John M. Doyle

Curriculum Vitae and Additional Information

Jefferson Laboratory of Physics
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Education:

Massachusetts Institute of Technology
Ph.D., Condensed Matter and Atomic Physics, 1991. Thesis: Energy Distribution Measurements of Magnetically Trapped Spin-Polarized Hydrogen: Evaporative Cooling and Surface Sticking. IBM Thomas J. Watson Fellowship. Advisor: T.J. Greytak

International School of America
One Term of Study, 1985
On site study of religion and ethnicity in Asia.

Massachusetts Institute of Technology
B.S., Electrical Engineering, 1986
Thesis: Vibrationally Excited H_2 in a Non-Equilibrium Population.

Positions:

Harvard University, Cambridge, MA — 2015–present
Henry B. Silsbee Professor of Physics

Harvard University, Cambridge, MA — 1999–present
Professor of Physics

Okayama University, Okayama, Japan — 2019–present
Visiting Professor

Harvard University, Cambridge, MA — 1997–1999
John L. Loeb Associate Professor of the Natural Sciences

Harvard University, Cambridge, MA — 1993–1997
Assistant Professor of Physics

Massachusetts Institute of Technology, Cambridge, MA — 1991–1993
Postdoctoral Associate

AT&T Bell Laboratories, Murray Hill, NJ — 1988
Research Assistant

Massachusetts Institute of Technology, Cambridge, MA — 1984–1985
Teaching Assistant

Wellesley College, Wellesley, MA — 1984
Instructor, Project Exploration

Angenics, Inc., Cambridge, MA — 1983-84
Engineering Consultant, Engineer

Raytheon, Inc., Manchester, NH — 1982
Engineering Assistant

Research Interests:

Research is performed in two areas: Atomic, Molecular and Optical (AMO) and Elementary Particle physics. Work centers around production and trapping of ultra-cold molecules for use in a variety of experiments including studies of quantum information systems, collisions, quantum gases, optical spectroscopy and searches for time-reversal violation and Beyond the Standard Model particles in the TeV-PeV range.

Refereed Publications:

[1] *Spin-polarized Hydrogen Maser*, H.F. Hess, G.P Kochanski, J.M. Doyle, T.J. Greytak, D. Kleppner, *Phys Rev. A* **34**, 1602 (1986).

[2] *Magnetic Trapping of Spin-polarized Atomic Hydrogen*, H.F. Hess, G.P. Kochanski, J.M. Doyle, N. Masuhara, D. Kleppner, T.J. Greytak, *Phys. Rev. Lett.* **59**, 935 (1987).

[3] *Evaporative Cooling of Spin-polarized Atomic Hydrogen*, N. Masuhara, J.M. Doyle, J.C. Sandberg, D. Kleppner, T.J. Greytak, G.P. Kochanski, and H.F. Hess, *Phys. Rev. Lett.* **61**, 935 (1988)

[4] *Energy Distributions of Trapped Atomic Hydrogen*, J.M. Doyle, J.C. Sandberg, N. Masuhara, I.A. Yu, D. Kleppner, and T.J. Greytak, *J. Opt. Soc. Am. B***6**, 2244 (1989)

[5] *Hydrogen in the Submillikelvin Regime: Sticking Probability on Superfluid* ^4He, J.M. Doyle, J.C. Sandberg, I.A. Yu, C. Cesar, D. Kleppner, and T.J. Greytak, *Phys. Rev. Lett.* **67**, 603 (1991).

[6] *Evidence for Universal Quantum Reflection of Hydrogen from Liquid* ^4He, I.A. Yu, J.M. Doyle, J.C. Sandberg, C. Cesar, D. Kleppner, and T.J. Greytak, *Phys. Rev. Lett.* **71**, 1589 (1993).

[7] *Evaporative Cooling of Atomic Hydrogen: Theory of Cooling and Progress Towards the Bose-Einstein Transition*, J.M. Doyle, J.C. Sandberg, I.A. Yu, C.L. Cesar, D. Kleppner and T.J. Greytak, *Physica B* **194**, 13 (1994).

[8] *Surface Reflection of Submillikelvin Atomic Hydrogen from Thin Superfluid* ^4He *Films: Substrate Effects*, I.A. Yu, J.M. Doyle, J.C. Sandberg, C.L. Cesar, D. Kleppner and T.J. Greytak, *Physica B* **194-196** (1994).

[9] *Quantum Reflection of Submilikelvin Atomic Hydrogen from Bulk Superfluid* ^4He, I.A. Yu, J.M. Doyle, J.C. Sandberg, C.L. Cesar, D. Kleppner and T.J. Greytak, *Physica B* **194**, 15, (1994).

[10] *On Measuring the Neutron Beta-Decay Lifetime using Ultracold Neutrons Produced and Stored in a Superfluid-*^{4}*He-Filled Magnetic Trap*, J.M. Doyle and S.K. Lamoreaux, *Europhysics Letters* **26**, 253 (1994).

[11] *Buffer-gas loading of atoms and molecules into a magnetic trap*, J.M. Doyle, B. Friedrich, J. Kim and D. Patterson *Physical Review A* **52**, R2515 (1995).

[12] *Scattering lengths for collisions of ground-state and metastable state hydrogen atoms*, M.J. Jamieson, A. Dalgarno and J.M. Doyle, *Molecular Physics* **87**, 817 (1996).

[13] *Two-photon Spectroscopy of Trapped Atomic Hydrogen*, C. L. Cesar, D.G. Fried, T.C. Killian, A.D. Polcyn, J.C. Sandberg, I.A. Yu, T.J. Greytak, D. Kleppner and J.M. Doyle, *Physical Review Letters* **77**, 255 (1996).

[14] *Bose-Einstein Condensation*, J.M. Doyle, *Proc. Nat. Acad. Sci.* **94**, 2774 (1997).

[15] *Buffer-gas Loading and Magnetic Trapping of Atomic Europium*, J. Kim, B. Friedrich, D. Katz, D. Patterson, J. Weinstein, R. DeCarvalho and J.M. Doyle, *Physical Review Letters* **78**, 3665-8 (1997).

[16] *Fluorescence Efficiencies of Thin Scintillating Films in the Extreme Ultraviolet*, D.N. McKinsey, C.R. Brome, J.S. Butterworth, R. Golub, K. Habicht, P.R. Huffman, S.K. Lamoreaux, C.E.H. Mattoni, and J.M. Doyle, *Nuclear Instrumentation and Methods B* **132** 541-63 (1997).

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[21] *A Demountable Cryogenic Feedthrough for Plastic Optical Fibers*, J.S. Butterworth, C.R. Brome, P.R. Huffman, C.E.H. Mattoni, D.N. McKinsey, and J.M. Doyle, *Review of Scientific Instruments* **69** 3697-8 (1998).

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[53] *Magnetic trapping of an atomic Mn-Cr mixture*, S.V. Nguyen, J.S. Helton, K. Maussang, W. Ketterle, J.M. Doyle, Physical Review A **71** 0256602 (2005)

[54] *High-flux beam source for cold, slow atoms or molecules*, S.E. Maxwell, N. Brahms, R. deCarvalho, D. Glenn, J. Helton, D. Kielpinski, S. Nguyen, J. Petricka, D. DeMille, J.M. Doyle, Physical Review Letters **95** 173201 (2005)

[55] *Chaotic Scattering of Marginally Trapped Neutrons*, K.J. Coakley, J.M. Doyle, S.N. Dzhosyuk, L. Yang, and P.R. Huffman, Journal of Research of the National Institute of Standards and Technology **110** 367 (2005)

[56] *Evaporation of Metastable Helium in the Multi-partial-wave Regime*, S. Nguyen, S. Charles Doret, C. Connolly, R. Michniak, W. Ketterle, J.M. Doyle, Physical Review A **92** 060703(R) (2005)

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[60] *A Bright, Guided Molecular Beam With Hydrodynamic Enhancement*, D. Patterson and J.M. Doyle, Journal of Chemical Physics **126** 154307 (2007)

[61] *Magnetic trapping and Zeeman relaxation of NH ($X^3\Sigma^-$)*, W.C. Campbell, E. Tsikata, Hsin-I Lu, J.M. Doyle, Physical Review Letters **98** 213001 (2007)

[62] *Spin-exchange collisions of submerged shell atoms below 1 Kelvin*, S.V. Nguyen, J.G.E. Harris, S.C. Doret, J. Helton, J.M. Doyle, Physical Review Letters **99** 223201 (2007)

[63] *Analysis of cold 52 Cr elastic and inelastic collision rates using evaporative cooling*, S.V. Nguyen, R. deCarvalho, J.M. Doyle, Physical Review A **75** 062706 (2007)

[64] *Development of High-field Superconducting Ioffe Magnetic Traps*, L. Yang, C. R. Brome, J. S. Butterworth, S. N. Dzhosyuk, C. E. H. Mattoni, D. N. McKinsey, R. A. Michniak, J. M. Doyle, R. Golub, E. Korobkina, C. M. O???fShaughnessy, G. R. Palmquist, P.-N. Seo, P. R. Huffman, K. J. Coakley , H. P. Mumm, A. K. Thompson, G. L. Yang, S. K. Lamoreaux, Rev. Sci. Inst. **79** 031301 (2008)

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[73] *Why are cold molecules so hot?*, B. Friedrich and J.M. Doyle, ChemPhysChem **10** 604 (2009)

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[77] *Large spin relaxation rates in trapped submerged-shell atoms*, C.B. Connolly, Y.S. Au, S.C. Doret, W. Ketterle and J.M. Doyle, Physical Review A **81** 010702(R) (2010)

[78] *Permeability of Noble Gases through Kapton, Butyl, Nylon and Silver Shield*, S.J. Schowalter, C.B. Connolly, and J.M. Doyle, NIM A **615** 267-271 (2010)

[79] *Search for the electric dipole moment of the electron with thorium oxide*, A.C. Vutha, W.C. Campbell, Y.V. Gurevich, N.R. Hutzler, M. Parsons, D. Patterson, E. Petrik, B. Spaun, J.M. Doyle, G. Gabrielse and D. DeMille, Journal of Physics B **43** 074007 (2010)

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[82] *Formation of van der Waals molecules in buffer gas cooled magnetic traps*, N. Brahms, T.V. Tscherbul, P. Zhang, J. Klos, H.R. Sadeghpour, A. Dalgarno, J.M. Doyle and T.G. Walker, Physical Review Letters **105** 033001 (2010)

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[87] *Magnetic relaxation in dysprosium-dysprosium collisions*, B. Newman, N. Brahms, Y.S. Au, C. Johnson, J.M. Doyle, D. Kleppner and T.J. Greytak, Physical Review A **83** 012713 (2011)

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[89] *Cold heteromolecular dipolar collisions*, B.C. Sawyer, B.K. Stuhl, M. Yeo, T.V. Tscherbul, M.T. Hummon, Y. Xia, J. Klos, D. Patterson, J.M. Doyle, J. Ye, PCCP **13** 19059 (2011)

[90] *A cryogenic beam of refractory, chemically reactive molecules with expansion cooling*, N.R. Hutzler, M.F. Parsons, Y. V. Gurevich, P.W. Hess, E. Petrik, B. Spaun, A.C. Vutha, D. DeMille, G. Gabrielse, J.M. Doyle., PCCP **13** 18976 (2011)

[91] *A Cold and Slow Molecular Beam*, Hsin-I Lu, J. Rasmussen, M.J. Wright, D. Patterson, and J.M. Doyle, PCCP **13** 18986 (2011)

[92] *Formation and dynamics of van der Waals molecules in buffer-gas traps*, N. Brahms, T. Tscherbul, P. Zhang, J. Klos, R. Forrey, Y.S. Au, H. Sadeghpour, A. Dalgarno, J.M. Doyle, and T. Walker, PCCP **13** 19125 (2011)

[93] *Buffer Gas Cooling and Intense, Cold, Slow Molecular Beams*, N.R. Hutzler, Hsin-I Lu, J.M. Doyle, Chemical Reviews Special Issue on Ultracold Molecules **112** 4803 (2012)

[94] *Cooling molecules in a cell for FTMW spectroscopy*, D. Patterson and J.M. Doyle, Molecular Physics **110** 1757 (2012)

[95] *Spin-dependent collision of ultracold metastable atoms*, S. Uetake, R. Murakami, J.M. Doyle and Y. Takahashi, Physical Review A **86** 032712 (2012)

[96] *Enantiomer-Specific Detection of Chiral Molecules via Microwave Spectroscopy*, D. Patterson, M. Schnell and J.M. Doyle, Nature, **497** 475-477 (2013)

[97] *Spin-orbit suppression of cold inelastic collisions of aluminum and helium*, C.B. Connolly, Y.S. Au, E. Chae, T.V. Tscherbul, A.A. Buchachenko, H-I. Lu, W. Ketterle, and J.M. Doyle, Physical Review Letters, **110** 173202 (2013)

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Service, Fellowships, etc.:

Founding Co-director of the Harvard Quantum Initiative, (2018-)
Founding Co-director of the Center for Ultracold Atoms, a National Science Foundation Physics Frontier Center, (2000-2020)
Founding Director of the Harvard Quantum Optics Center, (2010-2017)
Co-Founder of N95decon.org (2020)
Humboldt Fellow (2006-)
Fulbright Fellow (2010-2011)
Japanese Society for the Promotion of Science Fellow (2010-)

American Physical Society
Broida Prize (2021)
Fellow (2002-)
Topical Group on Precision Measurement and Fundamental Constants (GPMFC), Chair, Chair-elect, Vice-Chair
(2014-17)
Public Face of Physics member (1999)
POPA member (1999-2002)
GPMFC Nominating Committee member (2001 and 2021)
Visited Congress as Representative of the APS (2016)
DAMOP Program Committee (2016, 2017)
DAMOP APS Fellows Committee (2018-2020)
DAMOP Nominating Committee (2019-)
Pipkin Award Committee (vice chair 2020-21, chair 2022-23)
DNP 2021 Meeting Local Organizing Committee