Christopher R Monroe

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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

2021–	**Duke Quantum Center**	**Founding Director**
2021–	**Duke University, Durham NC**	**Gilhuly Family Presidential Distinguished Professor**
2021–	**Duke University, Durham NC**	**Professor of Physics**
2021–	**Duke University, Durham NC**	**Professor of Electrical and Computer Engeineering**
2021–	**Univ. of Maryland, College Park**	**College Park Professor of Physics**
2018–2019	IonQ, Inc., College Park	Chief Executive Officer
2018–2021	Univ. of Maryland, College Park	Professor, Electrical and Computer Engineering Dept.
2016–2023	IonQ, Inc., College Park	Co-Founder and Chief Scientist
2015–2021	Univ. of Maryland, College Park	Distinguished University Professor
2014–2021	Univ. of Maryland, College Park	Fellow, Center for Quantum Info. & Comp. Sci. (QuICS)
2007–2021	Univ. of Maryland, College Park	Fellow, Joint Quantum Institute (JQI)
2007–2021	Univ. of Maryland, College Park	Bice Zorn Professor of Physics
2006–2007	Univ. of Michigan, Ann Arbor	Director, FOCUS (NSF Frontier Center on Ultrafast Science)
2006–2007	Univ. of Michigan, Ann Arbor	Professor, Electrical Engineering and Computer Science Dept.
2003–2007	Univ. of Michigan, Ann Arbor	Professor, Physics Dept.
2000–2003	Univ. of Michigan, Ann Arbor	Associate Professor, Physics Dept.
1995–2000	Univ. 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

Fellow, Optical Society of America (2020)
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

US Presidential National Quantum Initiative Advisory Committee (NQIAC) (2020–2022)
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

Paul Scherrer Institute Laboratory for Nano and Quantum Technologies, Advisory Board (2023–)
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 (2018–2023).
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

Founding General Chair, Quantum 2.0 Optical Society of America conference (2020).
US National Quantum Initiative Founding Stakeholder; testified to US Congress in Oct 2017, May 2018, and May 2021
Founding Organizer, Biennial Michigan Summer School on Quantum Physics (2008–2014).
Chair, Gordon Research Conference on Atomic Physics (2007).
Director, *Enrico Fermi International School of Physics* on "Quantum Information Science" (2001).

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 (QI) 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 and application of quantum processing systems using atoms and photons, the natural carriers of QI. This includes the design and realization of entangling quantum logic gates between atoms, the photonic quantum networking of remotely-located atoms, and the scaling to huge numbers of atomic quantum bits.

Cold and Ultrafast 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 cw and ultrafast 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.

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.

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.

Quantum Policy. I routinely work with the US government (as well as select allied foreign governments) on the coordinated public, university, and private advocacy and development of quantum information science and technology. I have testified to the US Congress several times on this topic and was a primary architect of the 2018 US National Quantum Initiative that endowed the US DOE, NSF, and NIST with National Quantum Research Centers.

Invited Presentations (1995-present)

250 invited talks at conferences and workshops
225 academic colloquia and seminars
18 sets of lectures at academic summer schools
10 public lectures on Quantum Science, Quantum Information, and the Physics of Music and Quantum Physics

Mentoring (1995-present)

5 Research Scientists, 40 postdoctoral researchers, 60 graduate students, 24 undergraduate students, 4 high school students

Industrial Activity, Patents and Intellectual Property

- Co-Founder, former CEO, former Chief Scientist of IonQ, a startup that manufactures and develops quantum computers. IonQ became a public company in 2021 with a market capitalization of >$2B.
- 15 awarded patents; 6 patents pending

Research Journal Preprints under Review

1. "*Entanglement fidelity limits of photonically-networked atomic qubits from recoil and timing*," Yichao Yu, Sagnik Saha, Mikhail Shalaev, George Toh, Jameson OReilly, Isabella Goetting, Ashish Kalakuntla, Christopher Monroe, arXiv:2503.19818 (2025).
2. "*Observation of string-breaking dynamics in a quantum simulator*," A. De, A. Lerose, D. Luo, F. M. Surace, A. Schuckert, E. R. Bennewitz, B. Ware, W. Morong, K. S. Collins, Z. Davoudi, A. V. Gorshkov, O. Katz, and C. Monroe, arXiv:2410.13815 (2024).
3. "*Observation of the Symmetry-Protected Signature of 3-body Interactions*," Liudmila A. Zhukas, Qingfeng Wang, Or Katz, Christopher Monroe, Iman Marvian, arXiv:2408.10475 (2024).
4. "*Demonstration of a CAFQA-bootstrapped Variational Quantum Eigensolver on a Trapped-Ion Quantum Computer*," Qingfeng Wang, Liudmila Zhukas, Qiang Miao, Aniket S. Dalvi, Peter J. Love, Christopher Monroe, Frederic T. Chong, Gokul Subramanian Ravi, arXiv:2408.06482 (2024).
5. "*Simulating Meson Scattering on Spin Quantum Simulators*," E. R. Bennewitz, B. Ware, A. Schuckert, A. Lerose, F. M. Surace, R. Belyansky, W. Morong, L. Luo, A. De, K. S. Collins, O. Katz, C. Monroe, Z. Davoudi, and A. V. Gorshkov, arXiv 2403.07061 (2024).
6. "*Observing Topological Insulator Phases with a Programmable Quantum Simulator*," O. Katz, L. Feng, D. Porras, and C. Monroe, arXiv: 2401.10362 (2024).
7. "*Non-equilibrium critical scaling and universality in a quantum simulator*," A. De, P. Cook, K. Collins, W. Morong, D. Paz, P. Titum, G. Pagano, A. V. Gorshkov, M. Maghrebi, and C. Monroe, arXiv:2309.10856 (2023).
8. "*Phase transition in magic with random quantum circuits*," P. Niroula, C. D. White, Q. Wang, S. Johri, D. Zhu, C. Monroe, C. Noel, and M. J. Gullans, arXiv:2304.10481 (2023).
9. "*Experimental Implementation of an Efficient Test of Quantumness*," L. Lewis, D. Zhu, A. Gheorghiu, C. Noel, O. Katz, B. Harraz, Q. Wang, A. Risinger, L. Feng, D. Biswas, L. Egan, T. Vidick, M. Cetina, and C. Monroe, arXiv:2209.14316 (2022).
10. "*Quantum Simulation for High Energy Physics*," C. W. Bauer, et al., arXiv:2204.03381 (2022).
11. "*Digital quantum simulation of NMR experiments*," K. Seetharam, D. Biswas, C. Noel, A. Risinger, D. Zhu, O. Katz, S. Chattopadhyay, M.Cetina, C. Monroe, E. Demler, and Dries Sels, arXiv:2109.13298 (2021).

Research Journal Publications (70,000 citations, h=110)

1. "*High-fidelity remote entanglement of trapped atoms mediated by time-bin photon*s," S. Saha, M. Shalaev, J. O'Reilly, I. Goetting, G. Toh, A. Kalakuntla, Y. Yu, and C. Monroe, ***Nature Comm.*** **16**, 2533 (2025).
2. "*Observation of a finite-energy phase transition in a one-dimensional quantum simulator*," A. Schuckert, O. Katz, L. Feng, E. Crane, A. De, M. Hafezi, A. V. Gorshkov, and C. Monroe, ***Nature Physics*** **21**, 374 (2025).
3. "*Fast photon-mediated entanglement of continuously-cooled trapped ions for quantum networking*," J. O'Reilly, G. Toh, I. Goetting, S. Saha, M. Shalaev, A. Carter, A. Risinger, A. Kalakuntla, T. Li, A. Verma, and C. Monroe, ***Phys. Rev. Lett.*** **133**, 090802 (2024).
4. "*Ion Trap with In-Vacuum High Numerical Aperture Imaging for a Dual-Species Modular Quantum Computer*," A. L. Carter, J. O'Reilly, G. Toh, S. Saha, M. Shalaev, I. Goetting, and C. Monroe, ***Rev. Sci. Instrum.*** **95**, 033201 (2024).
5. "*Experimental Implementation of an Efficient Test of Quantumness*," L. Lewis, D. Zhu, A. Gheorghiu, C. Noel, O. Katz, B. Harraz, Q. Wang, A. Risinger, L. Feng, D. Biswas, L. Egan, T. Vidick, M. Cetina, and C. Monroe, ***Phys. Rev. A*** **109**, 012610 (2024).

6. "*Continuous Symmetry Breaking in a Trapped-Ion Spin Chain*," L. Feng, O. Katz, C. Haack, M. Maghrebi, A. V. Gorshkov, Z. Gong, M. Cetina, and C. Monroe, ***Nature* 623**, 713 (2023).
7. "*Interactive Protocols for Classically-Verifiable Quantum Advantage*," D. Zhu, G. D. Kahanamoku-Meyer, L. Lewis, C. Noel, O. Katz, B. Harraz, Q. Wang, A. Risinger, L. Feng, D. Biswas, L. Egan, A. Gheorghiu, Y. Nam, T. Vidick, U. Vazirani, N. Y. Yao, M. Cetina, and C. Monroe, ***Nature Physics*** (2023).
8. "*Demonstration of three- and four-body interactions between trapped-ion spins*," Or Katz, Lei Feng, Andrew Risinger, Christopher Monroe, Marko Cetina, ***Nature Physics* 19**, 1452 (2023).
9. "*Engineering dynamically decoupled quantum simulations with trapped ions*," W. Morong, K. S. Collins, A. De, E. Stavropoulos, T. You, and C. Monroe, ***Phys. Rev. X Quantum* 4**, 010334 (2023).
10. "*Programmable* Quantum Simulations of Bosonic Systems with Trapped Ions," O. Katz and C. Monroe, ***Phys. Rev. Lett.* 131**, 033604 (2023).
11. "*Programmable N-body interactions with trapped ions*," O. Katz, M. Cetina, and C. Monroe, ***Phys. Rev. X Quantum* 4**, 030311 (2023).
12. "*Observation of measurement-induced quantum phases in a trapped-ion quantum computer*," C. Noel, P. Niroula, D. Zhu, A. Risinger, L. Egan, D. Biswas, M. Cetina, A. V. Gorshkov, M. J. Gullans, D. A. Huse, C. Monroe, **Nature Physics 18**, 760 (2022).
13. "*Cross-Platform Comparison of Arbitrary Quantum Computations*," D. Zhu, Z.-P. Cian, C. Noel, A. Risinger, D. Biswas, L. Egan, Y. Zhu, A. M. Green, A. Maksymov, Y. Nam, M. Cetina, N. M. Linke, M. Hafezi, and C. Monroe, ***Nature Comm.* 13**, 6620 (2022).
14. "*N-body interactions between trapped ion qubits via spin-dependent squeezing*," O. Katz, M. Cetina, and C. Monroe, ***Phys. Rev. Lett.* 129**, 063603 (2022).
15. "*Many-body quantum teleportation via operator spreading in the traversable wormhole protocol*," T. Schuster, B. Kobrin, P. Gao, I. Cong, E. T. Khabiboulline, N. M. Linke, M. D. Lukin, C. Monroe, B. Yoshida, and N. Y. Yao, ***Phys. Rev. X Quantum* 12**, 031013 (2022).
16. "Observation of measurement-induced quantum phases in a trapped-ion quantum computer," C. Noel, P. Niroula, D. Zhu, A. Risinger, L. Egan, D. Biswas, M. Cetina, A. V. Gorshkov, M. J. Gullans, D. A. Huse, C. Monroe, ***Nature Physics* 18**, 760 (2022).
17. "*Control of Transverse Motion for Quantum Gates on Individually Addressed Atomic Qubits*," M. Cetina, L.N. Egan, C. Noel, M.L. Goldman, D. Biswas, A.R. Risinger, D. Zhu, and C. Monroe, ***Phys. Rev. X Quantum* 3**, 010334 (2022).
18. "*Comparison of Cloud-Based Ion Trap and Superconducting Quantum Computer Architectures*," S. Blinov, B. Wu, and C. Monroe, ***AVS Quantum Sci.* 3**, 033801 (2021)
19. "*Observation of Stark many-body localization without disorder*," W. Morong, F. Liu, P. Becker, K. S. Collins, L. Feng, A. Kyprianidis, G. Pagano, T. You, A. V. Gorshkov, and C. Monroe, ***Nature* 599**, 393 (2021).
20. "*Observation of a prethermal discrete time crystal*," A. Kyprianidis, F. Machado, W. Morong, P. Becker, K. S. Collins, D. V. Else, L. Feng, P. W. Hess, C. Nayak, G. Pagano, N. Y. Yao, and C. Monroe, to appear in ***Science* 372**, 1192 (2021).
21. "*Optimizing Stabilizer Parities for Improved Logical Qubit Memories*," Dripto M. Debroy, Laird Egan, Crystal Noel, Andrew Risinger, Daiwei Zhu, Debopriyo Biswas, Marko Cetina, Chris Monroe, and Kenneth R. Brown, ***Phys. Rev. Lett.* 127**, 240501 (2021).
22. "*Fault-Tolerant Operation of a Quantum Error-Correction Code*," L. N. Egan, D. M. Debroy, C. Noel, A. Risinger, D. Zhu, D. Biswas, M. Newman, M. Li, K. R. Brown, M. Cetina, and C. Monroe, ***Nature* 598**, 281 (2021).
23. "*Probing many-body localization on a noisy quantum computer*," D. Zhu, S. Johri, N. H. Nguyen, C. Huerta Alderete, K. A. Landsman, N. M. Linke, C. Monroe and A. Y. Matsuura, ***Phys. Rev. A* 103**, 032606 (2021).
24. "*Domain Wall Confinement and Dynamics in a Quantum Simulator*," L. Tan, P. Becker, F. Liu, G. Pagano, K. S. Collins, A. De, L. Feng, H. B. Kaplan, A. Kyprianidis, R. Lundgren, W. Morong, S. Whitsitt, A. V. Gorshkov, C. Monroe, ***Nature Physics* 17**, 742 (2021).
25. "*The Character of Motional Modes for Entanglement and Sympathetic Cooling of Mixed-Species Trapped Ion Chains*," K. Sosnova, A. Carter, and C. Monroe, ***Phys. Rev. A*** 103, 012610 (2021).
26. "*Efficient ground-state cooling of large trapped-ion chains with an EIT tripod scheme*," L. Feng, W. L. Tan, A. De, A. Menon, A. Chu, G. Pagano, and C. Monroe, ***Phys. Rev. Lett.* 125**, 053001 (2020).
27. "*Resource-Optimized Fermionic Local-Hamiltonian Simulation on Quantum Computer for Quantum Chemistry*," Q. Wang, M. Li, C. Monroe, Y. Nam, ***Quantum* 5**, 509 (2021).
28. "*Universal one-dimensional discrete-time quantum walks and their implementation on near term quantum hardware*," S. Singh, C. H. Alderete, R. Balu, C. Monroe, N. M. Linke, and C. M. Chandrashekar, ***Phys. Rev. A* 104**, 062401 (2021)
29. "*Many-Body Dephasing in a Trapped-Ion Quantum Simulator*," H. B. Kaplan, L. Guo, W. L. Tan, A. De, F. Marquardt, G. Pagano, and C. Monroe, ***Phys. Rev. Lett.* 125**, 120605 (2020).
30. "*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).

31. "*Quantum walks and Dirac cellular automata on a programmable trapped-ion quantum computer*," C. H. Alderete, S. Singh, N. Nguyen, D. Zhu, R. Balu, C. Monroe, C. M. Chandrashekar, and N. M. Linke, ***Nature Communications*** **11**, 3720 (2020).
32. "*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, ***Proc. Nat. Acad. Sci.*** **117**, 25396 (2020).
33. "*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, ***Proc. Nat. Acad. Sci.*** **117**, 25402 (2020).
34. "*Towards analog quantum simulations of lattice gauge theories with trapped ions*," Z. Davoudi, M., C. Monroe, G. Pagano, A. Seif, and A. Shaw, ***Phys. Rev. Research*** **2**, 023015 (2020).
35. "*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).
36. "*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, ***Phys. Rev. A*** **100**, 062319 (2019).
37. "*Benchmarking an 11-qubit quantum computer*," K. Wright, et al., ***Nature Communications*** **10**, 5464 (2019).
38. "*Ground-state energy estimation of the water molecule on a trapped ion quantum computer*," Y. Nam, et al., ***Nature Quantum Information*** **6**, 33 (2020)..
39. "*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, ***Phys. Rev. A*** **100**, 042304 (2019).
40. "*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)
41. "*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].
42. "*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).
43. "*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, ***Science Advances*** **5**, eaaw9918 (2019).
44. "*High Purity Single Photons Entangled with an Atomic Memory*," C. Crocker, M. Lichtman, K. Sosnova, A. Carter, S. Scarano, and C. Monroe, ***Optics Express*** **27**, 28143 (2019).
45. "*Quantum repeaters based on two species trapped ions*," Santra, S. Muralidharan, M. Lichtman, L. Jiang, C. Monroe, and V. S. Malinovsky, ***New J. Phys.*** **21** 073002 (2019).
46. "*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. Birckelbaw, M. R. Hernandez, Y. Wu, C. Monroe, ***Quantum Sci. Tech.*** **4**, 014004 (2018).
47. "*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).
48. "*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).
49. "*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).
50. "*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).
51. "*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).
52. "*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).
53. "*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).
54. "*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).
55. "*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).
56. "*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).

57. "*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).
58. "*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).
59. "*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).
60. "*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).
61. "*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).
62. "*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).
63. "*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)..
64. "*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).
65. "*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).
66. "*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).
67. "*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)..
68. "*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).
69. "*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).
70. "*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).
71. "*Entanglement of distinguishable quantum memories*," G. Vittorini, D. Hucul, I.V. Inlek, C. Crocker, and C. Monroe, ***Phys. Rev. A*** 90, 040302(R) (2014).
72. "*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).
73. "*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).
74. "*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).
75. "*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).
76. "*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).
77. "*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).
78. "*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).
79. "*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).
80. "*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).
81. "*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).
82. "*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).

83. "*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).
84. "*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).
85. "*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).
86. "*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).
87. "*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).
88. *"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).
89. *"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).
90. *"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).
91. "*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).
92. "*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).
93. "*Random Numbers Certified by Bell's Theorem*," S. Pironio, A. Acın, 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).
94. "*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).
95. "*Protocol for Hybrid Entanglement Between a Trapped Atom and a Semiconductor Quantum Dot*," E. Waks and C. Monroe, ***Phys. Rev. A*** 80, 062330 (2009).
96. "*Demonstration of a scalable, multiplexed ion trap for quantum information processing*," D. Leibrandt, 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).
97. "*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).
98. "*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).
99. "*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).
100. "*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).
101. "*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).
102. "*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).
103. "*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.
104. "*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).
105. "*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).
106. "*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).
107. *"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***.
108. "*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).

109. "*Scaling and Suppression of Anomalous Quantum Decoherence in Ion Traps*," L. Deslauriers, S. Olmschenk, D. Stick, and C. Monroe, ***Phys. Rev. Lett.*** **97**, 103007 (2006).
110. *"Trapped ion quantum computation with transverse phonon modes*," Shi-Liang Zhu, C. Monroe, and L.-M. Duan ***Phys. Rev. Lett.*** **97**, 050505 (2006).
111. *"Semiconductor Traps for Laser-Cooled Atomic Ions and Scalable Quantum Computing,"* D. Stick, W. K. Hensinger, S. Olmschenk, and C. Monroe, ***IEEE Lasers and Electro-Optic Society Newsletter*** **20** (3), 13 (June, 2006)
112. *"Probabilistic Quantum Gates between Remote Atoms through Interference of Optical Frequency Qubits*," L.-M. Duan, M. J. Madsen, D. L. Moehring, P. Maunz, R. N. Kohn, and C. Monroe, ***Phys. Rev. A*** **73,** 062324 (2006).
113. *"Ultrafast Coherent Coupling of Atomic Hyperfine and Photon Frequency Qubits*," M. J. Madsen, D. L. Moehring, P. Maunz, R. N. Kohn, L.-M. Duan, and C. Monroe, ***Phys. Rev. Lett.*** **97**, 040505 (2006).
114. "*Near-Perfect Simultaneous Detection of a Qubit Register*," M. Acton, L. Deslauriers, K.-A. Brickman, P. C. Haljan, P. J. Lee, S. Olmschenk, and C. Monroe, ***Quant. Inf. Comp.*** **6**, 465 (2006); *quant-ph/0511257*.
115. "*Precision Lifetime Measurement of a Single Trapped Ion with Ultrafast Laser Pulses*," D. L. Moehring, B. B. Blinov, D. W. Gidley, R. N. Kohn, M. J. Madsen, T. B. Sanderson, R. S. Vallery, and C. Monroe, ***Phys. Rev. A*** **73**, 023413 (2006).
116. "*T-junction ion trap array for two dimensional ion shuttling, storage and manipulation*" W. K. Hensinger, S. Olmschenk, D. Stick, D. Hucul, M. Yeo, M. Acton, L. Deslauriers, J. Rabchuk, and C. Monroe, ***Appl. Phys. Lett.*** **88**, 034101 (2006).
117. "*Arbitrary-speed quantum gates within large ion crystals through minimum control of laser beams*," Shi-Liang Zhu, C. Monroe, L.-M. Duan, ***Europhys. Lett.*** **73** (4), 1 (2006); *quant-ph/0508037*.
118. "*Ion Trap in a Semiconductor Chip*," D. Stick, W. K. Hensinger, S. Olmschenk, M. J. Madsen, K. Schwab, and C. Monroe, ***Nature Physics*** **2**, 36 (2006).
119. "*Broadband Laser Cooling of Trapped Atoms with Ultrafast Laser Pulses*," B. B. Blinov, R. N. Kohn, M. J. Madsen, D. L. Moehring, and C. Monroe, ***J. Opt. Soc. Am. B*** **23**, 1170 (2006); *quant-ph/0505111*.
120. "*Entanglement of Trapped-Ion Clock States*," P. C. Haljan, P. J. Lee, K.-A. Brickman, M. Acton, L. Deslauriers, and C. Monroe, ***Phys. Rev. A*** **72**, 062316 (2005).
121. "*Implementation of Grover's Quantum Search Algorithm in a Scalable System*," K.-A. Brickman, P. C. Haljan, P. J. Lee, M. Acton, L. Deslauriers, and C. Monroe, ***Phys. Rev. A*** **72**, 050306 (2005).
122. *"Phase Control of Trapped Ion Quantum Gates*," P. J. Lee, K.-A. Brickman, L. Deslauriers, P. C. Haljan, L.-M. Duan, and C. Monroe, ***Journal of Optics B*** **7**, S371 (2005).
123. "*Ion trap transducers for quantum electromechanical oscillators"*, W. K. Hensinger, D. W. Utami, H.-S. Goan, K. Schwab, C. Monroe, and G. J. Milburn, ***Phys. Rev. A*** (2005).
124. "*Spin-dependent Forces on Trapped Ions for Phase-Stable Quantum Gates and Motional Schrődinger Cat States*," P. C. Haljan, K.-A. Brickman, L. Deslauriers, P. J. Lee, and C. Monroe, ***Phys. Rev. Lett.*** **94**, 153602 (2005).
125. "*Experimental measurement of a Bell inequality violation between an atom and a photon*," D.L. Moehring, M.J. Madsen, B.B. Blinov, and C. Monroe, ***Phys. Rev. Lett.*** **93**, 090410 (2004).
126. "*Zero-point cooling and heating of Trapped Cd^+ ions*," L. Deslauriers, P. Haljan, P. Lee, K.-A. Brickman, M. Madsen, B. B. Blinov, and C. Monroe, ***Phys. Rev. A*** **70**, 043408 (2004).
127. "*Control of trapped-ion quantum states with optical pulses*," C. Rangan, A.M. Bloch, C. Monroe, P.H. Bucksbaum, ***Phys. Rev. Lett.*** **92**, 113004 (2004).
128. "*Scalable trapped ion quantum computation with a probabilistic ion-photon mapping*," L.-M. Duan, B. B. Blinov, D. L. Moehring, and C. Monroe, ***Quantum Inf. Comp.***, **4**, 165 (2004); *quant-ph/0401185*.
129. "*Observation of entanglement between a single trapped atom and a single photon*," B. B. Blinov, D. L. Moehring, L.-M. Duan, and C. Monroe, ***Nature*** **428**, 153 (2004).
130. "*Planar ion trap geometry for microfabrication*," M.J. Madsen, W. Hensinger, D. Stick, J. Rabchuk, and C. Monroe, ***Applied Physics B: Laser and Optics*** **78**, 639 (2004); *quant-ph/0401047*.
131. "*Atomic qubit manipulations with an electro-optic modulator*," P.J. Lee, B.B. Blinov, K. Brickman, L. Deslauriers, M.J. Madsen, R. Miller, D.L. Moehring, D. Stick, and C. Monroe, ***Optics Letters*** **28**, 1582 (2003).
132. "*Decoherence of motional superpositions of a trapped ion*," C. A. Sackett, C. Monroe, and D. J. Wineland, ***Chaos, Solitons, and Fractals*** **16**, 431 (2003).
133. "*Sympathetic cooling of trapped Cd^+ isotopes*," B. Blinov, L. Deslauriers, M. P. Lee, M. Madsen, R. Miller, and C. Monroe, ***Phys. Rev. A,*** 040304 (2002).
134. "*Quantum information processing with atoms and photons*," C. Monroe, ***Nature*** **416**, 238 (2002).
135. "*Architecture for a large scale ion-trap quantum computer*," D. Kielpinski, C. Monroe, and D. Wineland, ***Nature*** **417**, 709 (2002).
136. "*Experimental demonstration of entanglement-enhanced rotation angle estimation using trapped ions*," V. Meyer, M. Rowe, D. Kielpinski, C. Sackett, W. Itano, C. Monroe, and D. Wineland, ***Phys. Rev. Lett.*** **86**, 5870 (2001).
137. "*A Decoherence-Free Quantum Memory Using Trapped Ions*," D. Kielpinski, V. Meyer, M. A. Rowe, C. A. Sackett, W. Itano, C. Monroe, and D. Wineland, ***Science*** **291**, 1013 (2001).

138. "*Experimental Violation of a Bell's Inequality with Efficient Detection*," M. A. Rowe, D. Kielpinski, V. Meyer, C. A. Sackett, W. Itano, C. Monroe, and D. Wineland, ***Nature* 409**, 791 (2001).
139. "*Computing with atoms and molecules?*" C. Monroe and D. Wineland, ***Science Spectra***, Issue 23, 17 (2000).
140. "*Experimental Entanglement of Four Particles*," C. Sackett, D. Kielpinski, Q. Turchette, V. Meyer, M. Rowe, C. Langer, C. Myatt, B. King, W. Itano, D. Wineland, and C. Monroe, ***Nature* 404**, 256 (2000).
141. "*Decoherence and Decay of Motional Quantum States of a Trapped Atom Coupled to Engineered Reservoirs*," Q. Turchette, C. Myatt, D. Kielpinski, B. King, C. Sackett, W. Itano, C. Monroe, and D. Wineland, ***Phys. Rev. A* 62**, 053807 (2000).
142. "*Heating of Trapped Ions From the Quantum Ground State*," Q. Turchette, D. Kielpinski, B. King, C. Myatt, C. Sackett, W. Itano, C. Monroe, and D. Wineland, ***Phys. Rev. A* 61**, 063418 (2000).
143. "*Decoherence of Quantum Superpositions Coupled to Engineered Reservoirs*," C. Myatt, D. Kielpinski, B. King, C. Sackett, Q. Turchette, W. Itano, C. Monroe, and D. Wineland, ***Nature* 403**, 269 (2000).
144. "*Quantum Logic Using Sympathetically Cooled Ions*," D. Kielpinski, B. King, Q. Turchette, C. Myatt, C. Sackett, D. Kielpinski, W. Itano, C. Monroe, D. Wineland, and W. Zurek, ***Phys. Rev. A* 61**, 032310 (2000).
145. "*Deterministic Entanglement of Two Trapped Ions*," Q. Turchette, C. Wood, C. Myatt, B. King, D. Leibfried, W. Itano, C. Monroe, and D. Wineland, ***Phys. Rev. Lett.* 81**, 17 (1998).
146. "*Initializing the Collective Motion of Trapped Ions for Quantum Logic*," B. King, C. Wood, C. Myatt, Q. Turchette, D. Leibfried, W. Itano, C. Monroe, and D. Wineland, ***Phys. Rev. Lett.* 81**, 1525 (1998).
147. "*Trapped-Ion Quantum Simulator*," D. Wineland, C. Monroe, W. Itano, B. King, D. Leibfried, C. Myatt, and C. Wood, ***Physica Scripta* T76**, 147 (1998).
148. "*Quantum Computing*," G. Brassard, I. Chuang, S. Lloyd, and C. Monroe, ***Proc. Nat. Acad. Science* 95**,11032 (1998).
149. "*Quantum State Manipulation of Trapped Atomic Ions*," D. Wineland, C. Monroe, D. Meekhof, B. King, D. Leibfried, W. Itano, J. Bergquist, D. Berkeland, J. Bollinger, and J. Miller, ***Proc. R. Soc. A* 454**, 411 (1998).
150. "*Experimental Creation and Measurement of Motional Quantum States of a Trapped Ion*," D. Meekhof, D. Leibfried, C. Monroe, B. King, W. Itano, and D. Wineland, ***Brazilian Journal of Physics* 27**, 178 (1997).
151. "*Atomic Physics in Ion Traps*," C. Monroe and J. Bollinger, ***Physics World* 10**, 37 (March 1997).
152. "*Experimental Preparation and Measurement of the State of Motion of a Trapped Atom*," D. Leibfried, D. Meekhof, B. King, C. Monroe, W. Itano, and D. Wineland, ***Journal of Modern Optics* 44**, 2485 (1997).
153. "*Simplified Quantum Logic with Trapped Ions*," C. Monroe, D. Leibfried, B. King, D. Meekhof, W. Itano, and D. Wineland, ***Phys. Rev. A* 55**, R2489 (1997).
154. "*Experimental Determination of the Motional Quantum State of a Trapped Atom*," D. Leibfried, D. Meekhof, B. King, C. Monroe, W. Itano, and D. Wineland**, *Phys. Rev. Lett.* 77**, 4281 (1996).
155. "*A Schrödinger Cat Superposition State of an Atom*," C. Monroe, D. Meekhof, B. King, D. Wineland, ***Science* 272**, 1131 (1996).
156. "*Generation of nonclassical motional states of a trapped atom*," D. Meekhof, C. Monroe, B. King, W. Itano, and D. Wineland, ***Phys. Rev. Lett.* 76**, 1796 (1996).
157. "*Demonstration of a Universal Quantum Logic Gate*," C. Monroe, D. Meekhof, B. King, W. Itano, and D. Wineland, ***Phys. Rev. Lett.* 75**, 4714 (1995).
158. "*Resolved-Sideband Raman Cooling of a Bound Atom to the 3D Zero-Point Energy*," C. Monroe, D. Meekhof, B. King, S. Jefferts, W. Itano, D. Wineland, and P. Gould, ***Phys. Rev. Lett.* 75**, 4011 (1995).
159. "*Paul Trap for Optical Frequency Standards*," S. Jefferts, C. Monroe, A. Barton, and D. Wineland, ***IEEE Trans. on Instrum. and Measur.* 44**, 148 (1995).
160. "*A Coaxial-Resonator Driven rf (Paul) Ion Trap for Strong Confinement*," S. Jefferts, C. Monroe, E. Bell, D. Wineland, ***Phys. Rev. A* 51**, 1235 (1995).
161. "*A New Magnetic Suspension System for Atoms and Bar Magnets*," C. Sackett, E. Cornell, C. Monroe and C. Wieman, ***Amer. Jour. Phys.* 61**, 304 (1993).
162. "*Measurement of Cs-Cs Elastic Scattering at T=30 μKelvin*, " C. Monroe, E. Cornell, C. Sackett, C. Myatt, and C. Wieman, ***Phys. Rev. Lett.* 70**, 414 (1993).
163. "*Multiply Loaded, AC Magnetic Trap for Neutral Atoms*, " E. Cornell, C. Monroe and C. Wieman, ***Phys. Rev. Lett.* 67**, 2439 (1991).
164. "*Observation of the Cesium Clock Transition using Laser-Cooled Atoms in a Vapor Cell*," C. Monroe, H. Robinson and C. Wieman, ***Opt. Lett.* 16**, 50 (1991).
165. "*Very Cold Trapped Atoms in a Vapor Cell*," C. Monroe, W. Swann, H. Robinson and C. Wieman, ***Phys. Rev. Lett.* 65**, 1571 (1990).
166. "*Collisional Losses from a Light Force Atom Trap*," D. Sesko, T. Walker, C. Monroe, A. Gallagher and C. Wieman, ***Phys. Rev. Lett.* 63**, 961 (1989).

Review Articles

1. "*Colloquium: Quantum and classical discrete time crystals*," M. P. Zaletel, M. Lukin, C. Monroe, C. Nayak, F. Wilczek, and N. Y. Yao, Rev. Mod. Phys. 95, 031001 (2023).
2. "*Discrete Time Crystals*," D. V. Else, C. Monroe, C. Nayak, and N. Y. Yao, ***Annual Review of Condensed Matter Physics*** 11, 467-499 (2020).
3. "*Programmable Quantum Simulations of Spin Systems with Trapped Ions*," C. Monroe, W. C. Campbell, L. -M. Duan, Z. -X. Gong, A. V. Gorshkov, P. Hess, R. Islam, K. Kim, G. Pagano, P. Richerme, C. Senko, N. Y. Yao, ***Rev. Mod. Phys.*** 93, 025001 (2021).
4. *Non-thermalization in trapped atomic ion spin chains*," P. W. Hess, P. Becker, H. B. Kaplan, A. Kyprianidis, A. C. Lee, B. Neyenhuis, G. Pagano, P. Richerme, C. Senko, J. Smith, W. L. Tan, J. Zhang, C. Monroe, ***Phil. Trans. Roy. Soc.*** **A** 375, 20170107 (2017).
5. "*Quantum Connections*," C. Monroe, M. Lukin, and R. Schoelkopf, ***Scientific American*** (May, 2016), p50.
6. "*Co-Designing a Scalable Quantum Computer with Trapped Atomic Ions*," K. R. Brown, J. Kim, and C. Monroe, ***Nature Quantum Information*** **2**, 16034 (2016).
7. "*Scaling the Ion Trap Quantum Processor*" C. Monroe and J. Kim, ***Science*** 339, 1164 (2013).
8. "*Quantum Networks with Trapped Ions,*" C. Monroe and L.-M. Duan, ***Rev. Mod. Phys.*** **82**, 1209 (2010).
9. "*Quantum Computers*," T. D. Ladd, F. Jelezko, R. Laflamme, Y. Nakamura, C. Monroe, and J. L. O'Brien, ***Nature*** **464**, 45 (2010).
10. "*Phonon-mediated entanglement for trapped ion quantum computing*," K.-A. Brickman and C. Monroe, ***Rep. Prog. Phys.*** **73** 036401 (2010).
11. "*Protocols and Techniques for a Scalable Atom–Photon Quantum Network*," L. Luo, D. Hayes, T.A. Manning, D.N. Matsukevich, P. Maunz, S. Olmschenk, J.D. Sterk, and C. Monroe, ***Fortschritte der Physik*** **57**, 1133-1152 (2009).
12. *"Remapping the Quantum Frontier*," C. Monroe and M. Lukin, ***Physics World*** (August, 2008), pp. 32-39.
13. "*Quantum Computing with Ions*," C. Monroe and D. J. Wineland, ***Scientific American*** (August, 2008), 64.
14. "*On the Transport of Atomic Ions in Multidimensional Ion Trap Arrays,*" D. Hucul, M. Yeo, S. Olmschenk, W. K. Hensinger, J. A. Rabchuk, and C. Monroe, ***Quant. Inf. Comp.*** **8**, 501-578 (2008).
15. "T*he Trap Technique: Toward a Chip-Based Quantum Computer*,".D. Stick, J. D. Sterk, and C. Monroe, ***IEEE Spectrum*** (August, 2007), p. 5378.
16. *"Quantum Networking with Photons and Trapped Atoms,"* D. L. Moehring, M. J. Madsen, K. Younge, R. N. Kohn, Jr., P. Maunz, L.-M. Duan, and C. Monroe, ***J. Opt. Soc. Amer.*** **24**, 300 (2007).
17. "*Robust Quantum Information Processing with Atoms, Photons, and Atomic Ensembles,*" L.-M. Duan and C. Monroe, ***Advances in Atomic, Molecular, and Optical Physics***, vol. 55, E. Arimondo, P.R. Berman and C.C. Lin, eds. (Elsevier, 2007), pp. 419-464.
18. "*Quantum computing with trapped ion hyperfine qubits*," B. B. Blinov, D. Leibfried, C. Monroe, and D. J. Wineland, ***Quantum Inf. Proc.*** **3**, 45 (2004).
19. "*Quantum dynamics of single trapped ions*," D. Leibfried, R. Blatt, C. Monroe, and D. Wineland, ***Rev. Mod. Phys.*** **75**, 281 (2003).
20. "*Superposition and quantum measurement of trapped atoms*," D.J. Wineland, C.R. Monroe, C. Sackett, D. Kielpinski, M. Rowe, V. Meyer, and W. Itano, ***Ann. der Physik*** **9**, 851 (2000).
21. "*Coherent Quantum State Manipulation of Trapped Ions*," D. Wineland, C. Monroe, D. Meekhof, B. King, D. Leibfried, W. Itano, J. Bergquist, D. Berkeland, J. Bollinger, J. Miller, ***Adv. in Quantum Chemistry*** **30**, 41 (1998).
22. "*Issues in Coherent Quantum Manipulation of Trapped Atomic Ions*," D. Wineland, C. Monroe, W. Itano, D. Leibfried, B. King, and D. Meekhof, ***NIST Journal of Research*** **103**, 259 (1998).
23. "*Shadows and Mirrors: Reconstructing the Quantum State of Atom Motion*," D. Leibfried, T. Pfau, and C. Monroe, ***Physics Today*** **51**, 22 (April, 1998).
24. "*Experimental Primer on the Trapped Ion Quantum Computer*," D. Wineland, C. Monroe, W. Itano, B. King, D. Leibfried, D. Meekhof, C. Myatt, and C. Wood, ***Fortschritte der Physik*** **46**, 363 (1998).
25. "*Manipulating the Motion of a Single Trapped Atom*," C. Monroe, D. Meekhof, B. King, D. Leibfried, W. Itano, and D. Wineland, ***Accounts of Chemical Research*** **29**, 585 (1996).

Policy, Op-Ed Pieces

1. "*Commentary on the Bayh-Dole Act and Quantum Computing*," J. Kim and C. Monroe, ***Fortune*** (April 12, 2024).
2. "*Accelerating Progress Towards Practical Quantum Advantage: A National Science Foundation Project Scoping Workshop*," P. Alsing, et al., arXiv:2210.14757 (2022).
3. "*Quantum Computer Systems for Scientific Discovery*," ***Phys. Rev. X Quantum*** **2**, 017001 (2021).
4. "*Quantum Simulators: Architectures and Opportunities*," ***Phys. Rev. X Quantum*** **2**, 017002 (2021).

5. "*Development of Quantum InterConnects for Next-Generation Information Technologies*," ***Phys. Rev. X Quantum* 2**, 017003 (2021).
6. "*Remote Quantum Computing is the Future*," ***Nature*** 583, 10 (2020).
7. "*The Quantum Computing Party Hasn't Even Started Yet*," ***Scientific American*** (Aug 12, 2019).
8. "*The U.S. National Quantum Initiative: From Act to Action*," C. Monroe, M. G. Raymer, and J. Taylor," ***Science* 364**, 440 (2019).
9. "*Quantum Computing is a Marathon, not a Sprint*," ***Venturebeat***, (April 21, 2019).
10. "*The US National Quantum Initiative*," M. G. Raymer and C. Monroe, ***Quantum Sci. Technol.* 4** 020504 (2019).
11. "*Demolishing Quantum Nondemolition*," C. Monroe, ***Physics Today***, 8 (Jan 2011).
12. *"Shaping Atoms in Optical Lattices*," C. Monroe, ***Nature*** 338, 719 (1997).

Book Chapters, Conference Proceedings

1. "*Quantum Simulation of Spin Models with Trapped Ions*," C. Monroe, W. C. Campbell, E. E. Edwards, R. Islam, D. Kafri, S. Korenblit, A. Lee, P. Richerme, C. Senko, and J. Smith, Proceedings of the International School of Physics 'Enrico Fermi,' Course 189, Varenna, 2013, edited by M. Knoop, I. Marzoli, and G. Morigi (2014).
2. "*Quantum Networks with Atoms and Photons*," C Monroe, W Campbell, C Cao, T Choi, S Clark, S Debnath, C Figgatt, D Hayes, D Hucul, V Inlek, R Islam, S Korenblit, K Johnson, A Manning, J Mizrahi, B Neyenhuis, A Lee, P Richerme, C Senko, J Smith and K Wright, J. Phys. Conf. Ser. 467, 012008 (2013).
3. "*Mode-locked laser driven gates for trapped ion quantum information processing*" W. C. Campbell, C. Conover, D. Hayes, D. Hucul, D. N. Matsukevich, P. Maunz, J. Mizrahi, S. Olmschenk, Q. Quraishi, C. Senko, and C. Monroe, *Laser Spectroscopy XX*, W. Ertmer, ed. (World Scientific, 2011).
4. "*Ion Trap Networking: Cold, Fast, and Small*," D. L. Moehring, M. Acton, B. B. Blinov, K.-A. Brickman, L. Deslauriers, P. C. Haljan, D. Hucul, R. N. Kohn, P. J. Lee, M. J. Madsen, P. Maunz, S. Olmschenck, D. Stick, M. Yeo, and C. Monroe, *Laser Spectroscopy XVII*, E. Hinds, A. Ferguson, and E. Riis, eds. (World Scientific, 2005) pg. 421.
5. "*What Quantum Computers Tell Us About Quantum Mechanics*," Chapter 17 of *Science and Ultimate Reality: Quantum Theory, Cosmology, and Complexity* (Cambridge University Press, 2003).
6. *Experimental Quantum Computation and Information, Proceedings of the International School of Physics Enrico Fermi*, F. DeMartini and C. Monroe, eds. (North Holland, Amsterdam, 2002).
7. "*Scalable Entanglement of Trapped Ions*," C. Monroe, C. Sackett, D. Kielpinski, B. King, C. Langer, V. Meyer, C. Myatt, M. Rowe, Q. Turchette, W. Itano, and D. Wineland, in *Atomic Physics 17* (AIP, N.Y., 2001), pg 173.
8. "*From Microscopic Towards Mesoscopic: Quantum State Engineering with Cold Trapped Ions*," B. King, Q. Turchette, C. Myatt, C. Wood, D. Leibfried, D. Kielpinski, W. Itano, C. Monroe, and D. Wineland, in *Mesoscopic and Macroscopic Quantum Phenomena*, ed. by J.R. Friedman and S. Han (Nova, New York, 2000).
9. "*Searches for anomalous interactions using trapped ions*," D. J. Wineland, J. J. Bollinger, W. M. Itano, J. C. Bergquist, and C. Monroe, in CPT and Lorentz Symmetry, proc. of the First Meeting, Indiana University, Bloomington, November 1998, edited by V. A. Kostelecky (World Scientific, Singapore, 1999), p. 87-93.
10. "*Quantum Logic with a Few Trapped Ions*," C. Monroe, W. Itano, D. Kielpinski, B. King, D. Leibfried, C. Myatt, Q. Turchette, D. Wineland, and C. Wood, *Trapped Charged Particles and Fundamental Physics*, eds. D. Dubin and D. Schneider (American Inst. Phys., 1999), p. 378.
11. "*Trapped ions, Entanglement, and Quantum Computing*," C. Myatt, B. King, D. Kielpinski, D. Leibfried, Q. Turchette, C. Wood, W. Itano, C. Monroe, and D. Wineland, in *Methods of Ultrasensitive Detection*, SPIE conf. 3270, p. 131 (1998).
12. "*Entangled States of Atomic Ions for Quantum Metrology and Computation*," D. Wineland, C. Monroe, D. Meekhof, B. King, D. Leibfried, W. Itano, J. Bergquist, D. Berkeland, J. Bollinger, J. Miller, in *Atomic Physics XV* (World Scientific, Singapore, 1997), pg 31.
13. "*Quantum Harmonic Oscillator State Synthesis and Analysis*," W. Itano, C. Monroe, D. Meekhof, D. Leibfried, B. King, and D. Wineland, in *Atom Optics*, SPIE vol. 2995 (1997).
14. "*Experiments at NIST with Trapped Ions: 3-D Zero-Point Cooling, Quantum Gates, Bragg Scattering, and Atomic Clocks*," C. Monroe, A. Barton, J. Bergquist, D. Berkeland, J. Bollinger, F. Cruz, W. Itano, S. Jefferts, B. Jelenkovic, B. King, D. Meekhof, J. Miller, M. Poitzsch, J. Tan, and D. Wineland, in *Laser Spectroscopy XII* (World Scientific, 1996), pg. 179.
15. "*Quantum-Mechanically Correlated States and Atomic Clocks*," C. Monroe, D. Meekhof, B. King, W. Itano, J Bollinger, and D. Wineland, in *Dark Matter, Clocks, and Tests of Fundamental Laws*, (Editions Frontièrs, Gif-sur-Yvette, 1995), pg. 391.
16. "*The Low Temperature Road toward Bose-Einstein Condensation in Optically and Magnetically Trapped Cesium Atoms*," C. Monroe, E. Cornell and C. Wieman, in *Laser Manipulation of Atoms and Ions, Proceedings of the International School of Physics Enrico Fermi* (North Holland, Amsterdam, 1992), pg. 361.
17. "*Fundamental Physics with Optically Trapped Atoms*," C. Wieman, C. Monroe and E. Cornell, in *Laser Spectroscopy X* (World Scientific, Singapore, 1992), pg. 37.

18. "*Curious Behavior of Optically Trapped Atoms*," C. Wieman, T. Walker, D. Sesko and C. Monroe, in *Atomic Physics XII* (Am. Instit. Phys., N.Y., 1991), pg 58.
19. "*Collisional Loss Mechanisms in Light-Force Atom Traps*," T. Walker, D. Sesko, C. Monroe and C. Wieman, in *The Physics of Electronic and Atomic Collisions XVI* (Am. Instit. Phys., N.Y., 1990), pg. 593.
20. "*Enhanced and Suppressed Visible Spontaneous Emission by Atoms in a Concentric Optical Resonator*," D. Heinzen, J. Childs, C. Monroe, and M.S. Feld, in *Laser Spectroscopy VIII* (Springer, Heidelberg, 1987), pg. 36.

Popular accounts of research covered by *Associated Press, Byte, CBS Evening News, CNN, the Christian Science Monitor, Tom Clancy, Discover, the Economist, FOX News, IEEE Spectrum, MSNBC, National Public Radio, Nature, New Scientist, New York Times, NOVA, Optics and Photonics News, Photonics Spectra, Physics Today, Physical Review Focus, Physics World, Popular Mechanics, Popular Science, Public Broadcasting System, Reuters, Science, Science News, Scientific American, Scientific Computing World, Scripps-Howard, Technology Review, Time, and Wired.* (see **http://iontrap.duke.edu/popular-press/print/**)