

Brian DeMarco

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Education and Training

Ph.D., Physics, University of Colorado 2001
B.A., Physics, State University of New York at Geneseo 1996

Professional Appointments

Professor of Physics, University of Illinois 2014–present
Associate Professor of Physics, University of Illinois 2010–2014
Assistant Professor of Physics, University of Illinois 2003–2010
National Research Council post-doctoral researcher, NIST Boulder 2001–2003

Awards and Honors

University of Illinois Nordsieck Award for Excellence in Physics Teaching 2017
Elected as Fellow of the American Physical Society 2015
University of Illinois Willett Faculty Scholar Award 2013
University of Illinois College of Engineering Excellence in Research Award 2012
Vestal High School Hall of Fame Inductee 2012
State University of New York at Geneseo Outstanding Young Alumnus Award 2006
Sloan Foundation Research Fellowship 2006
UIUC Center for Advanced Study Beckman Fellow 2006–2007
1st prize in Quantum Physics session at the *Amazing Light* Young Scholars
Competition 2005
National Science Foundation CAREER Award 2005
Office of Naval Research Outstanding Young Investigator Award 2004
Michelson Post-doctoral Lectureship Prize, Case Western Reserve University 2003
Atomic, Molecular, or Optical Physics Outstanding Doctoral Thesis Award
(DAMOP thesis prize), American Physical Society 2002
National Research Council (NRC) post-doctoral fellowship 2001–2003
JILA Scientific Achievement Award 2000
Science Magazine listed the article *Onset of Fermi degeneracy in a trapped
atomic gas* among the Top Ten Scientific Breakthroughs of 1999 1999

Barry M. Goldwater Scholarship 1995–1996

Service

National and Regional

American Physical Society Panel on Public Affairs	2017–2019
NASA Fundamental Physics Standing Science Review Board, Chair	2017–2020
Defense Sciences Study Group (DSSG)	2016–2017
American Physical Society Davisson-Germer Prize committee, Chair	2017
American Physical Society Davisson-Germer Prize committee	2015–present
National Academies of Sciences Intelligence Science and Technology Experts Group (ISTEG)	2015–present
JILA-NIST Cooperative Agreement Review Committee, Chair	2015
NASA Fundamental Physics Standing Scientific Review Board, member	2014–present
American Physical Society DAMOP Thesis Prize Committee	2014
National Academy of Science Board on Physics and Astronomy standing Committee on Atomic, Molecular, and Optical Physics (CAMOS)	2012–2015
American Physical Society Division of Atomic, Molecular, and Optical Physics (DAMOP) Executive Committee member at large	2012–2015
International Symposium on Molecular Spectroscopy Executive Committee	2012–2014
Leal Elementary Science Night organizer	2012–present
National Research Council postdoctoral fellowship review panel	2011–2015
American Physical Society Division of Atomic, Molecular and Optical Physics Program Committee	2008–2011
American Physical Society March Meeting Program Committee Chair	2009–2010
National Science Foundation Atomic, Molecular, and Optical physics proposal review panel	2017, 2014, 2012, 2011, 2008
CLEO/QELS 2008 Quantum Optics of Atoms, Molecules, and Solids program subcommittee	2008
Co-organizer of CIAR Quantum Simulation Workshop	2007
Co-founder and co-organizer of Midwestern Cold Atom Workshop	2005–present

University

Vice Chancellor for Research Improving the Research Experience (IRE) working group	2017
Provost Task Force on Center for Advanced Study, co-Chair	2016
Campus Laser and Radiation Safety Committee	2012–present
Goldwater Fellowship Review Committee	2011–2014
College of Engineering Placement Standing Committee	2010–2011
College of Engineering Course approval committee for PHYS522	2008

Department

Chair, Technical Research Writer Search Committee	2017
Budget and Policy Committee	2015–present
Chair, Faculty Search in AMO Physics	2013
Ph.D Qualifying Exam Committee	2013
Physics Department Colloquium Co-Organizer	2012–2013
Machine Shop Supervisor Search Committee	2012
Chair, Faculty Search in AMO Physics	2012
Chair, Physics Communications Coordinator Search Committee	2012
Chair, Physics Budget Director Search Committee	2011
Chair, Faculty Search in AMO Physics	2011
Physics Machine Shop Oversight Committee	2008–present
Physics Library Advisory Committee	2008–2010
Physics Machine Shop lab mechanic search committee	2007
Faculty Search Committee in AMO Physics	2007
Ph.D. Qualifying Exam committee	2006
Electronics Research Engineer hiring search committee	2006
Quantum Information Science Seminar Co-Chair / Chair	2003–present

Professional Development

University of Illinois Engineering Faculty Leadership Forum	2015–2016
American Association of Physics Teachers retreat on active learning	2004

Publications

- W. Xu, W. McGehee, W. Morong, and B. DeMarco, *Strange Metal Analog in a Fermi Lattice Gas*, arXiv:1606.06669 (2017).
- B. DeMarco, J. Bohn, and E. Cornell, *Deborah Jin (1968–2016): Pioneer of Ultracold Quantum Physics*, *Nature* **538**, 318 (2016).
- C. Meldgin, U. Ray, P. Russ, D. Ceperley, and B. DeMarco, *Probing the Bose-glass–Superfluid Transition Using Quantum Quenches of Disorder*, *Nat. Phys.* **12**, 646-649 (2016).
- David Chen, Carolyn Meldgin, Philip Russ, Brian DeMarco, and Erich Mueller, *Quasimomentum Cooling and Relaxation in a Strongly Correlated Optical Lattice*, *Phys. Rev. A* **94**, 021601(R) (2016).
- W. Xu and B. DeMarco, *Velocity-selective EIT measurement of potassium Rydberg states*, *Phys. Rev. A* **93**, 011801(R) (2016).
- W. Morong and B. DeMarco, *Simulation of Anderson localization in two-dimensional ultracold gases for point-like disorder*, *Phys. Rev. A* **92**, 023625 (2015).
- V. Scarola and B. DeMarco, *Dynamics of Hubbard-Band Quasiparticles in Disordered Optical Lattices*, *Phys. Rev. A* **92**, 053628 (2015).
- D. McKay, U. Ray, S. Natu, P. Russ, D. Ceperley, and B. DeMarco, *Metastable Bose-Einstein Condensation in a Strongly Correlated Optical Lattice*, *Phys. Rev. A* **91**, 023625 (2015).
- S. S. Kondov, W. R. McGehee, W. Xu, and B. DeMarco, *Disorder-induced Localization in a Strongly Correlated Atomic Hubbard Gas*, *Phys. Rev. Lett.* **114**, 083002 (2015)
- D. Chen, C. Meldgin, and B. DeMarco, *Bath-induced band decay of a Hubbard lattice gas*, *Phys. Rev. A* **90**, 0136012 (2014).
- W.R. McGehee, S. S. Kondov, W. Xu, J. J. Zirbel, and B. DeMarco, *Three-Dimensional Anderson Localization in Variable Scale Disorder*, *Phys. Rev. Lett.* **111**, 145303 (2013).
- D. C. McKay, C. Meldgin, D. Chen, and B. DeMarco, *Slow Thermalization Between a Lattice and Free Bose Gas*, *Phys. Rev. Lett.*, **111**, 063002 (2013).
- S. S. Natu, D. C. McKay, B. DeMarco, and E. Mueller, *Evolution of condensate fraction during rapid lattice ramps*, *Phys. Rev. A* **85**, 061601(R) (2012).
- S. S. Kondov, W. R. McGehee, J.J. Zirbel, and B. DeMarco, *Three-dimensional Localization of Ultracold Matter*, *Science* **334**, 66 (2011).
- D. Chen, M. White, C. Borries, and B. DeMarco, *Quantum Quench of an Atomic Mott insulator*, *Phys. Rev. Lett.* **106**, 235304 (2011).
- A. Traill and B. DeMarco, *Review of: Mélodie, mètre et rythme dans les vers d'Alexis. Le savoir-faire d'un poète comique*, *The Classical Rev.* **61**, 47-49 (2011).
- D. McKay and B. DeMarco, *Cooling in strongly correlated optical lattices: prospects and challenges*, *Rep. Prog. Phys.* **74**, 0544401 (2011).

B. DeMarco, *An atomic view of quantum phase transitions*, Science News and Views **329**, 523 (2010).

M. Pasienski, D. McKay, M. White, and B. DeMarco, *A disordered insulator in an optical lattice*, Nat. Phys. **6**, 677 (2010).

D. McKay and B. DeMarco, *Thermometry with spin-dependent lattices*, New J. Phys. **12**, 055013 (2010).

D. McKay, M. White, and B. DeMarco, *Lattice Thermodynamics using Ultra-cold Atoms*, Phys. Rev. A **79**, 063605 (2009).

M. White, M. Pasienski, D. McKay, S. Zhou, D. Ceperley, and B. DeMarco, *Strongly interacting bosons in a disordered optical lattice*, Phys. Rev. Lett. **102**, 055301 (2009).

M. Pasienski and B. DeMarco, *A high-accuracy algorithm for designing arbitrary holographic atom traps*, Optics Express **16**, 2176 (2008).

M. Pasienski and B. DeMarco, *An algorithm for designing high-accuracy arbitrary holographic atom traps*, Proc. SPIE **7038**, 70381D (2008).

D. McKay, M. White, M. Pasienski, and B. DeMarco, *Phase-slip induced dissipation in an atomic Bose-Hubbard system*, Nature **453**, 76 (2008).

M. White, H. Gao, M. Pasienski, B. DeMarco, *Bose-Einstein condensates in RF-dressed adiabatic potentials*, Phys. Rev. A **74**, 023616 (2006).

B. DeMarco, C. Lannert, S. Vishveshwara, and T.-C. Wei, *Structure and stability of Mott-insulator shells of bosons trapped in an optical lattice*, Phys. Rev. A **71**, 063601 (2005).

R. Ozeri, C. Langer, J. D. Jost, B. DeMarco, A. Ben-Kish, B. R. Blakestad, J. Britton, J. Chiaverini, W. M. Itano, D. B. Hume, D. Leibfried, T. Rosenband, P. O. Schmidt, and D. J. Wineland, *Hyperfine Coherence in the Presence of Spontaneous Photon Scattering*, Phys. Rev. Lett. **95**, 030403 (2005).

C. Langer, R. Ozeri, J. D. Jost, J. Chiaverini, B. DeMarco, A. Ben-Kish, R. B. Blakestad, J. Britton, D. B. Hume, W. M. Itano, D. Leibfried, R. Reichle, T. Rosenband, T. Schaetz, P. O. Schmidt, and D. J. Wineland, *Long-lived qubit memory using atomic ions*, Phys. Rev. Lett. **95**, 060502 (2005).

D. Wineland, D. Leibfried, M. Barrett, A. Ben-Kish, J. Bergquist, R. Blakestad, J. Bollinger, J. Britton, J. Chiaverini, B. DeMarco, D. Hume, W. Itano, M. Jensen, J. Jost, E. Knill, J. Koelemeij, C. Langer, W. Oskay, R. Ozeri, R. Reichle, T. Rosenband, T. Schaetz, P. Schmidt, S. Seidelin, *Quantum Control, Quantum Information Processing, and Quantum-Limited Metrology With Trapped Ions*, Proc. ICOLS (2005).

T. Schaetz, D. Leibfried, J. Chiaverini, M.D. Barrett, J. Britton, B.L. DeMarco, W.M. Itano, J.D. Jost, C. Langer, and D.J. Wineland, *Towards a scalable quantum computer/simulator based on trapped ions*, Appl. Phys. B **79**, 979 (2004).

M. D. Barrett, B. DeMarco, T. Schaetz, D. Leibfried, J. Britton, J. Chiaverini, W. M. Itano, B. Jelenković, J. D. Jost, C. Langer, T. Rosenband, and D. J. Wineland, *Sympathetic Cooling of $^9\text{Be}^+$ and $^{24}\text{Mg}^+$ for Quantum Logic*, Phys. Rev. A **68**, 042302 (2003).

- D. Leibfried, B. DeMarco, V. Meyer, M. Rowe, A. Ben-Kish, J. Britton, W. M. Itano, B. Jelenković, C. Langer, T. Rosenband and D. J. Wineland, *Experimental Demonstration of a Geometric Phase Gate*, Nature **422**, 412 (2003).
- A. Ben-Kish, B. DeMarco, V. Meyer, M. Rowe, J. Britton, W. M. Itano, B.M. Jelenković, C. Langer, D. Leibfried, T. Rosenband, D.J. Wineland, *Experimental Demonstration of a Technique to Generate Arbitrary Quantum Superposition States of a Harmonically Bound Spin-1/2 Particle*, Phys. Rev. Lett. **90**, 037902 (2003).
- D. Leibfried, B. DeMarco, V. Meyer, A. Ben-Kish, M. Barrett, J. Hughes, W.M. Itano, B.M. Jelenković, C. Langer, D. Lucas, R. Rosenband, and D. J. Wineland, *Towards Quantum Information with Trapped Ions at NIST*, J. Phys. B **36**, 599 (2003).
- D. Leibfried, M.D. Barrett, A. Ben-Kish, J. Britton, J. Chiaverini, B.L. DeMarco, W.M. Itano, B.M. Jelenkovic, J.D. Jost, C. Langer, D. Lucas, V. Meyer, T. Rosenband, M.A. Rowe, T. Schaetz, and D.J. Wineland, *Building Blocks for a Scalable Quantum Information Processor Based On Trapped Ions*, Proc. ICOLS (2003).
- D. Leibfried, B. DeMarco, V. Meyer, A. Ben-Kish, M. Barrett, J. Hughes, W.M. Itano, B.M. Jelenković, C. Langer, D. Lucas, R. Rosenband, and D. J. Wineland, *Quantum Information with Trapped Ions at NIST*, J. Mod. Opt. **50**, 1115 (2003).
- D.J. Wineland, M. Barrett, J. Britton, J. Chiaverini, B. DeMarco, W.M. Itano, B. Jelenković, C. Langer, D. Leibfried, V. Meyer, T. Rosenband, and T. Schatz, *Quantum Information Processing with Trapped Ions*, Philos. T. Roy. Soc. A **361**, 1349 (2003).
- B. DeMarco, A. Ben-Kish, V. Meyer, M. Rowe, J. Britton, W.M. Itano, B.M. Jelenković, C. Langer, D. Leibfried, T. Rosenband and D.J. Wineland, *Experimental Demonstration of a Controlled-NOT Wave-packet Gate*, Phys. Rev. Lett. **89**, 267901 (2002).
- D. Leibfried, B. DeMarco, V. Meyer, M. Rowe, A. Ben-Kish, J. Britton, W. M. Itano, B. Jelenković, C. Langer, T. Rosenband and D. J. Wineland, *Trapped-Ion Quantum Simulator: Experimental Application to Nonlinear Interferometers*, Phys. Rev. Lett. **89**, 247901 (2002).
- M.A. Rowe, A. Ben-Kish, B. DeMarco, D. Leibfried, V. Meyer, J. Britton, W.M. Itano, B. Jelenković, C.Langer, T. Rosenband, and D.J. Wineland, *Transport of Quantum States and Separation of Ions in a Dual RF Ion Trap*, Quant. Info. Compt. **4**, 257 (2002).
- D.J. Wineland, D. Leibfried, B.L. DeMarco, V. Meyer, M.A. Rowe, A. Ben Kish, M. Barrett, J. Britton, J. Hughes, W.M. Itano, B.M. Jelenkovic, C. Langer, D. Lucas and T. Rosenband, *Quantum information processing and multiplexing with trapped ions*, Proc. ICAP (2002).
- B. DeMarco and D.S. Jin, *Spin Excitations in a Fermi Gas of Atoms*, Phys. Rev. Lett. **88**, 040405 (2002).
- J. Goldwin, S.B. Papp, B. DeMarco, and D.S. Jin, *A Two-species Magneto-Optical Trap with ^{40}K and ^{87}Rb* , Phys. Rev. A **65**, 021402R (2002).
- B. DeMarco, S.B. Papp, and D.S. Jin, *Pauli Blocking of Collisions in a Quantum Degenerate Atomic Fermi Gas*, Phys. Rev. Lett. **86**, 5409 (2001).

D.S. Jin, B. DeMarco, and S. Papp, *Exploring a Quantum Degenerate Fermi gas*, At. Phys. **551**, 414 (2000).

M.J. Holland, B. DeMarco, and D.S. Jin, *Evaporative Cooling of a Two Component Fermi Gas*, Phys. Rev. A **61**, 053610 (2000).

B. DeMarco and D.S. Jin, *Onset of Fermi Degeneracy in a Trapped Atomic Gas*, Science **285**, 1703 (1999).

B. DeMarco, J. L. Bohn, J. P. Burke, Jr., M. Holland, and D. S. Jin, *Measurement of p -Wave Threshold Law Using Evaporatively Cooled Fermionic Atoms*, Phys. Rev. Lett. **82**, 4208 (1999).

B. DeMarco and D.S. Jin, *Exploring a Quantum Degenerate Gas of Fermionic Atoms*, Phys. Rev. A **58**, R4276 (1999).

B. DeMarco, H. Rohner, and D.S. Jin, *An Enriched ^{40}K Source for Fermionic Atom Studies*, Rev. Sci. Instrum. **70**, 1967 (1998).

Invited Talks

Prof. DeMarco has given **over 100** invited talks at conferences, workshops, and seminars worldwide. A selection of recent talks follows.

<i>From the First Atomic Fermi Gas to a Bad Metal</i>	
American Physical Society DAMOP meeting	2017
<i>NASA Cold Atom Laboratory</i>	
National Research Council Panel on Space Decadal Study	2017
<i>Ultracold Disordered Quantum Gases</i>	
Simon Fraser University Physics Colloquium, Vancouver, BC	
University of British Columbia Physics Colloquium, Vancouver, BC	2016
<i>Ultracold Disordered Gases I, I, III</i>	
Princeton Condensed Matter Summer School, Princeton, NJ	2016
<i>Quench and Transport Dynamics in Disordered Atomic Hubbard Lattice</i>	
American Physical Society March Meeting, Baltimore, MD	2016
<i>Many-body Localization and Relaxation in Optical lattice</i>	
KITP Conference: Aspects and Applications of MBL, Santa Barbara, CA	2015
<i>Localization in the Disordered Fermi-Hubbard Model</i>	
APS DAMOP Hot Topics session, Columbus, OH	2015
<i>Ultracold Disordered Quantum Gases</i>	
Rice University AMO Seminar, Houston, TX	
The Ohio State University Physics Colloquium, Columbus, OH	
Grand Challenges in Quantum Fluids and Solid Workshop, Buffalo, NY	
University of Florida Physics Colloquium, Gainesville, FL	2015
<i>Evidence of Many-Body Localization in an Ultracold Atomic Hubbard Gas</i>	
Gordon Research Conference, Mount Holyoke, MA	2014
Princeton Center for Theoretical Physics Workshop on Many-body localization, Princeton, NJ	2014
<i>Ultracold Disordered Quantum Gases</i>	2014

University of Oklahoma Physics Colloquium, Norman, OK	
University of Maryland Physics Colloquium, College Park, MD	2014
Yale University Physics Colloquium, New Haven, CT	2013
Stony Brook Physics Colloquium, Stony Brook, NY	2013
<i>Controlled Dynamics in Disordered Quantum Gases</i>	
KITP conference: New Directions in the Quantum Control Landscape, Santa Barbara, CA	2013
<i>3D Anderson Localization of Ultracold Matter</i>	
Georgia Tech Hard Condensed Matter and AMO Seminar, Atlanta, GA	2013
<i>Quantum Quench of an Atomic Mott Insulator</i>	
Los Alamos Center for Nonlinear Studies Seminar, Los Alamos, NM	2012
<i>3D Anderson Localization of an Ultra-cold Fermi Gas</i>	
Disequilibrium Workshop, Minneapolis, MN	2012
Argonne Colloquium, Lemont, IL	2012
ITAMP seminar, Boston, MA	2011
<i>Strongly Correlated Quantum Gases Trapped in 3D Spin-Dependent Optical Lattices</i>	
APS March meeting, Dallas, TX	2011
<i>Quantum Computers</i>	
Osher Lifelong Learning Institute, Urbana, IL	2011
<i>Hubbard Physics with Optical Lattices</i>	
APS March meeting tutorial, Dallas, TX	2011
<i>Disordered Insulator in an Optical Lattice</i>	
University of Chicago Physics Colloquium, Chicago, IL	2011
KITP, Santa Barbara, CA	2011
<i>State-of-the-art in Lattice Hubbard Quantum Simulation</i>	
MPQ workshop on New Trends in Quantum Information and Quantum Optics, St. Benet, Spain	2011
<i>Optical Lattices and Quantum Simulators</i>	
University of Birmingham / MUARC Advanced Techniques in Atomic Physics Summer School, Birmingham, England	2010
<i>Experimental aspects of ultra-cold atoms in optical lattices, including spin- dependent lattices</i>	
University of Michigan Quantum Summer School, Ann Arbor, MI	2010
<i>Disordered Insulator in an Optical Lattice</i>	
CIFAR Quantum Materials program meeting, Montreal, Canada	2010
Northwestern University condensed matter seminar, IL	2010
Notre Dame University Physics department colloquium, South Bend, IN	2010
<i>Transport Experiments with Dirty Bosons</i>	
ICAM Exotic Insulating States of Matter conference, Baltimore, MD	2010
Indiana University condensed matter seminar, Bloomington, IN	2010

Funding

<i>Laser Systems of Measurements of Local Relaxation in Disordered Atomic Hubbard Models (DURIP)*</i>		
Army Research Office	\$149,653	7/2017-7/2018
<i>Localization, Excitation, and Relaxation in Disordered Atomic Hubbard Models*</i>		
Army Research Office	\$559,137	7/2017-7/2020
<i>Laser Amplifier System for Optical Lattice Rydberg Dressing*</i>		
University of Illinois Research Board	\$27,866	4/2015-5/2016
<i>Disordered Quantum Matter in Strongly Correlated Optical Lattices*</i>		
National Science Foundation	\$450,000	8/2015-8/2018
<i>Optical lattice Simulations of Correlated Fermions</i>		
DARPA (sub-contract through Rice University)	\$708,800	12/2009-7/2014
<i>Disorder and Dynamics in Strongly Correlated Optical Lattices*</i>		
National Science Foundation	\$698,791	5/2012-5/2015
<i>Quantum Simulation of the Disordered Fermi-Hubbard Model*</i>		
Army Research Office	\$479,450	7/2012-3/2016
<i>Simulation of Frustrated Magnetism and Disorder using Ultra-cold Atoms*</i>		
Army Research Office	\$665,520	10/2007–6/2012
<i>Simulating Thermopower in Mott-Hubbard Materials*</i>		
National Science Foundation	\$416,360	6/2009–6/2012
<i>Simulating Thermopower in Mott-Hubbard Materials using Optical Lattices*</i>		
Office of Naval Research	\$390,000	6/2009–6/2012
<i>Apparatus to simulate thermopower in Mott-Hubbard materials (DURIP)*</i>		
Office of Naval Research	\$288,018	4/2009–4/2010
<i>Optimizing Thermopower in Mott-Hubbard Materials*</i>		
University of Illinois Research Board	\$21,755	9/2008-10/2009
<i>CAREER: Quantum Simulation Using Ultra-cold Atom Gases*</i>		
National Science Foundation	\$548,099	1/2005–1/2010
<i>Quantum Simulation using Ultra-cold Atoms*</i>		
University of Illinois Research Board	\$23,375	12/2005–1/2006
<i>Quantum State Control Of An Ultra-cold Atom Gas*</i>		
Office of Naval Research	\$297,842	6/2004–5/2007

*single investigator grants