# Lorenza Viola

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## Education

**Ph.D., Physics, University of Padua, Italy**
October 1996. Thesis: "Relativistic stochastic quantization through co-moving coordinates."
Advisor: Prof. Laura M. Morato, University of Verona, Italy.

**M.S., Physics, University of Trento, Italy**
December 1991, *Laurea Summa Cum Laude*. Thesis: "Roto-vibrational spectroscopy of linear quadriatomic molecules in the vibron model: monofluoroacetylene." Advisor: Prof. Francesco Iachello, Yale University.

## Professional Experience

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|---|---|
| Since 7/20 | **James Frank Family Professor of Physics**<br>*Dartmouth College*, Department of Physics and Astronomy. |
| 07/12 - 7/20 | **Professor of Physics**<br>*Dartmouth College*, Department of Physics and Astronomy. |
| 07/04 - 06/12 | **Associate Professor of Physics**<br>*Dartmouth College*, Department of Physics and Astronomy. |
| 01/02 - 01/05 | **J. Robert Oppenheimer Fellow**<br>*Los Alamos National Laboratory*, Computer & Computational Sciences Division. |
| 08/00 - 12/01 | **Director-Funded Postdoctoral Fellow**<br>*Los Alamos National Laboratory*, Theoretical Division.<br>Research advisors: Dr. Emanuel Knill, Dr. Raymond Laflamme. |
| 01/97 - 07/00 | **Postdoctoral Fellow**<br>*Massachusetts Institute of Technology*, Department of Mechanical Engineering.<br>Research advisor: Prof. Seth Lloyd. |
| 01/93 - 12/96 | **Graduate Research Fellow**<br>*University of Padua*, Italy, Department of Physics. |

## Visiting Appointments

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| Since 09/16 | **EQUS Partner Investigator**<br>*ARC Centre of Excellence for Engineered Quantum Systems*, The University of Sydney. |
| 02/13 - 03/13 | **Visiting Scientist**<br>*Kavli Institute for Theoretical Physics*, University of California, Santa Barbara. |
| 06/09 - 07/09 | **Visiting Scientist**<br>*Kavli Institute for Theoretical Physics*, University of California, Santa Barbara. |
| 11/08 - 12/08 | **Visiting Scientist**<br>*Institute for Theoretical Atomic, Molecular, and Optical Physics*, Harvard-Smithsonian. |
| 09/07 - 12/07 | **Visiting Scientist**<br>*Center for Extreme Quantum Information Theory*, Massachusetts Institute of Technology. |
| 01/05 - 08/07 | **Guest Scientist**<br>*Los Alamos National Laboratory*, Computer & Computational Sciences Division. |
| 01/99 - 12/99 | **Postdoctoral Visiting Associate**<br>*Northeastern University*, Department of Physics. |

## Research Interests

• **Quantum Information Science**: Modeling and control of open quantum systems. Methods for robust quantum information processing: dynamical decoupling, quantum error correction, noiseless subsystems, quantum feedback. Fundamental limits of control, quantum sensing and metrology. Theory and applications of entanglement, entanglement in quantum field theories. Quantum signatures of gravitation.
• **Quantum Statistical Mechanics:** Quantum irreversibility, quantum decoherence and dissipation in open quantum systems, engineered dissipation. Many-body quantum chaos and complexity. Equilibrium and non-equilibrium quantum critical phenomena. Topological phases of matter, bulk-boundary correspondence.

## Awards and Honors

2017 Outstanding referee, *American Physical Society* (APS)
2016 Outstanding referee, *Nature and Nature Publications*
2016 Nominated for the *Simons Investigator in Physics Fellowship*, Simons Foundation
2015 Nominated for the *Simons Investigator in Physics Fellowship*, Simons Foundation
2014 Elected a *Fellow of the American Physical Society*
Awarded *Senior Faculty Grant Fellowship* for A.Y. 2015-16
2013 Nominated for the *Balzan Prize in Quantum Information Processing and Communication*
2012 *Melville and Leila Straus 1960 Faculty Fellowship*
2009 *Linda B. and Kendrick R. Wilson III 1969 Fellowship* for excellence in teaching and research
2008 Included in the 2008-09 *Madison Who's Who Among Executive and Professionals*
Included in the 2008-09 62*nd Edition of Who's Who in America*
Included in the 2008-09 *Who's Who in Science and Engineering*
2007 Included in the 2007-08 *Cambridge Who's Who Among Executive & Professional Women*
2006 Included in the 2006-07 *Who's Who in Science and Engineering*
2005 Honored Member of the *Empire Who's Who 2005-2006*
Included in the 2005-06 *Who's Who in Science and Engineering*
2002 Awarded J. Robert Oppenheimer Fellowship at LANL
2000 Awarded Director-Funded Postdoctoral Fellowship at LANL
1998 Selected for full membership in *Sigma Xi*, MIT Chapter
1997 *Honorable Mention Winner* in the competition for *Essays on Gravitation 1997*
Awarded European Community *Marie Curie Postdoctoral Fellowship*
Awarded Padua University *Graduate Exchange Fellowship* for research at MIT
1993-96 Recipient of Padua University Doctoral Fellowship

## Grants Awarded

**External Funding:**

- **Current research grants and contracts**

2020-23 National Science Foundation — USD 420,000
*Quantum Metrology in Complex Noise Environments*
Principal Investigator.

2019-23 National Science Foundation, EPSCoR — USD 1,949,000
*Harnessing the data revolution for the quantum leap: From quantum control to quantum materials*. Senior Personnel.

2019-24 Department of Energy — USD 750,000
*Fundamental Algorithmic Research for Quantum Computing (FAR-QC)*
Co-Principal Investigator.

2019-24 Department of Energy — USD 530,000
*Tough Errors Are no Match (TEAM): Optimizing the Quantum Compiler for Noise Resilience*. Co-Principal Investigator.

2018-23 Army Research Office, Multidisciplinary University Research Initiative — USD 710,924
*Quantum control based on real-time environment analysis by spectator qubits*
Co-Principal Investigator. (Total grant amount: USD ∼9,000,000.)

2016-21 National Science Foundation, Physics Division — USD 270,000
*Weaving stability from dissipation: Fixed-point engineering for quantum information processing*. Principal Investigator.

• **Past research grants**

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|---|---|---|
| 2014-20 | Army Research Office & National Security Agency<br>*Quantum Control Engineering*<br>Co-Principal Investigator. (Total grant amount: USD ∼4,750,000.) | USD 783,847 |
| 2014-16 | National Science Foundation, Division of Mathematical Sciences<br>Conference on *Mathematical Sciences Challenges in Quantum Information*<br>Principal Investigator. | USD 36,068 |
| 2011-15 | National Science Foundation, Physics & Computer Science Divisions<br>*Explorations in Quantum Pseudo-Randomness*<br>Principal Investigator. | USD 201,800 |
| 2011-14 | Army Research Office & National Security Agency<br>*Precision Quantum Control and Error-Suppressing Quantum Firmware for Robust Quantum Computing*<br>Co-Principal Investigator. (Total grant amount: USD ∼1,600,000.) | USD 343,000 |
| 2009-13 | National Science Foundation, Physics Division<br>*High-Fidelity Quantum Information Processing via Dynamical Quantum Error Control*<br>Principal Investigator. | USD 300,000 |
| 2011-13 | Intelligence Advanced Research Projects Activity<br>*Optimized Resources and Architectures for Quantum Algorithms* (ORAQL)<br>Co-Principal Investigator. (Total grant amount: USD ∼16,800,000.) | USD 468,900 |
| 2006-09 | National Science Foundation, Physics Division<br>*Randomized Dynamical Decoupling Techniques for Quantum Information Processing*<br>Principal Investigator. | USD 180,000 |
| 2006-09 | Department of Energy<br>*Modeling, Control, and Diagnostics of Electronic and Nuclear Spins in Nanosystems*<br>Co-Principal Investigator. (Total grant amount: USD ∼1,000,000.) | USD 510,000 |

**Internal Funding:**

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|---|---|---|
| 2013- | Dartmouth College<br>*Special Projects Funds in Quantum Information Science* | USD 218,200 |
| 2012 | Dartmouth College<br>*Straus 1960 Faculty Fellowship Award* | USD 2,000 |
| 2009 | Dartmouth College<br>*Wilson III 1969 Faculty Fellowship Award* | USD 2,000 |
| 2004-09 | Dartmouth College<br>*Special Projects Funds in Quantum Information Science* | USD 285,000 |

## Selected Recent Conference Invitations

2021 KIPT Conference on *Spatiotemporal Control for Probing New Many-Body Physics*
2020 *Quantum 2020*, International Virtual Conference, IOP Publishing
2019 Workshop on *New Paradigms in Quantum Control* (NPQC), Sydney, Australia (Plenary)
Workshop on *Engineering Nonequilibrium Dynamics of Open Quantum Systems*, Dresden, Germany
*Noisy Intermediate-Scale Quantum Technology* Workshop, University of Maryland
2018 Symposium on *Symmetries & Order: Algebraic Methods in Many-Body Systems*, Yale
12th Workshop on *Principles & Applications of Control to Quantum Systems*, Paris
First Workshop on *Algorithms for Today's Quantum Processors*, Google, Venice
Annual Sectional Meeting of the *American Mathematical Society*, Northeastern University, Boston
2017 11th Workshop on *Principles & Applications of Control to Quantum Systems*, Seattle
The 5th Conference on *Nuclei and Mesoscopic Physics* (NMP17), East Lansing
2016 KITP Conference on *Designer Quantum Systems Out of Equilibrium*, Santa Barbara
Strategic Workshop on *Future Directions in Quantum Information Processing*, Arlington
IMA Annual Program Year Workshop on *Quantum and Nano Control*, Minneapolis

2015 Fall Meeting of the *New England Section* of the APS, Dartmouth (Plenary)
*International Program Development Fund* Workshop, The University of Sydney, Australia
Workshop on *Frontiers of Quantum Information & Quantum Computer Science*, QuICS, Baltimore
Annual Spring Meeting of the *Institut Transdisciplinaire d'Information Quantique*, Bromont, Quebec
ICAM Workshop on *Aspects of Non-Equilibrium Dynamics in Quantum Computation: Adiabaticity, Noise and Many-Body Localization*, Graduate Center, CUNY, New York
Annual March Meeting of the APS, San Antonio
17th *Southwest Quantum Information and Technology* (SQuInT) Workshop, Berkeley

2014 Third International Conference on *Quantum Error Correction*, ETH Zurich, Switzerland
9th Workshop on *Principles & Applications of Control to Quantum Systems*, Cambridge, UK

2013 Workshop on *Mathematical Aspects of Quantum Modeling, Estimation and Control*, Department of Information Engineering, University of Padua, Italy
Annual March Meeting of the APS, Baltimore
15th *Southwest Quantum Information Technology* (SQuInT) Workshop, Santa Barbara

2012 Gordon Research Conference on *Quantum Science*, Stonehill College, Easton
Annual March Meeting of the APS, Boston

2011 International Workshop on *Principles & Applications of Quantum Control*, Kavli Royal Society Centre for the Advancement of Science, Chicheley Hall, UK
Second International Conference on *Quantum Error Correction*, University of Southern California
Gordon Research Conference on *Quantum Control of Light and Matter*, Mt. Holyoke College
Second Conference on *Difficult Problems in Quantum Information Theory*, Center for Extreme Quantum Information Theory, Massachusetts Institute for Technology

2010 Workshop on *Random Matrix Techniques in Quantum Information Theory* Perimeter Institute for Theoretical Physics, Waterloo, Canada

2009 First International Workshop on *Dynamical Decoupling*, NIST, Boulder
Gordon Research Conference on *Quantum Control of Light and Matter*, Mt. Holyoke College
KITP Program on *Quantum Control of Light and Matter*, Santa Barbara

2008 Conference on *Difficult Problems in Quantum Information Theory*, Center for Extreme Quantum Information Theory, Massachusetts Institute for Technology
Workshop on *Quantum/Classical Control in Quantum Information: Theory and Experiments* Otranto, Italy (*Keynote*)
4th Workshop on *Principles & Applications of Control in Quantum Systems*, Eugene

2007 First International Conference on *Quantum Error Correction*, University of Southern California
Third International IEEE Scientific Conference on *Physics and Control*, Potsdam, Germany
14th International Conference on *Recent Progress in Many-Body Theories*, Barcelona, Spain

## Professional and Organizational Service outside Dartmouth

**Community leadership:**

- Members of the Scientific Advisory Board for the DOE Quantum Information Science Center on *Co-Design Center for Quantum Advantage* ($C^2QA$, September 2020 to present).
- Member of the Award Selection Committee for *Quantum 2020*.
- Member of the Fellowship Committee for the APS Division on Quantum Information (2017, 2020).
- Vice-chair of the Selection Committee for the *Rolf Landauer and Charles H. Bennett Award in Quantum Computing* of the APS Division on Quantum Information (2019).
- Member of the Fellowship Committee for the APS *Topical Group on Quantum Information* (2015).
- Member of the 2016 March Meeting Program Committee for the APS *Topical Group on Quantum Information*.
- 2014 Judge for *Davidson Fellows Scholarship*, Davidson Institute for Talent Development.
- Member of the Nominating Committee for the APS, *New England Section* (2011 through 2014).
- Member of the Executive Committee for the APS *Topical Group on Quantum Information*: Vice Chair (2006), Chair Elect (2007), Chair (2008), Past Chair (2009).

**Conference committees:**

- Member of the advisory committee of the International Conference *Quantum 2020*, Shanghai, China, October 2020.
- Member of the scientific committee for the Workshop on *Principles & Applications of Control to Quantum Systems* (University of Sydney, July 2015; University of Hong-Kong, December 2019).
- Member of the program committee for the 2018 Gordon Research Conference on *Quantum Science* (Stonehill College, August 2018).
- Member of the international scientific committee for the 2018 Institute Henri Poincaré thematic quarter on *Measurement and Control of Quantum Systems: Theory and Experiments* (Paris, May-July 2018).
- Member of the program committee for the *2016 International Conference on Quantum Communication, Measurement and Computing (QCMC 2016)* (Singapore, July 2016).
- Co-chair for the 2015 Gordon Research Conference on *Quantum Control of Light and Matter* (Mt. Holyoke, August 2015).
- Co-chair for the *Relativistic Quantum Information North* 2015 Workshop (Dartmouth College, July 2015).
- Vice Chair for the 2013 Gordon Research Conference on *Quantum Control of Light and Matter* (Mt. Holyoke, August 2013).
- Co-organizer of the Conference *New Directions in the Quantum Control Landscape*, Kavli Institute for Theoretical Physics (Santa Barbara, February 2013).
- Advisory board member for the First and the Second International Conference on *Quantum Error Correction* (University of Southern California, December 2007 and December 2011).
- Co-organizer of the Topical Group Workshop on *Open Quantum Systems and Quantum Control*, Institute for Theoretical Atomic, Molecular and Optical Physics (Harvard, August 2010).
- Co-organizer of the Workshop on *Open Quantum Systems: Decoherence and Control*, Institute for Theoretical Atomic, Molecular and Optical Physics (Harvard, November 2008).
- Member of the *Quantum Optics and Quantum Information* subcommittee for the *Conference on Electro-Optics/Quantum Electronics Laser Science Conference* (Baltimore, July 2007).
- Program committee and board member for the First and Second International Conference *Physics & Control 2003* (St. Petersburg, Russia), *Physics & Control 2005* (Potsdam, Germany).

**Service to funding agencies:**

- Panelist for the *National Science Foundation* site visit review to the *Joint Quantum Institute*, University of Maryland, College Park (April 2017).
- Lead organizer of strategic National Science Foundation *Conference on Mathematical Sciences Challenges in Quantum Information*, Division of Mathematical Sciences (February 2015).
- Panelist for the *National Science Foundation* site visit review to the *Joint Quantum Institute*, University of Maryland, College Park (May 2013).
- Panelist for the *National Science Foundation*, *Physics at the Information Frontier* Program (March 2011; March 2009).
- Panelist at the strategic *National Science Foundation Workshop on Theoretical Atomic, Molecular and Optical Physics* (August 2011).
- Panelist at the annual review of the *Laboratory Directed Research & Development Program* (Los Alamos, March 2006).
- Panelist for the *National Science Foundation* site visit review to the Physics Frontier Center *FOCUS*, University of Michigan, Ann Arbor (April 2005).
- Panelist for the *National Science Foundation*, *Quantum and Biologically Inspired Computation* Program (March 2002).
- Reviewer for the 2010 *John Simon Guggenheim Memorial Foundation Fellowship Competition*.

- Reviewer for: the US *National Science Foundation* (since 2001); the US *Research Corporation* (since 2005); the US *Army Research Office* (since 2008); the US *Foundational Questions Institute* (FQXi, since 2015); the US *Department of Energy Office of Science* (2018); the *Croucher Foundation*, Hong Kong (since 2015); the *Chinese Academy of Science* (2018); the *Academy of Finland* (2017); the *Foundation for Polish Science* (2017) and the *National Science Centre*, Poland (2019); the *Helmholtz Association of German Research Centers* (2019); the *Einstein Foundation Berlin* (2015); the *Swiss National Science Foundation* (2015); the *Italian Scientists and Scholars of North America Foundation* (2015); the *French Institute for Research in Computer Science and Automation* (2014); the *Deutsche Forschungsgemeinschaft* (2012); the *US-Israel Binational Science Foundation* (2007, 2010, 2012); the *European Coordinated Research on Long-term Challenges in Information and Communication Sciences and Technologies* (2011); the French *Agence Nationale de la Recherche* (2008); the *Natural Sciences and Engineering Research Council of Canada* (NSERC, since 2007); the *Netherlands Organisation for Scientific Research* (2007); the *Austrian Science Fund* (2007); the *Science Foundation of Ireland* (2003).

**Reviewer service:**

- Referee for: *Physical Review Letters*, *Physical Review A*, *B*, *E*, *X*, *Nature*, *Nature Physics*, *Nature Communications*, *Quantum*, *Europhysics Letters*, *New Journal of Physics*, *Physics Letters A*, *Optics Communications*, *Journal of Physics A* and *B*, *Journal of Applied Physics*, *Journal of Optics B*, *Physica C*, *American Journal of Physics*, *Canadian Journal of Chemistry*, *International Journal of Theoretical Physics*, *International Journal of Modern Physics D*, *Laser Physics Letters*, *Applied Magnetic Resonance*, *IEEE Transactions on Information Theory*, *IEEE Transactions on Automatic Control*, *IEEE Transactions on Nanotechnology*, *Automatica*, *International Journal of Control*, *Philosophical Transactions of the Royal Society A*, *SIAM Journal on Control and Optimization*, *Annals of Physics*, *Foundations of Physics*, *Quantum Information and Computation*, *Quantum Information Processing*, *Quantum Science and Technology*, *EPJ Quantum Technology*, *Journal of Statistical Mechanics: Theory and experiment*, *National Science Review*, *Systems and Control Letters*, *Journal of Mathematical Physics*, *Communications in Mathematical Physics*, *Reports on Mathematical Physics*, *Reports on Progress in Physics*, *Scientific Reports*, *Reviews of Modern Physics*, *Proceedings of the National Academy of Sciences*.
- Reviewer for *Mathematical Reviews* (1995 through 2005).

**Editorial positions:**

- Divisional associate editor, *Physical Review Letters* (since September 1, 2018).
- Editorial board member, *Journal of Physics A: Mathematical and Theoretical* (2016 through 2018).
- Editorial board member (*ad hoc*), *Physical Review X* (Winter 2016).
- Editorial board member, *Physical Review A*, Quantum Information Section (2006 through 2008).
- Acting editor (*ad hoc*), *Quantum Information Processing* (2007).

**Professional memberships and miscellaneous:**

- External reviewer for tenure and promotion evaluations (2008; 2010; 2013; 2018).
- Board member of the *International Physics And Control Society* (IPACS) (2007 to present).
- Member of the *American Physical Society* (2001 to present); the *American Association for the Advancement of Science* (2001 to present); the *Mathematical Association of America* (2006 to present).

## Professional and Organizational Service at Dartmouth

**Department service:**

- Graduate Advisor for Physics and Astronomy program (A.Y. 2018-19, 2019-20, 2020-21).
- Senior faculty mentor of two junior faculty (primary mentor to one; July 2018 to present).
- Graduate Curriculum Committee (Chair during A.Y. 2010-11, 2011-12, 2012-13; Member during A.Y. 2013-14, 2014-15, 2015-16, 2016-17, 2017-18, 2018-19, 2019-20, 2020-21).
- Member of the committee for Graduate Admission (A.Y. 2004-05, 2008-09, 2009-10, 2013-14, 2014-15, 2019-20, 2020-21).

- Member of the committee for the Physics Graduate Qualifying Exam (September 2004, 2005, 2006, 2007, 2008, 2014, 2015, 2016, 2019; Co-chair during 2009, 2011, 2013, 2016, 2017; Chair during 2012).
- First-year graduate advisor (A.Y. 2010-11, 2011-12, 2012-13, 2016-17, 2017-18, 2018-19, 2019-20).
- First-year undergraduate advisor (A.Y. 2005-06, 2006-07, 2009-10, 2010-11, 2013-14, 2017-18, 2018-19, 2019-20).
- Committee for Department Colloquia and Public Lectures (Fall 2004, Winter 2008, Spring 2011, Summer 2015, Winter 2016, Spring 2018; Chair during A.Y. 2019-20).
- Member of the departmental Strategic Planning Committee (A.Y. 2013-14).
- Member of the search committee for experimental condensed-matter faculty position (September 2011–March 2012).
- Member of the search committee for experimental condensed-matter faculty position (September 2009–March 2010).
- Curriculum development: (i) New graduate (specialty) course *Highlights in Quantum Information Science*, first offered in Spring 2005 as a Special Topics course (Phys 122), regular offering from Spring 2008 (Phys 116); (ii) New graduate (core) course *Statistical Mechanics II*, first offered in Summer 2011, regular offering in alternate years.
- Representative of the Physics Department at the annual *Major Enlightenment* event for first and second year students (October 2006).

**College service:**

- Director of the *Quantum Information Science Initiative* at Dartmouth (July 2004 to present).
- Member of the *Council on Honorary Degrees* (July 2017 through June 2020).
- Member of the review committee for the Chemistry Department (January 2020).
- Member of the *Neukom Fellows* Selection Committee (A.Y. 2012-13; 2014-15).
- Member of the Committee on Standards (A.Y. 2010-11, 2011-12).
- Member of the search committee for the Director of the *William H. Neukom Institute for the Computational Sciences* (September 2004–February 2006).
- Organizer of a *One-day Quantum Information Science Workshop* at Dartmouth (October 2004).

## Teaching Activity at Dartmouth

Quantum Physics of Matter: Introduction (Phys 24) *Winter 2008, 2009, 2010, 2011; Spring 2007, 2013*
Freshmen/sophomore level undergraduate course, requirement for Physics major.

Introductory Quantum Mechanics (Phys 42) *Summer 2007*
Sophomore level undergraduate course, requirement for Physics major.

Intermediate Quantum Mechanics (Phys 91/Phys 90) *Winter 2006, 2007, 2009, 2011, 2015, 2020*
Senior level undergraduate/beginning graduate level core course.

Mathematical Methods for Physicists (Phys 100) *Fall 2013, 2014, 2017, 2018*
Graduate level core course.

Methods in Applied Mathematics (Phys 100/Engs 100) *Fall 2004, 2005, 2011*
Graduate level core course (Joint offering, Physics and Engineering Departments).

Advanced Quantum Mechanics (Phys 103) *Spring 2006, 2010, 2012, 2016, 2018, 2020*
Graduate level core course.

Statistical Mechanics I (Phys 104) *Spring 2011, 2013, 2014, 2017, 2019, 2021*
Graduate level core course.

Statistical Mechanics II (Phys 109) *Summer 2016*
Advanced graduate level course.

Highlights in Quantum Information Science (Phys 116) *Spring 2005, 2008, 2010, 2012, 2014, 2016*
Graduate level course, open to senior undergraduate students.

## Additional Teaching Activities

Lecturer in Quantum Control Theory *June 2012*
12th Canadian Summer School on "Quantum Information," Institute for Quantum Computing and University of Waterloo, Waterloo, Canada. Lectures available at *http://www.youtube.com/watch?v=epS7l6Of1QU*.

Lecturer in Quantum Information *May 2009*
International School on "Quantum Information & Many-Body Systems," Cortona, Italy. One-week mini-course "Generalized entanglement with applications in many-body physics".

Lecturer in Quantum Error Correction *December 2007*
University of Southern California. Tutorial on "Decoherence-free subspaces, noiseless subsystems, and dynamical decoupling".

Lecturer in Quantum Information *December 2006*
Centro di Ricerca Matematica "Ennio De Giorgi", Scuola Normale Superiore, Pisa, Italy. One-week mini-course "Concepts in control of open quantum systems and quantum information".

Lecturer in Quantum Control *August 2005*
Caltech Summer School on "Principles & Applications of Control in Quantum Systems". Two-hour mini-course "Fundamentals of Dynamical Decoupling".

Lecturer in Quantum Information Processing *June 2003*
Los Alamos Summer School. Taught a three-day mini-course "Introduction to Quantum Information Processing and Quantum Error Correction".

Lecturer in Quantum Information Processing *July 2002*
Los Alamos Summer School. Taught a one-day mini-course "Introduction to Quantum Information Processing and Quantum Error Correction".

Lecturer in Quantum Mechanics *January 2002*
MIT Independent Activities Period. Taught a one-week mini-course "Open Quantum Systems".

Lecturer in Quantum Computation *July 2001*
Los Alamos Summer School. Taught lectures on "Introduction to Quantum Computers".

Lecturer on Quantum Computation *June 2001*
Santa Fe 2001 Complex Systems Summer School. Taught a two-day mini-course "Introduction to Quantum Computation: What you could do with a quantum computer if you had one," as part of the session on *Nonstandard Approaches to Computation*.

Lecturer on Quantum Information Processing *June 2001*
Second Student Retreat of the SQuInT Network. Taught a tutorial on "Noiseless Subsystems".

## Post-docs and Students Advised at Dartmouth

**Postdoctoral fellows:**

- Lea Ferreira dos Santos. September 2004 to August 2007 [Now Full Professor, Yeshiva University].
- Wenxian Zhang. August 2007 to July 2008 [Now Full Professor, Wuhan University, China].
- Kaveh Khodjasteh. January 2008 to October 2012 [Now Director of Data Science at *Target*].
- Shusa Deng. July 2011 to July 2013 [Now Adjoint Professor, Sacred Heart University].
- Seung-Woo Lee. February to December 2013. [Now Research Professor, Korea Institute of Advanced Study].
- Gerardo A. Paz-Silva. August 2013 to January 2015 [Now DECRA Research Fellow, Griffith University].
- Amrit Poudel. September 2013 to April 2015 [Now Technical Staff Member at *Synopsys*].
- Emilio Cobanera. September 2015 to August 2017 [Now Assistant Professor at SUNY Polytechnic].
- Félix Beaudoin. *Fonds de Recherche du Québec, Nature et Technologies* (FRQNT) Postdoctoral Fellow, January 2017 to January 2019. [Now Research Scientist at *NanoAcademic Technologies*].
- Leigh M. Norris. January 2015 to August 2019. Research Scientist from September 2019.
- Alexander R. H. Smith. *Dartmouth Society of Fellows*, junior postdoc and NSERC Postdoctoral Fellow. September 2017 to July 2020 [Now Assistant Professor at Saint Anselm College].
- Andrew Cupo. February 2020 to present. Joint with C. Ramanathan and J. D. Whitfield.
- Fabio Lingua. May 2020 to present. Joint with C. Ramanathan and J. D. Whitfield.

**Graduate students, sole supervisor:**

- Sarah T. Smith. Master in Physics. Graduated October 2007.
- Winton G. Brown. Ph.D. in Physics. Awarded a *GAANN Fellowship* for the A.Y. 2006–2007; awarded a *Hull Fellowship* for the A.Y. 2008-2009. Graduated October 2010. [Now at *Northrop Grumman*].
- Shusa Deng. Ph.D. in Physics. Awarded a *Hull Fellowship* for the A.Y. 2009-2010. Recipient of the *2011 Graduate Research Award*. Graduated June 2011.
- Peter D. Johnson. Ph.D. in Physics. Awarded a *Hull Fellowship* for the A.Y. 2015-2016. Recipient of the *2016 Graduate Research Award*. Graduated October 2016 [Now at *Zapata Computing*].
- Salini Karuvade. Master in Physics. Graduated June 2018. [Now PhD student at Calgary University].
- Abhijeet L. Alase. Ph.D. in Physics. Recipient of the *2018 Graduate Research Award*. Graduated January 2019, Ph.D. thesis published as part of the *Springer Theses* series, Fall 2019. [Now postdoc at Calgary University; recipient of a *2020 Killam Postdoctoral Research Fellowship*].
- Vincent P. Flynn. Fourth-year graduate student.
- Francisco Riberi. Third-year graduate student. Recipient of a *Fulbright U.S. Student Award*.
- Brent A. Harrison. Second-year graduate student.
- Muhammad Q. Khan. Second-year graduate student.

**Graduate students, joint supervisor:**

- Francesco Ticozzi. Ph.D. in Automatic Control at the University of Padua (Italy), co-advisor with Prof. A. Ferrante. Graduated February 2007. [Now Associate Professor, University of Padua].

**Graduate students, Ph.D. committee member:**

Qun Wei (Graduated May 2010); Weiwei Xue (Graduated August 2010); Laura Gilbert (Graduated May 2011); Joel Stettenheim (Graduated July 2012); Mingyun Yuan (Graduated June 2013); Latchezar Benatov (Graduated June 2014); Erind Brahimi (Graduated May 2015); Mallory L. Guy (Graduated May 2017); Kanav Setia (Graduated July 2020); Hui Wang (Ph.D. candidate); Benjamin L. Brock (Ph.D. candidate); Riley W. Chien (Ph.D. candidate); Jun Yang (Ph.D. candidate); Ethan Q. Williams (Ph.D. candidate); Linta Joseph (Ph.D. candidate).

**Undergraduate students:**

- David J. Starling. Research Experience for Undergraduate Program in Quantum Information Science, Summer 2005. Junior undergraduate from SUNY, Fredonia [Now Assistant Professor, Penn State].
- Dhrubo Jyoti. Physics and Mathematics double major at Dartmouth, December 2009–May 2011. Thesis advisor. Awarded a *Neukom Scholar Fellowship* for Summer and Fall 2010. Graduated May 2011.
- Alexander Meill. Physics major, senior thesis committee member. Graduated May 2013.
- Laurel E. Anderson. Physics major, senior thesis committee member. Graduated May 2014.
- Philip R. Larie. Physics research intern, 2014–2015. Recipient of a *Kaminsky Family Fund Award* for Summer 2014, and of a *Wilder Fellowship* for Fall 2014 and Winter 2015. Graduated May 2015.
- Matthew C. Digman. Physics major, senior thesis committee member. Graduated May 2015.
- Connie H. Jiang (Mousatov). Physics research intern, 2015–2016. Awarded a *Wilder Fellowship* for Summer 2015. Recipient of a *2015 Stamps Leadership Scholar Award*, and of 2016 *National Science Foundation Graduate Research Fellowship*. Graduated May 2016.
- Pawan Dhakal. Physics major, senior thesis committee member. Graduated May 2016.
- Jonathan P. Vandermause. Physics major, senior thesis committee member. Graduated May 2016.
- Samuel J. Greydanus. Physics major, senior thesis committee member. Graduated May 2017.
- Kent Ueno. Physics major, senior thesis committee member. Graduated May 2018.
- Krishan Canzius. Physics major, senior thesis committee member. Graduated May 2018.
- Erik Weis. Physics major, senior thesis committee member. Graduated May 2018.
- William Kaufmann. Physics major, senior thesis committee member. Graduating May 2021.

## Additional Supervision Work

- Eleanore Chadderdon. Summer student at the Los Alamos Summer School 2002. Senior undergraduate from Harvard University.
- Evan M. Fortunato. Ph.D. in Nuclear Science and Engineering at MIT. Co-advised jointly with Prof. D. G. Cory. Graduated May 2002. [Now Founding Member and CEO, *Apogee Research*, Washington].
- Aikaterini D. Mandilara. Ph.D. in Physics at the University of Washington in Saint Louis, co-advised jointly with Dr. V. Akulin (CNRS, Orsay). Graduated December 2005. [Now Assistant Professor, Nazarbayev University].
- Jonathan Hodges. Ph.D. in Nuclear Science and Engineering, MIT. Served as Ph.D. committee member. Graduated August 2007. [Now Senior Staff Member, MITRE].
- Sergio Boixo. Ph.D. in Physics, University of New Mexico, Albuquerque. Supervised research project, Spring-Summer 2004. Served as Ph.D. committee member. Graduated August 2008. [Now Senior Research Scientist, *Google*].
- Leonardo Banchi. Ph.D. in Physics, University of Florence, Italy. Served as Ph.D. committee member. Graduated January 2012.
- Todd J. Green. Second-year visiting graduate student from The University of Sydney. Co-advised jointly with Prof. M. J. Biercuk, April-December 2013. Graduated September 2016.
- Victor V. Albert. Ph.D. in Physics, Yale University. Served as external reader. Graduated April 2017. [Now postdoc at Caltech].
- Harrison Ball. Ph.D. in Physics, The University of Sydney, Australia. Served as external examiner. Graduated December 2017. [Now Senior Quantum Control Engineer, Q-CTRL].
- Arnab Chakrabarti. Ph.D in Physics, Served as external examiner. Indian Institute of Science Education and Research (IISER) Kolkata. Graduated Winter 2019.
- Catxere Andrade Casacio. Third-year graduate student in Physics, University of Queensland. ARC EQUS mentor. September 2018 to present.
- Anatoly Kulikov. Third-year graduate student in Physics, University of Queensland. ARC EQUS-affiliated mentor. September 2018 to present.
- Deepak Khurana. Visiting postdoctoral fellow, Indian Institute of Science Education and Research (IISER) Pune. August to December 2019.

## Additional Information

Personal. Citizen of Italy and of the United States of America.

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Complete List of Publications

**Peer-reviewed journal articles:**

**121** Q. Xu, V. P. Flynn, A. Alase, E. Cobanera, L. Viola, and G. Ortiz, "Squaring the fermion: The threefold way and the fate of zero modes," *Physical Review B*, in press (2020). Selected as *Editors' Suggestion*.

**120** V. P. Flynn, E. Cobanera, and L. Viola, "Restoring number conservation in quadratic bosonic Hamiltonians with dualities," *EPL*, in press (2020).

**119** U. von Lüpke, Y. Sung, F. Yan, F. Beaudoin, L. M. Norris, S. Gustavsson, L. Viola, and W. D. Oliver, "Two-qubit spectroscopy of spatio-temporally correlated quantum noise in superconducting qubits," *Physical Review X Quantum* **1**, 010305/1–24 (2020). Selected for *Physical Review Journal Club*, October 14, 2020.

**118** V. M. Frey, L. M. Norris, L. Viola, and M. J. Biercuk, "Simultaneous spectral estimation of dephasing and amplitude noise on a qubit sensor by optimally band-limited control," *Physical Review Applied* **14**, 024021 (2020).

**117** V. P. Flynn, E. Cobanera, and L. Viola, "Deconstructing effective non-Hermitian dynamics in quadratic bosonic Hamiltonians," *New Journal of Physics* **22**, 083004/1–36 (2020).

**116** G. A. Paz-Silva, L. M. Norris, F. Beaudoin, and L. Viola, "Extending comb-based spectral estimation to multiaxis quantum noise," *Physical Review A* **100**, 042334/1–18 (2019). Times cited: *2*

**115** Y. Sung, F. Beaudoin, L. M. Norris, F. Yan, D. M. Kim, J. Y. Qiu, U. von Lüpke, J. L. Yoder, T. P. Orlando, S. Gustavsson, L. Viola, and W. D. Oliver, "Non-Gaussian noise spectroscopy with a superconducting qubit sensor," *Nature Communications* **10**, 3715/1–8 (2019). Times cited: *9*

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**1** D. G. Cory, R. Laflamme, E. Knill, L. Viola, T. F. Havel, N. Boulant, G. Boutis, E. M. Fortunato, S. Lloyd, R. Martinez, C. Negrevergne, Y. Sharf, G. Teklemariam, Y. S. Weinstein, and W. H. Zurek, "NMR based quantum information processing: Achievements and prospects," *Fortschritte der Physik* **48**, 875-907 (2000), Special issue on "Experimental Proposals for Quantum Computation."
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| | ISI Web of Science | Google Scholar |
|---|---|---|
| Total times cited: | *6,704* | *10,237* |
| *h*-index: | *38* | *46* |

**Submitted and forthcoming articles:**

**S1** T. Chalermpusitarak, B. Tonekaboni, Y. Wang, L. M. Norris, L. Viola, and G. A. Paz-Silva, "Frame-based filter-function formalism for quantum characterization and control," arXiv:2008.13216, submitted to *Physical Review Letters* (September 2020).

**F1** L. M. Norris, G. A. Paz-Silva, and L. Viola, "Higher-order spectral estimation of non-Gaussian quantum noise: Linearly coupled bosonic dephasing environments and beyond," in preparation.

**F2** G. Baggio, F. Ticozzi, P. D. Johnson, and L. Viola, "Dissipative encoding of quantum information," in preparation for *Quantum Information & Computation*.

**F3** A. Alase, E. Cobanera, G. Ortiz, and L. Viola, "Matrix factorization approach to the bulk-boundary correspondence and stability of zero modes," in preparation for *Journal of Physics A*.

**F4** S. Karuvade, F. Ticozzi, and L. Viola, "Unique ground states need not be unique steady states of quasi-local quantum Markovian dynamics," in preparation.

**F5** A. Danageozian, N. Miller, P. Barge, N. Bhusal, L. M. Norris, L. Viola, and J. P. Dowling, "Noise analysis of the Nitrogen-vacancy center in diamond using coherent population trapping,"

**Book chapters:**

- L. Viola, "Introduction to dynamical decoupling," in: *Quantum Error Correction*, D. A. Lidar and T. Brun Eds. (Cambridge University Press, 2013), p. 94–112.
- L. Viola, "Experimental dynamical decoupling," *ibid.*, pp. 492–505.

**Contributions to peer-reviewed edited volumes:**

- L. Viola and H. Barnum, "Entanglement as an observer-dependent notion: Entanglement and subsystems, entanglement beyond subsystems, and all that," in: *Philosophy of Quantum Information and Entanglement*, edited by A. Bokulich and G. Jaeger (Cambridge University Press, Cambridge, 2010), pp. 16–43.
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- E. Knill, R. Laflamme, A. Ashikhmin, H. Barnum, L. Viola, and W. H. Zurek, "Introduction to quantum error correction," *ibid.*, pp. 188–225.
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- E. Knill, R. Laflamme, H. Barnum, D. A. R. Dalvit, J. Dziarmaga, J. Gubernatis, L. Gurvits, G. Ortiz, L. Viola, and W. H. Zurek, "From factoring to phase estimation: A discussion of Shor's algorithm," *ibid.*, pp. 38–45.
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- L. Viola and E. M. Fortunato, "Realizing a noiseless subsystem in an NMR quantum information processor," *ibid.*, pp. 260–263.

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- F. Ticozzi, G. Baggio, and L. Viola, "Quantum information encoding from stabilizing dynamics," Invited paper, in: Proceedings of the 58th IEEE Conference on Decision and Control, Nice, France, December 2019, pp. 413–418.
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- Publication "Non-Gaussian noise spectroscopy with a superconducting qubit sensor" featured in:
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- Featured in: "Dartmouth Professor Honored by American Physical Society," *Dartmouth Now*, February 3, 2015
- Interviewed by: *WHYY The Pulse/PBS*, in "Solving mysteries key to next generation of computers," July 22, 2014; also featured in:
  – "Dartmouth Physics Professor Working To Solve Mystery Key To Quantum Computing," New Hampshire Public Radio, August 11, 2014
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- Publication "Designing a practical high-fidelity long-time quantum memory" featured in:
  – "Making memories: Practical quantum computing moves closer to reality," AAAS's *EurekAlert!*, June 19, 2013
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- Publication "Pointer states via engineered dissipation" featured in: "Pointing toward stability," Synopsis in *Physics, Spotlighting exceptional research*, August 25, 2011
- Paper by undergraduate student Dhrubo Jyoti included in the *Dartmouth Undergraduate Journal of Science*, Volume XII, No. 3, Spring 2010, pp. 48–52
- Publication "Dynamically error-corrected gates for universal quantum computation" featured in: "Dartmouth researchers' self-correcting gates advance quantum computing," *Vox of Dartmouth*, Volume XXIII, March 12, 2009
- Interviewed by: ScienceNOW Daily News in "Quantum Physics Gets Spooky," August 13, 2008 on publication "Testing the speed of 'spooky action at a distance'," *Nature* **454**, August 2008
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- Publication "Randomized dynamical decoupling techniques for coherent quantum control" featured in: *Kudos, Vox of Dartmouth*, Volume XXV, October 23, 2006
- Publication "Experimental implementation of a concatenated quantum error-correcting code" featured in: "Keeping the noise down," *Vox of Dartmouth*, Volume XXIII, May 16, 2005

- Publication "Implementation of universal control on a decoherence-free qubit" featured in:
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- Publication "Experimental realization of noiseless subsystems for quantum information processing" featured in:
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  - "Gravità e antimateria," *Le Scienze* **97**, September 15, 1997 (Italian edition of *Scientific American*)

Complete List of Invited Presentations

**131** "Perspectives on quantum characterization and control in the NISQ era"
- Workshop on *Identification and Control of Fundamental Properties of Quantum Systems*, Brown University, January 21, 2020
- Workshop on *New Paradigms in Quantum Control*, Sydney, October 11, 2019

**129** "Qubit sensors in correlated noise environments: From noisy quantum metrology to quantum noise spectroscopy"
International Workshop on *Engineering Nonequilibrium Dynamics of Open Quantum Systems*, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany, June 20, 2019

**128** "Noise characterization for NISQ processors (and beyond)"
*NISQ Workshop*, University of Maryland, College Park, June 6, 2019

**127** "Advances in quantum spectral estimation by qubit sensors"
- *CUA Seminar*, MIT-Harvard Center for Ultracold Atoms, Cambridge, April 30, 2019
- *JQI Seminar*, University of Maryland, College Park, Joint Quantum Institute, February 4, 2019

**125** "My journey through symmetries"
Symposium on *Symmetries & Order: Algebraic Methods in Many Body Systems*, Yale, October 6, 2018

**124** "Advances in quantum spectral estimation"
Workshop on *Principles & Applications of Control in Quantum Systems*, Paris, July 3, 2018

**123** "Advances and challenges in Markovian quantum state stabilization under resource constraints"
- *Thematic Program on Quantum Measurement & Control*, Centre Émile Borel, Paris, July 11, 2018
- *Spring Eastern Sectional Meeting of the American Mathematical Society*, Boston, April 22, 2018

**121** "Perspectives on control of open quantum systems: From noisy qubits to qubit sensors"
- *Physics Colloquium*, University of Massachusetts, Lowell, March 21, 2018
- *Yale Quantum Institute Colloquium*, Yale University, November 3, 2017

**119** "Perspectives on control of open quantum systems and noisy qubits"
*Physics Colloquium*, University of Texas, Austin, October 4, 2017

**118** "Quantum noise spectroscopy via open-loop control on qubit sensors"
- *Interdisciplinary Quantum Information Science & Engineering Seminars*, MIT, October 19, 2017
- Workshop on *Principles & Applications of Control in Quantum Systems*, Seattle, July 18, 2017

**116** "Perspectives on quantum information science and quantum noise control"
*Physics Colloquium*, Williams College, April 28, 2017

**115** "Characterization and design of topological boundary modes via generalized Bloch theorem"
- *Condensed Matter Physics Seminar*, University of Illinois, Urbana-Champaign, April 9, 2018
- *Fifth Conference on Nuclei and Mesoscopic Physics* (NMP17), East Lansing, March 9, 2017

**113** "Design and characterization of topological boundary modes: from Floquet engineering to a generalized Bloch Ansatz"
KITP Conference *Designer Quantum Systems Out of Equilibrium*, Santa Barbara, November 16, 2016

**112** "Quantum noise spectroscopy via open-loop control"
Annual Program Year Workshop on *Quantum and Nano Control*, Institute for Mathematics and its Applications, Minneapolis, April 12, 2016

**111** "Perspectives on (and from) quantum information science: What's next?"
- *Physics Colloquium*, Department of Physics and Astronomy, Tufts University, March 4, 2016
- *2015 Joint Fall Meeting of the APS & AAPT New England Sections*, Dartmouth, November 7, 2015

**109** "Advances in quantum control engineering"
*International Program Development Fund* Workshop, The University of Sydney, October 19, 2015

**108** "Fixed-point engineering in quasi-local open-system dynamics"
Workshop on the *Frontiers of Quantum Information and Computer Science*, QuICS, University of Maryland, College Park, October 1, 2015

**107** "Dissipative quantum state preparation with quasi-local resources"
– Spring Meeting of the *Institut Transdisciplinaire d'Information Quantique* (INTRIQ), Bromont, Canada, April 28, 2015
– *17th Southwest Quantum Information Technology* Workshop, UC Berkeley, February 20, 2015

**105** "A general transfer-function approach to noise filtering in open-loop quantum control"
– *March Meeting of the American Physical Society*, San Antonio, March 2, 2015
– Third International Conference on *Quantum Error Correction*, ETH Zurich, December 16, 2014
– *Quantum Information Processing Seminars*, MIT, November 14, 2014
– Workshop on *Principles & Applications of Control in Quantum Systems*, Isaac Newton Institute for Mathematical Sciences, Cambridge, UK, August 5, 2014

**101** "Steady-state entanglement engineering with quasi-local dissipation"
*Center for Quantum Information and Control Seminars*, University of New Mexico, May 8, 2014

**100** "Advances in quantum Hamiltonian engineering"
*Interdisciplinary Quantum Information Science & Engineering Seminars*, MIT, March 13, 2014

**99** "Controlling open quantum systems: From dissipation-protected to dissipation-driven quantum engineering"
*Colloquium Series*, Max-Planck-Institute of Quantum Optics, Garching, Germany, June 11, 2013

**98** "Dynamical quantum error correction: Achievements and prospects"
*March Meeting of the American Physical Society*, Baltimore, March 20, 2013

**97** "Quantum state stabilization with engineered quasi-local Markovian dissipation"
– Workshop on *Mathematical Aspects of Quantum Modeling, Estimation and Control*, University of Padua, Italy, June 25, 2013
– *15th Southwest Quantum Information Technology* Workshop, Santa Barbara, February 21, 2013

**95** "Advances in dynamical quantum error suppression"
Kavli Institute for Theoretical Physics, Santa Barbara, February 19, 2013

**94** "Dissipative entanglement engineering with quasi-local control resources"
*Condensed Matter Physics Seminar Series*, University of Indiana, Bloomington, January 18, 2013

**93** "Quantum control of open quantum systems: From dissipation-protected to dissipation-driven quantum dynamics"
– *Quantum Lunch Seminar*, Los Alamos National Laboratory, November 1, 2012
– *Quantum Sciences & Chemistry Seminar Series*, Harvard, October 12, 2012

**91** "Multiband $s$-wave topological superconductors"
Gordon Research Conference on *Quantum Science*, Stonehill College, Easton, August 13, 2012

**90** "Quantum state stabilization with Markovian dissipative dynamics"
– *Information Engineering Seminar*, University of Padua, Italy, February 2, 2012
– Annual Meeting of the American Mathematical Society, Boston, January 7, 2012
– Royal Society Theo Murphy International Meeting on *Principles & Applications of Quantum Control Engineering*, Kavli Royal Society, Chicheley Hall, UK, December 13, 2011

**87** "Towards optimal constructions of dynamically corrected gates"
Second International Conference on *Quantum Error Correction*, University of Southern California, Los Angeles, December 5, 2011

**86** "Untangling entanglement: An observer-dependent perspective"
*Physics Colloquium*, Brown University, November 14, 2011

**85** "Pointer state engineering"
Workshop on *Difficult Problems in Quantum Information Theory*, Keck Center for *Extreme Quantum Information Theory*, MIT, Cambridge, May 3, 2011

**84** "Random matrices from random quantum circuits: Convergence rates of arbitrary statistical moments"
Workshop on *Random Matrix Techniques in Quantum Information Theory*, Perimeter Institute for Theoretical Physics, Waterloo, Canada, July 4, 2010

**83** "Dynamical quantum error correction: Advances and frontiers"
Gordon Research Conference on *Quantum Control of Light & Matter*,
Mt. Holyoke College, South Hadley, August 5, 2009

**82** "Dynamical quantum error correction: From dynamical decoupling to
dynamically corrected universal quantum gates"
– International Workshop on *Dynamical Decoupling*, NIST, Boulder, October 6, 2009
– Kavli Institute for Theoretical Physics, Santa Barbara, July 10, 2009

**80** "Untangling entanglement: An observer-dependent perspective"
*Colloquium Series*, Perimeter Institute for Theoretical Physics, Waterloo, Canada, April 8, 2009

**79** "Dynamically error-corrected universal quantum gates"
Workshop on *Difficult Problems in Quantum Information Theory*,
Keck Center for *Extreme Quantum Information Theory*, MIT, November 18, 2008

**78** "Open-loop quantum error control: From dynamical decoupling to
dynamically corrected universal quantum gates "
– *Princeton Center for Theoretical Science, Quantum Computing Seminar Series*,
Princeton, February 12, 2009
– *Center for Advanced Studies Seminar*, University of New Mexico, December 11, 2008
– Sandia National Laboratories, Albuquerque, December 10, 2008
– Workshop on *Quantum/Classical Control in Quantum Information: Theory and Experiments*,
Otranto, Italy, September 12, 2008

**74** "Dynamically error-corrected gates for accurate quantum control and computation"
– *Physics and Engineering Seminar Series*, University of Massachusetts, Boston, October 22, 2008
– *Information Engineering Seminar*, University of Padua, Italy, September 9, 2008
– Workshop on *Principles & Applications of Control in Quantum Systems*, Eugene, August 25, 2008

**71** "Towards quantum control of quantum information systems"
– Public lecture, University of Camerino, Italy, May 19, 2009
– *Jones Seminars on Science, Technology, and Society*
Thayer School of Engineering, Dartmouth College, Hanover, April 18, 2008

**69** "Introduction to decoherence-free subspace, noiseless subsystems, and dynamical decoupling"
Invited tutorial, *First International Conference on Quantum Error Correction*,
University of Southern California, Los Angeles, December 17, 2007

**68** "A quantum-entangled view to quantum critical phenomena"
– *Physics Club Colloquium*, Yale University, New Haven, November 2, 2007
– *Joint Atomic Physics Colloquium*, ITAMP, Harvard-Smithsonian Center for Astrophysics,
Harvard, February 13, 2008

**66** "Generalized entanglement in static and dynamic quantum phase transitions"
– *Joint Quantum Institute*, University of Maryland, College Park, February 4, 2008
– 14th International Conference on *Recent Progress in Many Body Theories*,
Barcelona, Spain, July 19, 2007

**64** "Physical and information-theoretic aspects of generalized entanglement"
– Quantum Information Science Seminar, MITRE corporation, Eatontown, August 27, 2007
– *Special Quantum Information Science Seminar*, MIT, May 16, 2007

**62** "(Some) principles and applications of quantum information control:
Toward a subsystem-theoretic approach?"
– *Atomic Physics Seminar Series*, ITAMP, Harvard-Smithsonian Center for Astrophysics,
Harvard, June 25, 2007
– *Center for Advanced Studies*, University of New Mexico, April 26, 2007
– Keck Center for *Extreme Quantum Information Theory*, MIT, April 17, 2007

**59** "Dynamical decoupling techniques for coherent quantum control: Recent developments"
– Third International Conference on *Physics and Control*, Potsdam, Germany, September 5, 2007
– *Condensed-Matter Physics Seminar*, Boston University, Boston, November 17, 2006

**57** "Coherence preservation via randomized dynamical decoupling"
Workshop on *Frontiers of Quantum Decoherence*, University of Toronto, Canada, August 13, 2006

**56** "Quantum dynamical decoupling with unconventional controllers"
Workshop on *Principles & Applications of Control in Quantum Systems*,
Harvard, August 10, 2006

**55** "Dynamical decoupling methods for coherent quantum control and decoherence suppression"
Laboratoire Aime Cotton, Orsay, France, June 23, 2006

**54** "Entanglement as an observer-dependent notion: Entanglement and subsystems,
entanglement beyond subsystems, and all that"
Boston Colloquium for Philosophy of Science on *Foundations of Quantum Information and Entanglement*, Boston University, Boston, March 24, 2006

**53** "Generalized entanglement as a framework for exploring complex quantum systems"
- *Quantum Computation and Information Seminar*, University of Bristol, UK, June 28, 2006
- Workshop on *Theory and Technology in Quantum Information, Communication, Computation, and Cryptography*, ICTP, Trieste, Italy, June 21, 2006
- *Israel Science Foundation Workshop on Decoherence, Entanglement, and Information in Complex Systems*, Eilat, Israel, February 28, 2006

**50** "Randomized dynamical decoupling techniques for coherent quantum control"
XXXVI Winter Colloquium on *The Physics of Quantum Electronics*, Snowbird, January 3, 2006

**49** "Randomized control of open quantum systems"
*44th IEEE Conference on Decision and Control & European Control Conference*,
Seville, Spain, December 12, 2005

**48** "On the inevitable relativity of quantum entanglement: What do we know?"
- *Physics Colloquium*, University of Southern California, Los Angeles, March 20, 2006
- *Physics Colloquium*, Hunter College, CUNY, New York, April 20, 2005

**46** "Entanglement as an observer-dependent concept: An application to quantum phase transitions"
- *Condensed-Matter Physics Seminar*, University of Massachusetts, Amherst, November 3, 2005
- *Institute for Quantum Sciences Seminar*, Michigan State University, Lansing, March 15, 2005
- Workshop on *Quantum Entanglement in Physical and Information Sciences*,
Scuola Normale Superiore, Pisa, Italy, December 15, 2004

**43** "Dynamical control of decoherence via active decoupling techniques: Random dynamical decoupling"
Workshop on *Quantum Entanglement, Decoherence, Information, and Geometrical Phases in Complex Systems*, ICTP, Trieste, Italy, November 9, 2004

**42** "Entanglement beyond subsystems"
- Second International *Feynman Festival*, College Park, August 20, 2004
- *Quantum Information Science Seminar*, MIT, April 20, 2004
- *Quantum Information Theory Seminar*, Scuola Normale Superiore, Pisa, Italy, October 27, 2003
- *Quantum Information Theory Seminar*, ISI Foundation, Torino, Italy, October 15, 2003
- *Quantum Lunch Seminar*, Los Alamos National Laboratory, July 3, 2003
- Conference and Workshop on *Coding Theory and Quantum Computing*,
University of Virginia, Charlottesville, May 23, 2003

**36** "Advances in decoherence control"
- XXXIV Winter Colloquium on *The Physics of Quantum Electronics*, Snowbird, January 6, 2004
- Euresco Conference *Quantum Optics: From Fundamental Concepts to Nanotechnology*,
Granada, Spain, September 28, 2003

**34** "Coherent control of quantum dynamics via active decoupling techniques"
*Quantum Physics Seminar*, University of Michigan, Ann Arbor, February 20, 2003

**33** "Principles of noise control for quantum information science"
- – *Physics Colloquium*, Dartmouth College, Hanover, January 24, 2003
- – *Statistical Mechanics and Complexity Colloquium*, University of Roma "La Sapienza", Roma, Italy, December 11, 2002

**31** "Quantum control via dynamical decoupling: Toward robust decoupling schemes"
*Information Engineering Seminar*, University of Padua, Italy, December 19, 2002

**30** "Noiseless subsystems, subspaces, and all that: From theory to experiment"
*Quantum Optics Seminar*, Blackett Laboratory, Imperial College, London, UK, December 5, 2002

**29** "Principles and demonstrations of noise control in quantum information processing"
- – First International *Feynman Festival*, University of Maryland, College Park, August 26, 2002
- – International Workshop on *Perspectives in Decoherence Control and Quantum Computing*, Michigan Center for Theoretical Physics, Ann Arbor, August 23, 2002

**27** "A unified look at quantum noise control in quantum information processing"
- – *Mathematics Colloquium*, University of Texas at Dallas, Dallas, April 24, 2002
- – Workshop on *Quantum Entropies: Dynamics and Information*, SISSA-ISAS, Trieste, Italy, December 13, 2001
- – *Quantum Information Theory Seminar*, ISI Foundation, Torino, Italy, December 5, 2001

**24** "Theory (and practice) of noiseless quantum subsystems"
- – Euro-Workshop on *Quantum Computer Theory: In search of viable optimal design*, ISI Foundation, Torino, Italy, June 13, 2001
- – *Institute for Quantum Information Seminar*, Caltech, April 27, 2001
- – *Quantum Lunch Seminar*, Los Alamos National Laboratory, April 5, 2001
- – *Information Physics Seminar*, University of New Mexico, March 21, 2001
- – *Research Laboratory for Electronics Seminar*, MIT, March 6, 2001

**19** "Noise control strategies for quantum information technology"
- – *General Physics Seminar*, University of Roma "La Sapienza", Roma, Italy, January 9, 2001
- – *Engineering Information Seminar*, University of Padua, Italy, December 18, 2000

**17** "On the problem of controlling quantum-mechanical systems – Alias...
Controlling and manipulating things on a small scale"
*Physics Colloquium*, Santa Fe Institute, Santa Fe, November 27, 2000

**16** "Noiseless subsystems for quantum noise control"
*Progress in Electromagnetics Research Symposium (PIERS 2000)*, Cambridge, July 13, 2000

**15** "Quantum noise suppression, noiseless quantum subsystems, and all that"
*Think-Tank on Computer Science Aspects*, ISI Foundation, Torino, Italy, June 28, 2000

**14** "Quantum noise control via decoupling"
- – *Physics Seminar Series*, University of Roma "La Sapienza", Roma, Italy, January 13, 2000
- – *Physics Seminar*, University of Trento, Department of Physics, Trento, Italy, December 17, 1999
- – *Quantum Lunch Seminar*, Los Alamos National Laboratory, Los Alamos, May 21, 1999

**11** "Decoupling methods for quantum information processing"
- – *Gordon Research Conference on Atomic Physics*, Plymouth State College, July 8, 1999
- – Conference on *Quantum Information Processing and NMR*, ITAMP, Harvard-Smithsonian Center for Astrophysics, Harvard, February 22, 1999
- – *Physics Seminar*, IBM T. J. Watson Research Center, Yorktown Heights, December 8, 1998

**8** "Decoupling methods for open quantum systems and quantum information"
- – *Physics Colloquium*, Northeastern University, Boston, November 19, 1998
- – *Research Laboratory for Electronics Seminar*, MIT, November 12, 1998
- – *Atomic Physics Seminar Series*, ITAMP, Harvard-Smithsonian Center for Astrophysics, Harvard, October 27, 1998

**5** "Decoherence control in quantum information processing: Simple models"
Fourth International Conference on *Quantum Communication, Measurement, and Computing* (*QCM'98*), Northwestern University, Evanston, August 23, 1998

**4** "Open system dynamics and quantum decoherence in trapped ions"
*Physics Seminar*, University of Padua, Italy, April 7, 1997

**3** "Measurement-induced decoherence in atomic systems"
– *Quantum Optics Seminar*, Université Pierre et Marie Curie, Paris, France, December 10, 1996
– *Physics Seminar*, University of Konstanz, Konstanz, Germany, December 5, 1996

**1** "Markov diffusions in comoving coordinates and stochastic quantization of the free relativistic spinless particle"
Euroconference *Classical and Quantum evolution: Deterministic and Stochastic*, Bielefeld Germany, July 14, 1995