

Biographical Sketch: Giacomo Mauro D'Ariano

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Education Laurea in Physics (Solid State) (1978), University of Pavia, Italy (Advisor: F. Borsa)
 Scuola di Perfezionamento in Polymer Science, Politecnico di Milano, 1979 (Advisor: A. Pavan).
 Research training: NMR, Phase transitions and Magnetic Systems, 1980-1982 (Advisor: A. Rigamonti); Statistical Mechanics, Group Theory, Integrable Systems, 1982-84 (Advisor: M. Rasetti)

Employment

2000-present Leader, *Quantum Optics and Information Group*, Istituto Nazionale di Fisica della Materia (INFN) (Pavia Unit)

2000-present Full professor, Dipartimento di Fisica “A. Volta”, University of Pavia, Italy

1992-2000 Associate professor, Dipartimento di Fisica “A. Volta”, University of Pavia, Italy

1984-1992 University Researcher, Dipartimento di Fisica “A. Volta”, University of Pavia, Italy

Other Institutional activities

2000-present Member of Center for Photonic Communication and Computing, ECE Department, Northwestern University, Evanston, IL

Honors, fellowships and awards

Alumnus Almo Collegio Borromeo of Pavia (1974-80); Fellowship in *Polymer Science* Politecnico di Milano (1978-79); Research fellowship, Pavia University (1979-80). Two INFN Excellences 1998; INFN Highlight 2000-01.

Main accomplishments

Started Quantum Optics and Quantum Information at Pavia University. Started the *Quantum Optics and Information Group* of the INFN in Pavia. Conceived and developed the first exact quantum homodyne tomographic method. Generalized the quantum tomographic method to arbitrary quantum system and arbitrary ensemble average. Conceived the first feasible method for experimental characterization of quantum devices.

Invited stages, visiting scholar, and visiting professor

[m=month, w=week] Institut des Hautes Études Scientifiques of Bur sur Ivette, Paris (1984 3m: L. Michel); Center for Nonlinear Studies, Los Alamos, New Mexico (1987 1w: M. M. Nieto and D. Campbell); Arbeitsgruppe “Nichtklassische Strahlung” der Max-Planck-Gesellschaft an der Humboldt-Universität zu Berlin (1994 1m: H. Paul); Department of Electrical and Computer Engineering, Northwestern University, Evanston IL (1994 2m, 95 4m, 96 4m: H. P. Yuen; 97 3m, 98 2m: P. Kumar; 2000 3m, 2001 5m, 2002 4m: H. P. Yuen); Department of Physics and Astronomy, University of Missouri-Columbia (1991 2w: B. DeFacio); Department for Physics and Astronomy, University of New Mexico (1993 1w: C. Caves); Graduate School of Human Informatics, Nagoya University, Japan (1993 1w: M. Ozawa); Abteilung für Quantenphysik, Universität Ulm (1994 1w W. Schleich); Max-Planck, Munich (1995 1w: H. Walther); Friedrich Schiller University di Jena, Theoretical Physics Institute (1997 1w: D. Welsch); University of Oxford (1998 1w: A. Ekert); Department of Physics, University of Maryland at Baltimore County, (1998 1w, 1999 1w, 2000 1w: Y. Shih, M. Rubin); Department of Mathematics, University of Stuttgart (2001 1w: B. Kummerer) EURANDOM, Eindhoven (2003 1w: R. Gill)

Funded Research Projects

INFN Advanced Research Projects (PRA): (1997-00) *Generation and detection of quantum mesoscopic superpositions in parametric media (CAT)*; (2002-) *Quantum Teleportation and Quantum Cloning by the Optical Parametric Squeezing Process (CLON)*; INFN PAIS Projects: (1999-00) *Study of correlations and state reduction in cw and pulsed parametric devices by self homodyne techniques (TWIN)*; Italian Ministry of University and Research Projects: (1997-98) *Amplification and Detection of Quantum Information*, (1999-00) *Quantum Information Transmission and Processing: Quantum Teleportation and Error Correction* (2002-) *Entanglement Assisted High Precision Measurements*

Institutional and Professional Service

Member of the Steering Committee of *Quantum Information Theory and Quantum Computation* of the European Science Foundation (1999-2002); Member of the Network of Excellence *QUIPROCONE* (Quantum Information Processing and Communication) (2000-); **Principal Organizer:** Working Conference on Quantum Measurements and Open Quantum Systems, Torino, Institute of Scientific Interchanges, 1997; II Working Party on Quantum Optics and Quantum Computation, Scuola Normale di Pisa 1997. **Member of the Organizing Committee:** 6th International Conference on Quantum Communication, Measurement, and Computing, MIT, Cambridge, MA, 2002; 5th International Conference on Quantum Communication, Computing and Measurement, Chicago, 1998. **Member of the Advisory Committee:** Wigner Centennial Conference, Pecs Hungary 2002; 7th International Conference on

Squeezed States and Uncertainty Relations, Boston, MA, 2001; 6-th International Conference on "Squeezed States and Uncertainty Relations" Naples 1999; 5th International Conference on Quantum Communication, Measurement, and Computing, Capri, Italy, 2000. **Member of Program Committee:** subcommittee "Quantum Optics", EQEC Munich, 2003; Topical meeting on: Quantum Information and Communication, Laser Munich 2001; Topic area: Quantum Optics, CLEO/EUROPE-IQEC Nice 2000. **Editorial Board Member:** Journal of Quantum and Semiclassical Optics, 2000-. **National Research Project Coordinator:** (1997-98) *Amplification and Detection of Quantum Information*, (1999-00) *Quantum Information Transmission and Processing: Quantum Teleportation and Error Correction* (2002-) *Entanglement Assisted High Precision Measurements*.

Research Interests

Quantum Information and Quantum Mechanics of Measurements and Open Systems. New types of quantum devices: programmable quantum devices. New kinds of quantum measurements. Quantum tomography of states and quantum devices. Quantum communications. Exploiting the quantum entanglement for improving quantum measurements. Logical foundations of quantum mechanics. **Additional expertise:** Quantum Mechanics in general, Quantum Optics, Group Theory, Lie algebras, Monte Carlo simulation methods, Statistical Mechanics, Phase transitions, NMR.

Publications: Over 192 papers, including 139 on peer-reviewed journal, 22 articles in hardbound volumes, one coauthored book, one co-edited book, one teaching book (in Italian), one computer book (in Italian), 15 conference papers, 12 preprints

Invited Talks: Over 70 invited talks, seminars, and lectures. Chairman of numerous conference sessions.

Principal Publications in the Past Five Years:

- M. Vasilyev, S.-K. Choi, P. Kumar, and G. M. D'Ariano, *Tomographic measurement of joint photon statistics of the twin-beam quantum state*, Phys. Rev. Lett. **84** 2354 (2000)
- G. M. D'Ariano, and P. Lo Presti, *Quantum tomography for measuring experimentally the matrix elements of an arbitrary quantum operation*, Phys. Rev. Lett. **86** 4195 (2001)
- G. M. D'Ariano, and P. Lo Presti, M. G. A. Paris, *Using entanglement improves precision of quantum measurements* Phys. Rev. Lett. **87** 270404 (2001)
- G. M. D'Ariano, F. De Martini, and M. F. Sacchi, *Continuous variable cloning via network of parametric gates*, Phys. Rev. Lett. **86** 914 (2001)
- S. L. Braunstein, G. M. D'Ariano, G. J. Milburn, and M. F. Sacchi, *Universal teleportation with a twist*, Phys. Rev. Lett. **84** 3486 (2000)

Other Collaborators

Current: H. P. Yuen, P. Kumar, F. De Martini, A. Mazzei, M. Ricci, G. Cassinelli, E. De Vito, R. Gill, B. Kümmerer, V. P. Belavkin, A. Andreoni, M. Bondani, A. Porzio, S. Solimeno. **Past:** D. Bruß, A. Levrero, P. Tombesi, S. Mancini, M. Fortunato, S. L. Braunstein, G. J. Milburn, M. Rubin, Y. Shih, A. Garuccio, K. Banaszek, M. Vasilyev, M. Fortunato, and P. Tombesi, S. Mancini, V. I. Man'ko, U. Leonhardt, H. Paul, R. Schack, C. M. Caves, S. Moroni, L. R. Evangelista, M. Saraceno, B. DeFacio, R. Bonifacio, M. Rasetti, A. Montorsi, M. Vadamchino, J. Katriel, A. Solomon, L. Michel **Occasional:** R. Werner, A. Ekert, M. Mosca, W. van Dam, G. A. Barbosa, C. Agnes, C. Buzano, L. Benini, C. Marchetti, S. Aldovrandi. **Only coauthors:** S.-K. Choi, M. B. Plenio, S. Bose, D. Jonathan, M. De Laurentis, M. Keyl, H. Maassen, E. Corndorf, G. Di Giuseppe, T.-G. Noh, P. Voss, A. P. Bonoldi, E. Castellaro, R. Ciapparelli, E. Cima, D. Colombo, M. Maffezzini, R. Dionigi. **Continuing discussion:** M. Ozawa,

Laurea, PhD, and Postdoctoral Supervision, Contract Sponsor

Laurea Thesis: L. Bertolini (1981/82), A. Cavalli (1984/85), G. Onida (1986-87), N. Sterpi (1986/87), R. Paoletti (1987/88), R. Simonelli (1991/92), R. Seno (1991/92), A. Zucchetti (1993/94), G. Orfino (1993/94), M. Sacchi (1994/95), L. Maccone (1995/96), M. Painsi (1997/98), M. Cinchetti (1998/99), P. Perinotti (1998/99), P. Scudo (1999/00), P. Lo Presti (1999/00), B. Falabretti (2001/02), R. Mecozzi (2001/02), F. Buscemi (2001/02). **PhD Thesis:** C. Macchiavello (1992-94), M. Paris (1992-94), R. Seno (1994-96), M. Sacchi (1996-98), L. Maccone (1997-99), P. Lo Presti (2000-), F. Buscemi (2002-). **Postdoctoral Fellows:** N. Sterpi (1994-95,97-98), M. Paris (1996-01), C. Macchiavello (1997-98), M. Sacchi (1998-01), L. Maccone (2000-01), P. Perinotti (2002-). **Long-term contract Sponsor:** M. Sacchi (2001-), O. Rudolph (2001-). **Short contracts :** K. Banaszek (1999), Th. Richter (2000).

Teaching Activities

Quantum Optics (1992-1999, Laurea, Phys.), *Quantum Systems and Information* (2000-, Laurea, Phys.), *Structure of Matter* (1997-98, Laurea, Phys.), *Solid State Theory* (1991-92, Laurea, Phys.), *Seminars in Statistical Mechanics* (1984-99, Laurea, Phys.), *Quantum Stochastic Methods in Quantum Optics* (1990-91, PhD, Phys.), *Structure of Matter: lecturer* (1984-94, Laurea, Phys.), *General Physics: lecturer* (1983-84, Laurea, Biology) *Physics Lab: lecturer* (1979-80, Laurea, Medicine), *Polymer Science: seminars on Creep Fracture* (1978-79, Laurea, Engineering)

International Schools

College on Representation Theory of Lie Groups, Trieste ICTP. 1985; *Summer School attributed to the Memory of Prof. A. O. Barut*, Ankara 1995 (two series of lectures)

Professional Societies:

Società Italiana di Fisica, Optical Society of America