indistinguishable bosons, hence disproving the common belief that boson bunching is maximized with indistinguishable bosons.

Bibliometry

- h-index: 68 (Google scholar).
- total number of citations ca. 27000 (Google scholar).
- 1 article in *Nature* (2003) received ca. 1700 citations (Google scholar) and was ranked by ISI Web of Science in the top 1% of the most influential articles in its field.

Research leader, scientific responsibilities

- Head of the *Centre for Quantum Information and Communication* (QuIC) since 2001, a research group of 15-20 people (first established Belgian group in quantum information science).
- Supervisor of 15 Ph.D. theses (+ 4 at present). After graduation, the Ph.D. students have been offered postdocs in many international groups (Université de Genève, University of Barcelona, California Institute of Technology, ICFO Barcelona, Université de Paris XI-Orsay, University of California Berkeley, NEC Princeton, ST Microelectronics, Massachusetts Institute of Technology, City University of New York, Max Planck Institute for Quantum Optics MPQ-Garching, University of Warwick, University of Arizona in Tucson, University of Cambridge, Albert-Ludwigs-Universität Freiburg, INRIA ENS Paris).
- Mentor of 20+ postdoctoral researchers.
- Advisor of 20+ Ms. theses and co-advisor of 4 Ms. theses (1 at Vrije Universiteit Brussels, 2 at Ghent University, 1 at Ecole Normale Supérieure in Lyon, France, and 1 at Johannes Gutenberg University in Mainz, Germany).
- Examiner in the thesis committees of 20+ Ph.D. students in Belgium and abroad.
- Belgian member of the steering committee of the scientific programme *Quantum information theory and quantum computation*, funded by the European Science Foundation (1999-2004).
- Belgian member of the governing board of the European Coordinating Action QUROPE (*Quantum Information Processing and Communication in Europe*), 2006-2009.
- Belgian member of the scientific board of the European Coordination Action QUIE²T (*Quantum Information Entangled-Enables Technologies*), 2010-2013.
- Belgian member of the Advisory Board of the Coordination Action QUTE-EUROPE (*Quantum Technologies for Europe*), 2013-2016.

Conference organization

- Co-founder and organizer of the first international conference devoted to *Quantum information with continuous variables*, CVQIP'02, Brussels, April 2002. This initiated a series of conferences (CVQIP'03 Aix-en-Provence, CVQIP'04 Veilbronn, CVQIP'05 Prague, CVQIP'06 Copenhagen, CVQIP'07 St Andrews, CVQIP'10 Ammersee near Munich, CVQIP'11 Paris, CVQIP'12 Frederiksdal near Copenhagen, CVQIP'13 Paris). Co-organizer of all these conferences.
- Co-organizer of the *ESF exploratory workshop on Long-distance Quantum Communication Networks with Atoms and Light*, Prague, Czech Republic, April 9-12, 2005.
- Co-organizer of the *26th Symp. on Information Theory in the Benelux*, Brussels, May 19-20, 2005.
- Co-organizer of the special session on *Quantum Optics and Quantum Information*, ICO Topical Meeting on Optoinformatics/Information Photonics, IV International Optical Congress « Optics – XXI Century », St-Petersbourg, Russia, September 4-7, 2006.
- Chair of the first *Solvay Workshop on Bits, Quanta, and Complex Systems: Modern approaches to photonic information processing*, organized by the International Solvay Institutes and held at the Palace of the Royal Academies for Science and the Arts, Brussels, April 30 to May 3, 2008.
- Co-chair of *21st Central European Workshop on Quantum Optics*, Brussels, June 23-27, 2014.
- Local organizing committee of the 26th international conference on Quantum Information Processing (QIP 2023), Ghent, 4-10 February 2023.

Technology transfer, links with industry

- Co-inventor of a patent on a high-rate quantum key distribution scheme using coherent light states. A prototype of this invention, adapted to telecom wavelengths, was tested in the laboratory of the company *Thales* and was proven to be a successful QKD platform in project SECOQC (quantum metropolitan-area network demonstration, Vienna, 2008). An improved version was later commercialized by the company *SeQureNet*, a spin-off of Telecom ParisTech.
- Principal investigator of the project "LINK" with the support of the company *Proton Technologies* (now *STMicroelectronics*), specialized in security and cryptography applications. An engineer of the company, G. Van Assche, was a former Ph.D. student at QuIC. His thesis manuscript was published as a book by *Cambridge University Press* (2006).
- Responsible for a project "Spin-off in Brussels" with 2 former Ph.D. students (L.-P. Lamoureux and J. Niset), which led to the creation of the company *SQR Technologies*, a spin-off of ULB in 2010. The Intellectual Property rights have been transferred to *ID Quantique* (IDQ) in 2017.

Role in increasing the public awareness of science

- Presented many scientific popularizing seminars on *quantum information science* for different public: secondary school students, undergraduate students, physics teachers at secondary school, industry, and general public.
- Was interviewed by *Radio France Internationale* (Paris) on January 21, 2000; programme “Le Monde Change” by Patrick Chompré.
- Was interviewed by Belgian national TV news (*Journal Télévisé, RTBF*) on April 18, 2005; by Pascale Bollekens.
- Was interviewed by *Radio France Internationale* (Paris) on April 28, 2005; programme “Le Monde Change” by Patrick Chompré.
- Was interviewed by *France Info* on May 12, 2005, and on August 25, 2005; chronique “Profession chercheur” by Marie-Odile Monchicourt.
- Was interviewed by Belgian national radio (*La Première, RTBF*) on December 4, 2005, and on December 11, 2005; programme “Semences de curieux” by Jacques Olivier.
- Was interviewed by Denis Delbecq in *La Recherche*, n° 455, September 2011, « Un nouveau monde quantique », p. 48-50.
- Was interviewed by Azar Khalatbari in *Sciences et Avenir*, n° 776, October 2011, « Une piste pour les ordinateurs du futur », p. 24.
- Was interviewed by Louise Mussat in *Le Monde (Science & Médecine)*, February 15, 2017, « Le temps, une propriété émergente », p. 8.

Miscellaneous

- Serving as a referee for various scientific journals, including *Nature* family journals, *Science*, *Physical Review* journals, etc.
- Serving as an evaluator for various organizations, including the *European Commission* and the *Agence Nationale de la Recherche* (France).
- Co-founded the *Antonella Karlson Prize* in exact sciences (awarded by FNRS).

Research Funding

Funding from European Union:

- QUIPROCONE (*Quantum Information Processing and Communications Network of Excellence*); Grant: IST-1999-29064, from 2000 to 2004
- EQUIP (*Entanglement in Quantum Information Processing and Communication*)
Grant: IST-1999-11053, from 01/01/2000 to 31/12/2002
- CHIC (*Consortium for Hamiltonian Intra-molecular Computing*)
Grant: IST-2001-32150, from 01/07/2002 to 30/06/2006
- RESQ (*Resources for Quantum Computation*)
Grant: IST-2001-37559, from 01/01/2003 to 31/12/2005
- SECOQC (*Development of a Global Network for Secure Communication based on Quantum Cryptography*)
Integrated Project (IP): IST-2002-506813, from 01/04/2004 to 31/03/2008
- COVAQIAL (*Continuous Variable Quantum Information with Atoms and Light*)
Specific Targeted Research Project (STREP): FP6-511004, from 01/09/2004 to 31/08/2007
Role: coordinator, 7 teams involved (total budget = 1.4 M€)
- QAP (*Qubit Applications*)
Integrated Project (IP): from 01/11/2005 to 30/10/2009
- QUROPE (*Quantum Information Processing and Communication in Europe*)
Coordinated Action (CA): from 01/09/2006 to 31/08/2009
- COMPAS (*Computing with Mesoscopic Photonic and Atomic States*)
Specific Targeted Research Project: FP7-ICT-2007-C-212008, from 01/04/2008 to 31/03/2011
Role: coordinator, 10 teams involved (total budget = 1.6 M€)
- HIPERCOM (*High-performance coherent quantum communications*)
Era-Net, European coordinated research on long-term challenges in ICST, 01/09/2011- 31/08/2014.
Role: coordinator, 6 teams involved (total budget = 1.2 M€)
- QUCHIP (*Quantum Simulation on a Photonic Chip*)
ICT FET-PROACTIVE project in H2020, from 01/03/2015 to 28/02/2018
- ShoQC (*Short-Range Optical Quantum Connections*)
QuantERA, H2020 ERA-NET Cofund in Quantum Technologies, from 01/01/2020 to 31/12/2022.
- AppQInfo (*Applications and Hardware for Photonic Quantum Information Processing*)
ITN, Marie Skłodowska-Curie Actions programme, project No. 956071, 2021-2025.

Funding from Belgian institutions:

- FNRS: 1 individual grant (“Crédit aux chercheurs”), 1998-99.
- FNRS: 6 grants (“Projet de recherche”), 2000-01, 2002-07, 2008-11, 2011-14, 2013-17, 2018-21.
- ULB: 3 grants (“Fonds d’Encouragement pour la Recherche – FER”), 2000, 2003, 2008.
- Fédération Wallonie-Bruxelles: Coordinator of 2 grants within ARC programme (“Action de Recherche Concertée”), 2000-2005, 2012-2017.
- Belgian Science Policy Office (BELSPO): 3 grants within IAP (“Inter-University Attraction Pole”) programme, PHOTON 2002-2006, Photonics@be 2007-2011, and Photonics@be 2012-2017.
- Brussels-Capital Region (INNOVIRIS): 4 grants. Coordinator of project CRYPTASC within “ICT Impulse Program” involving 4 teams, from 01/09/2007 to 31/08/2013 (total budget = 2.2 M€). Scientific advisor of 2 other projects within “Prospective Research in Brussels” and “Spin-off in Brussels”. Recipient of a grant “LINK”, 1999-2003.
- EOS: 1 “Excellence of Science” grant (*Creating highly entangled quantum states*), 2022-2025.

* The prize *La Recherche 2004* was awarded to 5 Ph.D. students of the centre QuIC (supervisor N. J. Cerf) and the Institut d’Optique d’Orsay (supervisor P. Grangier) for the joint work of the two teams on quantum cryptography.