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Education

- 1992 Ph.D., Physics, University of Colorado, Boulder, CO (Advisor: Carl Wieman)
1987 S.B., Physics, Massachusetts Institute of Technology, Cambridge MA (Advisor: Michael Feld)
1983 Detroit Catholic Central High School, Redford MI

Positions

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| 2018–2019 | IonQ, Inc., College Park | Chief Executive Officer |
| 2018– | University of Maryland, College Park | Professor, Electrical and Computer Engineering Dept. |
| 2016– | IonQ, Inc., College Park | Chief Scientist and Co-Founder |
| 2015– | University of Maryland, College Park | Distinguished University Professor |
| 2014– | University of Maryland, College Park | Fellow, Center for Quantum Info. and Comp. Science (QuICS) |
| 2007– | University of Maryland, College Park | Fellow, Joint Quantum Institute (JQI) |
| 2007– | University of Maryland, College Park | Bice Zorn Professor of Physics |
| 2006–2007 | University of Michigan, Ann Arbor | Director, FOCUS (NSF Frontier Center on Ultrafast Science) |
| 2006–2007 | University of Michigan, Ann Arbor | Professor, Electrical Engineering and Computer Science Dept. |
| 2003–2007 | University of Michigan, Ann Arbor | Professor, Physics Dept. |
| 2000–2003 | University of Michigan, Ann Arbor | Associate Professor, Physics Dept. |
| 1995–2000 | University of Colorado, Boulder | Adjunct Lecturer, Physics Dept. |
| 1994–2000 | National Inst. of Stand. Tech., Boulder | Staff Physicist and Project Leader |
| 1992–1994 | National Inst. of Stand. Tech., Boulder | NRC Postdoctoral Researcher (Mentor: David Wineland) |

Fellowships and Awards

- Willis E. Lamb Award for Laser Science and Quantum Optics (2019)
Member, National Academy of Sciences (2016)
American Physical Society Arthur Schawlow Prize for Laser Science (2015)
University of Maryland College of Science Distinguished Faculty Award (2014)
Fellow, American Association for the Advancement of Science (2012)
Scientific American “50” Research Award (2006)
University of Michigan Faculty Distinguished Research Award (2005-2006)
Fellow, American Physical Society (2005)
Fellow, UK Institute of Physics (2002)
Distinguished Traveling Lecturer, American Physical Society Division of Laser Science (2002–)
American Physical Society I.I. Rabi Award (2001)
International Quantum Communication Award, Tamagawa University, Japan (2000)
US Presidential Early Career Award for Scientists and Engineers (1997)
National Research Council Postdoctoral Fellowship (1992-1994)
University of Colorado Feldkamp Award for Graduate Research (1990)

Service

Committees

- American Physical Society Div. AMO Physics (DAMOP): **Chair** (2010), Chair-Elect (2009), Vice-Chair (2008).
American Physical Society Topical Group on Quantum Information: Executive Committee (2008-2010).
American Physical Society Committee on Meetings: **Chair** (2005), Member (2003-2004).
National Academy of Sciences Committee on AMO science (CAMOS): **Chair** (2012-2015), Member (2009-2011).
National Academy of Sciences Committee on AMO science (AMO2010 decadal report, 2005-2006).

Boards

Max Planck Institute for Quantum Optics, Scientific Advisory Board (2018–)
CalTech Institute for Quantum Information and Matter, Advisory Board (2018–)
Center for Quantum Technology, National University of Singapore: Technical Advisory Board (2018–).
National Academies of Sciences Intelligence Science and Technology Experts Group (ISTEG) (2015–)
DoD Advisory Board for Quantum Sciences and Engineering at ARL, AFRL, and NRL (2015–).
JILA and Univ. of Colorado NSF Physics Frontier Center External Advisory Board (2014–).
Center for Quantum Information, Tsinghua University, Beijing, China: International Advisory Board (2012–).
Institute for Quantum Computing, University of Waterloo, Canada: Scientific Advisory Committee (2010–).
Networked Quantum Information Technology Hub, Oxford University, UK: Scientific Advisory Committee (2013–).
Physics and Engineering Physics Department, Stevens Institute of Technology: External Advisory Board (2009–).

Organization and Outreach

US National Quantum Initiative Founding Stakeholder; testified to US Congress in Oct 2017 and May 2018.
Biennial Michigan Summer School on Quantum Physics, founding organizer (2008–2014).
Gordon Research Conference on Atomic Physics: **Chair** (2007), Vice-Chair (2005).
Enrico Fermi International School of Physics on “Quantum Information Science,” Director (2001).

Editorial

Nature: Quantum Information: Editorial Board (2015–).
Journal of Optics B: Editorial Board (2003-2007), Advisory Board (2008-2012).
Journal of Quantum Information (Rinton Press): Editorial Advisory Board (2000–)

Research Interests

I am an experimentalist in the areas of quantum information systems, quantum computing, quantum communication, atomic, molecular, and optical physics, and quantum optics. My research interests include:

Quantum Information Systems. Quantum information science exploits the properties of quantum superposition and quantum entanglement to store and process information in ways that are not possible classically. I have a longstanding interest in the fabrication of quantum processing systems using atoms and photons, natural carriers of quantum information. This includes the design and realization of entangling quantum logic gates between atoms, the quantum networking of remotely-located atoms with photons, and the scaling to much larger numbers of atomic quantum bits with advanced microfabricated atom trap array and photonic structures.

Cold Atomic Physics. Atoms can be localized to nanometer precision with electromagnetic fields and laser cooling techniques. My interest in this area involves the use of laser radiation to prepare, characterize, and exploit nearly-pure quantum states of internal (electronic) and external (motional) degrees of freedom of cold atoms and ions in order to generate controllable interactions and quantum entanglement for studies of quantum many-body systems.

The Interface between Atomic and Condensed Matter Physics. My group has led the development of atomic quantum simulators that can emulate intractable Hamiltonians that are found in contexts such as quantum magnetism and strongly-correlated condensed matter. We have also developed the use of microfabricated semiconductor structures for confining individual atomic ions in free space, while also characterizing the electrical noise processes of semiconductor and other electrode materials using single atoms as sensitive probes. More generally, I am interested in juxtaposing atomic systems with mesoscopic condensed-matter systems, including photonic couplings between atomic ions and quantum dots and electro-mechanical couplings between mesoscopic oscillators and atoms.

Ultrafast Control of Cold Atoms. I am actively pursuing the use of ultrafast ($\sim 10^{-12}$ s) optical techniques for the manipulation and control of cold atomic systems and the generation of multi-atom entangled quantum states. Ultrafast control eliminates sensitivity to slower decoherence processes, and represents a new regime of ultracold atomic physics.

Foundations of Quantum Mechanics. I have a longstanding interest in foundational aspects of quantum mechanics, from quantum measurement, quantum decoherence, and alternative interpretations of quantum mechanics, to the general phenomenon of quantum entanglement and various forms of Bell’s Inequalities. I am interested in quantum metrology and the border between quantum and classical physics as system complexity grows. I enjoy conveying quantum tenets to younger students and the public, with heavy reliance on analogies from the visual and musical arts.

Research Grants

- Over \$50M in Federal Research grants since 2000, from NSF, DARPA, IARPA, NSA, ARO, AFOSR, NGA, DOE.
- \$5,100,000 in external funding (AY 2018-2019)

Intellectual Property and Patents

- 4 awarded patents
- 20 pieces of intellectual property pending patent awards

Invited Presentations (1994-pres)

- 240 invited talks at conferences and workshops; 180 academic colloquia and seminars
- 26 sets of lectures at academic summer schools on Quantum Science and Atomic/Optical Physics
- 22 public lectures on Quantum Information Science and the Physics of Music

Mentoring (1994-pres)

- 6 Research Scientists
- 38 Postdoctoral Researchers
- 46 Graduate Students in Physics, Chemistry, Computer Science, and Engineering
- 18 Undergraduate Students
- 2 High School Students

Research Journal Publications (>38,000 citations, h=77)

1. “*Quantum Approximate Optimization with a Trapped-Ion Quantum Simulator*,” G. Pagano, A. Bapat, P. Becker, K. S. Collins, A. De, P. W. Hess, H. B. Kaplan, A. Kyprianidis, W. L. Tan, C. Baldwin, L. T. Brady, A. Deshpande, F. Liu, S. Jordan, A. V. Gorshkov, C. Monroe, arXiv 1906.02700 (2019).
2. “*Variational Generation of Thermofield Double States and Critical Ground States with a Quantum Computer*,” D. Zhu, S. Johri, N. M. Linke, K. A. Landsman, N. H. Nguyen, C. H. Alderete, A. Y. Matsuura, T. H. Hsieh, C. Monroe, arXiv 1905.02699 (2019).
3. “*Noise reduction using past causal cones in variational quantum algorithms*,” Omar Shehab, Isaac H. Kim, Nhung H. Nguyen, Kevin Landsman, Cinthia H. Alderete, Daiwei Zhu, C. Monroe, Norbert M. Linke, arXiv 1906.00476 (2019).
4. “*Two-qubit entangling gates within arbitrarily long chains of trapped ions*,” K. A. Landsman, Y. Wu, P. H. Leung, D. Zhu, N. M. Linke, K. R. Brown, L.-M. Duan, and C. Monroe, Phys. Rev. A 100, 022332 (2019).
5. “*Toward convergence of effective field theory simulations on digital quantum computers*,” O. Shehab, K. A. Landsman, Y. Nam, D. Zhu, N. M. Linke, M. J. Keesan, R. C. Pooser, and C. Monroe, arXiv 1904.04338 (2019).
6. “*Benchmarking an 11-qubit quantum computer*,” K. Wright, et al., arXiv 1903.08181 (2019).
7. “*Ground-state energy estimation of the water molecule on a trapped ion quantum computer*,” Y. Nam, et al., arXiv 1902.10171 (2019).
8. “*Heisenberg-Scaling Measurement Protocol for Analytic Functions with Quantum Sensor Networks*,” K. Qian, Z. Eldredge, W. Ge, G. Pagano, C. Monroe, J. V. Porto, and A. V. Gorshkov, arXiv 1901.09042 (2019).
9. “*Parallel Entangling Operations on a Universal Ion Trap Quantum Computer*,” C. Figgatt, A. Ostrander, N. M. Linke, K. A. Landsman, D. Zhu, D. Maslov, C. Monroe, **Nature** **567**, 61 (2019)
10. “*Verified Quantum Information Scrambling*,” K. A. Landsman, C. Figgatt, T. Schuster, N. M. Linke, B. Yoshida, N. Y. Yao, C. Monroe, **Nature** **567**, 61 (2019); [News and Views].
11. “*Confined Quasiparticle Dynamics in Long-Range Interacting Quantum Spin Chains*,” F. Liu, R. Lundgren, P. Titum, G. Pagano, J. Zhang, C. Monroe, and A. V. Gorshkov, **Phys. Rev. Lett.** **122**, 150601 (2019).
12. “*Training of Quantum Circuits on a Hybrid Quantum Computer*,” D. Zhu, N. M. Linke, M. Benedetti, K. A. Landsman, N. H. Nguyen, C. H. Alderete, A. Perdomo-Ortiz, N. Korda, A. Garfoot, C. Brecque, L. Egan, O. Perdomo, and C. Monroe, arXiv 1812.08862 (2018).
13. “*High Purity Single Photons Entangled with an Atomic Memory*,” C. Crocker, M. Lichtman, K. Sosnova, A. Carter, S. Scarano, and C. Monroe, arXiv: 1812.01749 (2018).
14. “*Quantum repeaters based on two species trapped ions*,” Santra, S. Muralidharan, M. Lichtman, L. Jiang, C. Monroe, and V. S. Malinovskiy, arXiv: 1811.10723 (2018).
15. “*Cryogenic Trapped-Ion System for Large Scale Quantum Simulation*,” G. Pagano, P.W. Hess, H. B. Kaplan, W. L. Tan, P. Richerme, P. Becker, A. Kyprianidis, J. Zhang, E. Birkelbaw, M. R. Hernandez, Y. Wu, C. Monroe, **Quantum Sci. Tech.** **4**, 014004 (2018).

16. “Measuring the Renyi entropy of a two-site Fermi-Hubbard model on a trapped ion quantum computer,” N. M. Linke, S. Johri, C. Figgatt, K. A. Landsman, A. Y. Matsuura, and C. Monroe, *Phys. Rev. A* **98**, 052334 (2018).
17. “Machine Learning Assisted Readout of Trapped Ion Qubits,” A. Seif, K. A. Landsman, N. M. Linke, C. Figgatt, C. Monroe, and M. Hafezi, *J. Phys. B: At. Mol. Opt. Phys.* **51** 174006 (2018).
18. “Demonstration of a Bayesian Quantum Game on an Ion Trap Quantum Computer,” N. Solmeyer, N. M. Linke, C. Figgatt, K. A. Landsman, R. Balu, G. Siopsis, C. Monroe, *Quantum Sci. Tech.* **3**, 045002 (2018).
19. “Observation of Hopping and Blockade of Bosons in a Trapped Ion Spin Chain,” S. Debnath, N. M. Linke, S.-T. Wang, C. Figgatt, K. A. Landsman, L.-M. Duan, and C. Monroe, *Phys. Rev. Lett.* **120**, 073001 (2018).
20. “Robust two-qubit gates in a linear ion crystal using a frequency-modulated driving force,” P.-H. Leung, K. A. Landsman, C. Figgatt, N. M. Linke, C. Monroe, and K. R. Brown, *Phys. Rev. Lett.* **120**, 020501 (2018).
21. “Demonstration of two-atom entanglement with ultrafast optical pulses,” J. D. Wong-Campos, S. A. Moses, K. G. Johnson, and C. Monroe, *Phys. Rev. Lett.* **119**, 230501 (2017).
22. “Observation of a Many-Body Dynamical Phase Transition in a 53-Qubit Quantum Simulator,” J. Zhang, G. Pagano, P. W. Hess, A. Kyprianidis, P. Becker, H. B. Kaplan, A. V. Gorshkov, Z.-X. Gong, and C. Monroe, *Nature* **551**, 601 (2017).
23. “Complete 3-Qubit Grover Search on a Programmable Quantum Computer,” C. Figgatt, D. Maslov, K. A. Landsman, N. M. Linke, S. Debnath, C. Monroe, *Nature Comm.* **8**, 1918 (2017).
24. “Fault-Tolerant Quantum Error Detection,” N. M. Linke, M. Gutierrez, K. A. Landsman, C. Figgatt, S. Debnath, K. R. Brown, C. Monroe, *Science Advances* **3**, e1701074 (2017).
25. “Multi-Species Trapped Ion Node for Quantum Networking,” I. V. Inlek, C. Crocker, M. Lichtman, K. Sosnova, and C. Monroe, *Phys. Rev. Lett.* **118**, 250502, (2017).
26. “Ultrafast Creation of Large Schrödinger Cat States of an Atom,” K. G. Johnson, J. D. Wong-Campos, B. Neyenhuis, J. Mizrahi, C. Monroe, *Nature Comm.* **8**, 697 (2017).
27. “Experimental Comparison of Two Quantum Computing Architectures,” N. M. Linke, D. Maslov, M. Roetteler, S. Debnath, C. Figgatt, K. A. Landsman, K. Wright, C. Monroe, *Proc. Nat’l Acad. Sci.* **114**, 13 (2017).
28. “Observation of a Discrete Time Crystal,” J. Zhang, P.W. Hess, A. Kyprianidis, P. Becker, A. Lee, J. Smith, G. Pagano, I.-D. Potirniche, A.C. Potter, A. Vishwanath, N.Y. Yao, C. Monroe, *Nature* **543**, 217–220 (2017).
29. “Observation of Prethermalization in Long-Range Interacting Spin Chains,” B. Neyenhuis, J. Smith, A. Lee, P. Richerme, P. Hess, J. Zhang, Z. Gong, A. Gorshkov, and C. Monroe, *Science Advances* **3**, e1700672 (2017).
30. “Engineering Large Stark Shifts for Control of Individual Clock-State Qubits,” A. C. Lee, J. Smith, P. Richerme, B. Neyenhuis, P. W. Hess, J. Zhang, and C. Monroe, *Phys. Rev. A* **94**, 042308 (2016).
31. “Demonstration of a programmable general purpose quantum computer,” S. Debnath, N. M. Linke, C. Figgatt, K. A. Landsman, K. Wright, and C. Monroe, *Nature* **536**, 63 (2016).
32. “Many-body localization in a quantum simulator with programmable random disorder,” J. Smith, A. Lee, P. Richerme, B. Neyenhuis, P. W. Hess, P. Hauke, M. Heyl, D. A. Huse, and C. Monroe, *Nature Physics* doi:10.1038/nphys3783 (2016)..
33. “High resolution adaptive imaging of a single atom,” J. D. Wong-Campos, K. Johnson, B. Neyenhuis, J. Mizrahi, and C. Monroe, *Nature Photonics* **10**, 606 (2016).
34. “Kaleidoscope of quantum phases in a long-range interacting spin-1 chain,” Z.-X. Gong, M. F. Maghrebi, A. Hu, M. Foss-Feig, P. Richerme, C. Monroe, and A. V. Gorshkov, *Phys. Rev. B* **93**, 205115 (2016).
35. “Active Stabilization of Ion Trap Radiofrequency Potentials,” K. G. Johnson, J. D. Wong-Campos, B. Neyenhuis, J. Mizrahi, and C. Monroe, *Rev. Sci. Instrum.* **87**, 053110 (2016).
36. “Simulating the Haldane Phase in Trapped Ion Spins Using Optical Fields,” I. Cohen, P. Richerme, Z.-X. Gong, C. Monroe, A. Retzker, *Phys. Rev. A* **92**, 012334 (2015)..
37. “Sensing Atomic Motion from the Zero Point to Room Temperature with Ultrafast Atom Interferometry,” K. G. Johnson, B. Neyenhuis, J. Mizrahi, J. D. Wong-Campos, C. Monroe, *Phys. Rev. Lett.* **115**, 213001 (2015).
38. “Realization of a Quantum Integer-Spin Chain with Controllable Interactions,” C. Senko, P. Richerme, J. Smith, A. Lee, I. Cohen, A. Retzker, and C. Monroe, *Phys. Rev. X* **5**, 021026 (2015).
39. “Modular Entanglement of Atomic Qubits using both Photons and Phonons,” D. Hucul, I. V. Inlek, G. Vittorini, C. Crocker, S. Debnath, S. M. Clark, and C. Monroe, *Nature Physics*, **11**, 37 (2015).
40. “Entanglement of distinguishable quantum memories,” G. Vittorini, D. Hucul, I.V. Inlek, C. Crocker, and C. Monroe, *Phys. Rev. A* **90**, 040302(R) (2014).
41. “Quantum gates with phase stability over space and time,” I.V. Inlek, G. Vittorini, D. Hucul, C. Crocker, and C. Monroe, *Phys. Rev. A* **90**, 042316 (2014).
42. “Coherent Imaging Spectroscopy of a Quantum Many-Body Spin System,” C. Senko, J. Smith, P. Richerme, A. Lee, W.C. Campbell, and C. Monroe, *Science* **345**, 430 (2014).
43. “Non-local propagation of correlations in long-range interacting quantum systems,” P. Richerme, Z.-X. Gong, A. Lee, C. Senko, J. Smith, M. Foss-Feig, S. Michalakis, A. V. Gorshkov, and C. Monroe, *Nature* **511**, 198 (2014).

44. "Large Scale Modular Quantum Computer Architecture with Atomic Memory and Photonic Interconnects," C. Monroe, R. Raussendorf, A. Ruthven, K. R. Brown, P. Maunz, L.-M. Duan, J. Kim, **Phys. Rev. A** 89, 022317 (2014).
45. "Optimal quantum control of multi-mode couplings between trapped ion qubits for scalable entanglement," T. Choi, S. Debnath, T. A. Manning, C. Figgatt, Z.-X. Gong, L.-M. Duan, and C. Monroe, **Phys. Rev. Lett.** 112, 19502 (2014).
46. "Beat note stabilization of mode-locked lasers for quantum information processing," R. Islam, W. C. Campbell, T. Choi, S. M. Clark, S. Debnath, E. E. Edwards, B. Fields, D. Hayes, D. Hucul, I. V. Inlek, K. G. Johnson, S. Korenblit, A. Lee, K. W. Lee, T. A. Manning, D. N. Matsukevich, J. Mizrahi, Q. Quraishi, C. Senko, J. Smith, and C. Monroe, **Optics Letters** 39, 3238 (2013).
47. "Quantum Catalysis of Magnetic Phase Transitions in a Quantum Simulator," P. Richerme, C. Senko, S. Korenblit, J. Smith, A. Lee, R. Islam, W. C. Campbell, and C. Monroe, **Phys. Rev. Lett.** 111, 100506 (2013).
48. "Quantum Control of Qubits and Atomic Motion Using Ultrafast Laser Pulses," J. Mizrahi, B. Neyenhuis, K. G. Johnson, W. C. Campbell, C. Senko, D. Hayes, D. Hucul, and C. Monroe, submitted to **Appl. Phys. B** (2013).
49. "Experimental Performance of a Quantum Simulator: Optimizing Adiabatic Evolution and Identifying Many-body Ground States," P. Richerme, C. Senko, J. Smith, A. Lee, S. Korenblit, and C. Monroe, **Phys. Rev. A** 88, 012334 (2013).
50. "Emergence and Frustration of Magnetism with Variable-Range Interactions in a Quantum Simulator" R. Islam, C. Senko, W. C. Campbell, S. Korenblit, J. Smith, A. Lee, E. E. Edwards, C.-C. Wang, J. K. Freericks and C. Monroe, **Science** 340, 583 (2013).
51. "Ultrafast Spin-Motion Entanglement and Interferometry with a Single Atom," J. Mizrahi, C. Senko, W. C. Campbell, K. G. Johnson, C. W. S. Conover, C. Monroe, **Phys. Rev. Lett.** 203001 (2013).
52. "Quantum Simulation of Spin Models on an Arbitrary Lattice with Trapped Ions," S. Korenblit, W. C. Campbell, R. Islam, E. E. Edwards, Z. Gong, G.-D. Lin, L.-M. Duan, J. Kim, K. Kim, and C. Monroe, **New J. Phys.** 14, 095024 (2012).
53. "Coherent Error Suppression in Spin-Dependent Force Quantum Gates," D. Hayes, S. M. Clark, S. Debnath, D. Hucul, Q. Quraishi, and C. Monroe, **Phys. Rev. Lett.** 109, 020503 (2012).
54. "Photon collection from a trapped ion + cavity system," J. D. Sterk, L. Luo, T. A. Manning, P. Maunz, and C. Monroe, arXiv 1112.4489, **Phys. Rev. A** 85, 062308 (2012).
55. "Quantum simulation of the transverse Ising model with trapped ions," K. Kim, S. Korenblit, R. Islam, E. E. Edwards, M-S Chang, C. Noh, H. Carmichael, G-D Lin, L-M Duan, C. C. Joseph Wang, J. K. Freericks and C. Monroe, **New J. Phys.** 13, 1050031 (2011).
56. "Onset of a Quantum Phase Transition with a Trapped Ion Quantum Simulator," R. Islam, E. E. Edwards, K. Kim, S. Korenblit, C. Noh, H. Carmichael, G.-D. Lin, L.-M. Duan, C.-C. Joseph Wang, J. K. Freericks, C. Monroe, **Nature Communications** 2, 377 (2011).
57. "Sharp Phase Transitions in a Small Frustrated Network of Trapped Ion Spins," G.-D. Lin, C. Monroe, and L.-M. Duan, **Phys. Rev. Lett.** 106, 230402 (2011).
58. "Quantum Simulation and Phase Diagram of the Transverse Field Ising Model with Three Atomic Spins," E. E. Edwards, S. Korenblit, K. Kim, R. Islam, M. Chang, J. Freericks, G. Lin, L.-M. Duan, C. Monroe, **Phys. Rev. B** 82, 060412 (2010).
59. "Ultrafast Gates for Single Atomic Qubits," W. C. Campbell, J. Mizrahi, Q. Quraishi, C. Senko, D. Hayes, D. Hucul, D. N. Matsukevich, P. Maunz, C. Monroe, **Phys. Rev. Lett.** 105, 090502 (2010).
60. "Quantum Logic between Distant Trapped Ions," S. Olmschenk, D. Hayes, D. N. Matsukevich, P. Maunz, D. L. Moehring, and C. Monroe, **Int. Jour. Quant. Info.** 8, 337 (2010).
61. "Quantum Simulation of Frustrated Ising Spins with Trapped Ions," K. Kim, M.-S. Chang, S. Korenblit, R. Islam, E. E. Edwards, J. K. Freericks, G.-D. Lin, L.-M. Duan, and C. Monroe **Nature** 465, 590 (2010).
62. "Random Numbers Certified by Bell's Theorem," S. Pironio, A. Acin, S. Massar, A. Boyer de la Giroday, D. N. Matsukevich, P. Maunz, S. Olmschenk, D. Hayes, L. Luo, T. A. Manning, and C. Monroe, **Nature** 464, 1021 (2010).
63. "Entanglement of Atomic Qubits using an Optical Frequency Comb," D. Hayes, D. N. Matsukevich, P. Maunz, D. Hucul, Q. Quraishi, S. Olmschenk, W. Campbell, J. Mizrahi, C. Senko, and C. Monroe **Phys. Rev. Lett.**, 104, 140501 (2010).
64. "Protocol for Hybrid Entanglement Between a Trapped Atom and a Semiconductor Quantum Dot," E. Waks and C. Monroe, **Phys. Rev. A** 80, 062330 (2009).
65. "Demonstration of a scalable, multiplexed ion trap for quantum information processing," D. Leibbrandt, J. Labaziewicz, R. Clark, I. Chuang, R. Epstein, C. Ospelkaus, J. Wesenberg, J. Bollinger, D. Leibfried, D. Wineland, D. Stick, J. Sterk, C. Monroe, C-S Pai, Y Low, R Frahm, and R Slusher, **Quantum Inf. Comp.** 9, 899 (2009).
66. "Entanglement and Tunable Spin-Spin Couplings Between Trapped Ions Using Multiple Transverse Modes," K. Kim, M.-S. Chang, R. Islam, S. Korenblit, L.-M. Duan, and C. Monroe, **Phys. Rev. Lett.** 102, 250502 (2009).
67. "Precision measurement of the lifetime of the $6p\ ^2P_{1/2}$ level of Yb^+ ," S. Olmschenk, D. Hayes, D. N. Matsukevich, P. Maunz, D. L. Moehring, K. C. Younge, C. Monroe, **Phys. Rev. A** 80, 022502 (2009).
68. "Large Scale Quantum Computation in an Anharmonic Linear Ion Trap," G.-D. Lin, S.-L. Zhu, R. Islam, K. Kim, M.-S. Chang, S. Korenblit, C. Monroe, and L.-M. Duan, **Europhysics Letters** 86, 60004 (2009).

69. “A heralded quantum gate between remote atoms,” P. Maunz, S. Olmschenk, D. Hayes, D. N. Matsukevich, L.-M. Duan, and C. Monroe, *Phys. Rev. Lett.* **102**, 250502 (2009).
70. “Quantum Teleportation between Distant Matter Qubits,” S. Olmschenk, D. N. Matsukevich, P. Maunz, D. Hayes, L.-M. Duan, and C. Monroe, *Science* **323**, 486 (2009).
71. “Bell inequality violation with two remote atomic qubits,” D. Matsukevich, P. Maunz, D. L. Moehring, S. Olmschenk, and C. Monroe, *Phys. Rev. Lett.* **100**, 150404 (2008).
72. “Manipulation and detection of a trapped Yb^+ hyperfine qubit,” S. Olmschenk, K. C. Younge, D. L. Moehring, D. Matsukevich, P. Maunz, and C. Monroe, *Phys. Rev. A* **76**, 052314.
73. “Magneto-optical trapping of cadmium,” K.-A. Brickman, M.-S. Chang, M. Acton, A. Chew, D. Matsukevich, P. C. Haljan, V. S. Bagnato, and C. Monroe, *Phys. Rev. A* **76**, 043411 (2007).
74. “Entanglement of single-atom quantum bits at a distance,” D. L. Moehring, P. Maunz, S. Olmschenk, K. C. Younge, D. N. Matsukevich, L.-M. Duan, and C. Monroe, *Nature* **449**, 68 (2007).
75. “Quantum interference of photon pairs from two remote trapped atomic (Yb) ions,” P. Maunz, D. L. Moehring, S. Olmschenk, K. C. Younge, D. N. Matsukevich and C. Monroe, *Nature Physics* **3**, 538 (2007).
76. “Quantum Interference of Photon Pairs from Two Trapped Atomic (Cd) Ions,” P. Maunz, D. L. Moehring, M. J. Madsen, R. N. Kohn, Jr., K. Younge, and C. Monroe, *quant-ph/0608047*.
77. “Efficient Photoionization-Loading of Trapped Ions with Ultrafast Pulses,” L. Deslauriers, M. Acton, B. B. Blinov, K.-A. Brickman, P. C. Haljan, W. K. Hensinger, D. Hucul, S. Katnik, R. N. Kohn, P. J. Lee, M. A. Madsen, P. Maunz, D. L. Moehring, S. Olmschenk, D. Stick, and C. Monroe, *Phys. Rev. A* **74**, 063421 (2006).
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