

Wesley C. Campbell

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Education

Harvard University

2008 Ph.D. Physics
Thesis: *Magnetic Trapping of Imidogen Molecules*
Thesis Advisor: John M. Doyle

Trinity University

2001 B.S. Physics
Honors Thesis: *Optical Billiards with Ultracold Cesium Atoms*
Thesis Advisors: Daniel R. Spiegel and Mark G. Raizen

Research Positions

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| <i>Associate Professor</i> Dept. of Physics and Astronomy | 2018–present University of California Los Angeles |
| <i>Assistant Professor</i> Dept. of Physics and Astronomy | 2012–2018 University of California Los Angeles |
| <i>Assistant Research Scientist</i> Dept. of Physics, University of Maryland | 2011–2012 UMD / NIST Joint Quantum Institute |
| <i>Postdoctoral Researcher</i> Group of Chris Monroe | 2008–2011 UMD / NIST Joint Quantum Institute |

Invited Talks

Colloquia

2021 University of Waterloo Dept. of Physics & Astronomy
2021 Colorado State University Dept. of Physics
2018 Max-Planck-Institute for Quantum Optics
2017 University of Nevada Reno Dept. of Physics
2014 California State University Long Beach Dept. of Physics & Astronomy
2014 California State University Los Angeles Dept. of Physics & Astronomy
2014 University of California Riverside Dept. of Physics & Astronomy
2014 USC Dept. of Physics & Astronomy
2013 Harvey Mudd College Dept. of Physics
2010 Bates College Dept. of Physics & Astronomy
2010 Trinity University Dept. of Physics & Astronomy

Specialized

NSF Challenge Institute for Quantum Computation Seminar *The Utilization of Atomic Resources for Better Qubits* The Internet. March 2021
VAMOS *Stability Means Never Being Excited (and that's no fun, is it?)* The Internet. October 2020

The Molecular Underpinnings of Astrophysics, TSRC Workshop *An example study of a laboratory interstellar medium: H₂O + C⁺ Telluride*, CO. January 2020

Stanford AMO Seminar *New Ion Qubits* Palo Alto, CA. November 2019

2nd North American Conference on Trapped Ions *Myth: SPAM is either a versatile canned meat product or unsolicited email* College Park, MD. July 2019

US-Japan QELS-13 *Frequency combs and radioactive species for avoiding the UV light problem* Kanazawa, Japan. September 2018

“Cold molecules for chemistry” symposium of the Spring ACS meeting, *A strong, stimulated optical force for molecular deceleration* New Orleans, LA. March 2018

Cold and Controlled Molecules and Interactions (CCMI), *Optical Deceleration and Cold Hydrocarbon Chemistry* Athens, GA. March 2018

Southwest Quantum Information Technology (SQuInT), *Combs and isotopic customization for trapped ion quantum computing* Santa Fe, NM. February 2018

Center for Ultracold Atoms Seminar, *Confessions of a CW Laser Addict* MIT, Cambridge, MA. December 2016

Cold and Ultracold Molecules Workshop, “Hot Topic” (*Proposal for*) *Continuous all-optical deceleration of molecules beams* Casas del Chapiz, Granada, Spain. November 2013

72nd Okazaki Conference on Ultimate Control of Coherence, *Emergence and Frustration of Magnetism in a Trapped Ion Quantum Simulator* Institute for Molecular Science, Okazaki, Japan. January 2013

20th International Conference on Laser Spectroscopy, *Optical frequency combs for moving beyond resolved sidebands in trapped ion quantum information processing* Schlosshotel Münchhausen, Aerzen, Germany. June 2011

Minerva-Weizmann Workshop on Entanglement in Atomic Systems, *Pulsed Raman Transitions for Quantum Simulation and Ultrafast Gates* Weizmann Institute, Rehovot, Israel. November 2010

European Conference on Trapped Ions, *Ultrafast Pulsed Laser Gates for Atomic Qubits*. Redworth Hall, County Durham, UK. September 2010

DAMOP Coherent Control with Optical Frequency Combs Session, *Quantum Information Processing with Atomic Qubits and Optical Frequency Combs*. Houston, TX. May 2010

Joint Quantum Institute Seminar, *Quantum Information Processing with Atomic Qubits and Optical Frequency Combs*. University of Maryland. May 2010

Center for Ultracold Atoms Seminar, “CUA Hot Topics” *Collisional Physics with Cold Molecules*. MIT. February 2008

Wilhelm und Else Heraeus-Seminar on Cold Molecules, “Hot Topic” *Current progress toward buffer-gas loading NH into a magnetic trap*. Bad Honnef, Germany. October 2006

MPG Workshop on Cold Polar Molecules, *Loading a Magnetic Trap from a Molecular Beam*. Ringberg Castle, Bavaria, Germany. October 2005

DAMOP Undergraduate Research Session, *Optical Billiards for Atoms*. London, Ontario, Canada. May 2001

Synergistic Activities

Faculty, INAOE Quantum Optics Workshop, Puebla, Mexico. November 2017

Speaker, Exploring Your Universe, UCLA 2012, 2013, & 2014

Plenary session speaker, Canadian-American-Mexican Graduate Student Physics Conference, Perimeter Institute, Waterloo, Ontario, Canada. August 2013

Volunteer, Maryland Day, University of Maryland 2010 & 2011

Volunteer, US Science and Engineering Festival, Washington DC 2010

Honors and Awards

Faculty Mentor Award, 2018 UCLA Undergraduate Research Week

Selected by the Editorial Board of *J. Phys. B.* as an “Emerging Leader,” 2017

NSF CAREER Program grant, 2015

AFOSR Young Investigator Program grant, 2013

Robbins Prize, Harvard University, 2003

NSF Graduate Research Fellowship, 2001

Outstanding Graduating Senior Award, Physics Dept., Trinity University 2001

Barry M. Goldwater Scholarship, 1999

“Excellent participation in Science,” Mrs. Borgmann’s first grade class, 1986

Professional Service

Member-at-Large, DAMOP Executive Committee (current)

Member-at-Large, Executive Committee, APS Topical Group on Few-Body Systems and Multiparticle Dynamics (GFB), (2018-2020)

Publications

52. Claire Dickerson, Han Guo, Guo-Zhu Zhu, Eric R. Hudson, Justin Caram, Wesley C. Campbell, and Anastassia Alexandrova. **Optical Cycling Functionalization of Arenes** *J. Phys. Chem. Lett.* **12**, 3989 (2021)
51. 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, and N. Y. Yao. **Programmable Quantum Simulations of Spin Systems with Trapped Ions** *Rev. Mod. Phys.* **93**, 025001 (2021)
50. Claire E. Dickerson, Han Guo, Ashley J. Shin, Benjamin L. Augenbraun, Justin R. Caram, Wesley C. Campbell, and Anastassia N. Alexandrova. **Franck-Condon tuning of optical cycling centers by organic functionalization** *Phys. Rev. Lett.* **126**, 123002 (2021)
49. Adam D West, Randall Putnam, Wesley C Campbell, and Paul Hamilton. **Tunable transverse spin-motion coupling for quantum information processing** *Quantum Science and Technology* **6**, 024003 (2021)
48. Tiangang Yang, Anyang Li, Gary Chen, Qian Yao, Arthur G. Suits, Hua Guo, Eric R. Hudson, and Wesley C. Campbell. **Isomer-specific kinetics of the $C^+ + H_2O$ reaction at the temperature of interstellar clouds** *Science Advances* **7**, eabe4080 (2021)

47. Han Guo, Claire E Dickerson, Ashley J. Shin, Changling Zhao, Timothy L. Atallah, Justin R. Caram, Wesley C. Campbell, and Anastassia N. Alexandrova. **Surface Chemical Trapping of Optical Cycling Centers** *Phys. Chem. Chem. Phys.* **23**, 211 (2021)
46. Michael Mills, Hao Wu, Evan C. Reed, Lu Qi, Kenneth R. Brown, Christian Schneider, Michael C. Heaven, Wesley C. Campbell, and Eric R. Hudson. **Dipole-phonon quantum logic with alkaline-earth monoxide and monosulfide cations** *Phys. Chem. Chem. Phys.* **22**, 24964 (2020)
45. Anatoliy A. Savchenkov, Justin E. Christensen, David Hucul, Wesley C. Campbell, Eric R. Hudson, Skip Williams, and Andrey B. Matsko. **Application of a self-injection locked cyan laser for Barium ion cooling and spectroscopy** *Scientific Reports* **10**, 16494 (2020)
44. Wesley C. Campbell and Eric R. Hudson. **Dipole-phonon quantum logic with trapped polar molecular ions** *Phys. Rev. Lett.* **125**, 120501 (2020)
43. Wesley C. Campbell. **Certified quantum gates** *Phys. Rev. A* **102**, 022426 (2020)
42. Di Xiao, Jiguang Li, Wesley C. Campbell, Thomas Dellaert, Patrick McMillin, Anthony Ransford, Conrad Roman, and Andrei Derevianko. **Hyperfine structure of $^{173}\text{Yb}^+$: Toward resolving the ^{173}Yb nuclear-octupole-moment puzzle** *Phys. Rev. A* **102**, 022810 (2020)
41. Conrad Roman, Anthony Ransford, Michael Ip, and Wesley C. Campbell. **Coherent control for qubit state readout** *New J. Phys.* **22**, 073038 (2020)
40. Justin E. Christensen, David Hucul, Wesley C. Campbell, and Eric R. Hudson. **High-fidelity manipulation of a qubit enabled by a manufactured nucleus** *npj Quantum Information* **6**, 35 (2020)
39. Xueping Long, Seejia S. Yu, Andrew M. Jayich, and Wesley C. Campbell. **Suppressed spontaneous emission for coherent momentum transfer** *Phys. Rev. Lett.* **123**, 033603 (2019)
38. Gary K. Chen, Changjian Xie, Tiangang Yang, Anyang Li, Arthur G. Suits, Eric R. Hudson, Wesley C. Campbell, and Hua Guo. **Isotope-selective chemistry in the $\text{Be}^+(^2\text{S}_{1/2}) + \text{HOD} \rightarrow \text{BeOD}^+/\text{BeOH}^+ + \text{H/D}$ reaction** *Phys. Chem. Chem. Phys.* **21**, 14005 (2019)
37. Eric R. Hudson and Wesley C. Campbell. **Dipolar quantum logic for freely rotating trapped molecular ions** *Phys. Rev. A* **98**, 040302(R) (2018)
36. Michael Ip, Anthony Ransford, Andrew M. Jayich, Xueping Long, Conrad Roman, and Wesley C. Campbell. **Phonon Lasing from Optical Frequency Comb Illumination of Trapped Ions** *Phys. Rev. Lett.* **121**, 043201 (2018)
35. Tiangang Yang, Anyang Li, Gary K. Chen, Changjian Xie, Arthur G. Suits, Wesley C. Campbell, Hua Guo, and Eric R. Hudson. **Optical Control of Reactions between Water and Laser-Cooled Be^+ Ions** *J. Phys. Chem. Lett.* **9**, 3555 (2018)
34. Mary Beth Campbell, Wesley C. Campbell, James Rogers, Natalie Rogers, Zachary Rogers, Anne Marie van den Hurk, Annie Webb, Talon Webb, and Paul Zaslav. **Bloom syndrome: research**

and data priorities for the development of precision medicine as identified by some affected families *Molecular Case Studies* **4**, a002816 (2018)

33. Amar C. Vutha, Eliot A. Bohr, Anthony Ransford, Wesley C. Campbell and Paul Hamilton. **Displacement operators: the classical face of their quantum phase** *Eur. J. Phys.* **39**, 025405 (2018)
32. David Hucul, Justin E. Christensen, Eric R. Hudson, and Wesley C. Campbell. **Spectroscopy of a Synthetic Trapped Ion Qubit** *Phys. Rev. Lett.* **119**, 100501 (2017)
31. (the ACME Collaboration): J. Baron, W. C. Campbell, D. DeMille, J. M. Doyle, G. Gabrielse, Y. V. Gurevich, P. W. Hess, N. R. Hutzler, E. Kirilov, I. Kozyryev, B. R. O’Leary, C. D. Panda, M. F. Parsons, B. Spaun, A. C. Vutha, A. D. West, E. P. West, and ACME collaboration. **Methods, analysis, and the treatment of systematic errors for the electron electric dipole moment search in thorium monoxide** *New J. Phys.* **19**, 073029 (2017)
30. (News and Views) Wes Campbell. **Quantum Physics: Atomic envoy enables molecular control.** *Nature* **545**, 164 (2017)
29. W. C. Campbell and P. Hamilton. **Rotation sensing with trapped ions** *J. Phys. B: At. Mol. Opt. Phys.* **50**, 064002 (2017)
28. A. M. Jayich, X. Long and W. C. Campbell. **Direct Frequency Comb Laser Cooling and Trapping** *Phys. Rev. X* **6**, 041004 (2016)
27. Bryce Yoshimura, Marybeth Stork, Danilo Dacic, Wesley C. Campbell, and James K. Freericks. **Creation of two-dimensional Coulomb crystals of ions in oblate Paul traps for quantum simulations** *EPJ Quantum Technology* **2**, 2 (2015)
26. Bryce Yoshimura, W. C. Campbell, and J. K. Freericks. **Diabatic-ramping spectroscopy of many-body excited states** *Phys. Rev. A* **90**, 062334 (2014)
25. C. Monroe, W. C. Campbell, E. E. Edwards, R. Islam, D. Kafri, S. Korenblit, A. Lee, P. Richerme, C. Senko, and J. Smith. **Quantum Simulation of Spin Models with Trapped Ions** Proceedings of the International School ‘Enrico Fermi,’ Course 189: Ion traps for Tomorrow’s Applications, Edited by M. Knoop, I. Marxoli, and G. Morigi. (2014)
24. C. Senko, J. Smith, P. Richerme, A. Lee, W. C. Campbell, and C. Monroe. **Coherent Imaging Spectroscopy of a Quantum Many-Body Spin System** *Science* **345**, 430 (2014)
23. R. Islam, W. C. Campbell, T. Choi, S. M. Clark, C. W. S. Conover, 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, C. Monroe. **Beat note stabilization of mode-locked lasers for quantum information processing** *Optics Letters* **39**, 3238 (2014)
22. J. Mizrahi, B. Neyenhuis, K. Johnson, W. C. Campbell, C. Senko, D. Hayes, and C. Monroe. **Quantum Control of Qubits and Atomic Motion Using Ultrafast Laser Pulses** *Applied Phys. B* **114**, 45 (2014)

21. A. M. Jayich, A. C. Vutha, M. T. Hummon, J. V. Porto, and W. C. Campbell. **Continuous all-optical deceleration and single-photon cooling of molecular beams** *Phys. Rev. A* **89**, 023425 (2014)
20. The ACME Collaboration: J. Baron, W. C. Campbell, D. DeMille, J. M. Doyle, G. Gabrielse, Y. V. Gurevich, P. W. Hess, N. R. Hutzler, E. Kirilov, I. Kozyryev, B. R. O'Leary, C. D. Panda, M. F. Parsons, E. S. Petrik, B. Spaun, A. C. Vutha, and A. D. West. **Order of Magnitude Smaller Limit on the Electric Dipole Moment of the Electron** *Science* **343**, 269 (2014)
19. P. Richerme, C. Senko, S. Korenblit, J. Smith, A. Lee, R. Islam, W. C. Campbell, and C. Monroe. **Quantum Catalysis of Magnetic Phase Transitions in a Quantum Simulator** *Phys. Rev. Lett.* **111**, 100506 (2013)
18. E. Kirilov, W. C. Campbell, J. M. Doyle, G. Gabrielse, Y. V. Gurevich, P. W. Hess, N. R. Hutzler, B. R. O'Leary, E. Petrik, B. Spaun, A. C. Vutha, and D. DeMille. **Shot-noise-limited spin measurements in a pulsed molecular beam** *Phys. Rev. A* **88**, 013844 (2013)
17. R. Islam, C. Senko, W. C. Campbell, S. Korenblit, J. Smith, A. Lee, E. E. Edwards, C.-C. J. Wang, J. K. Freericks, and C. Monroe. **Emergence and Frustration of Magnetism with Variable-Range Interactions in a Quantum Simulator** *Science* **340**, 583 (2013)
16. J. Mizrahi, C. Senko, B. Neyenhuis, K. G. Johnson, W. C. Campbell, C. W. S. Conover, and C. Monroe. **Ultrafast Spin-Motion Entanglement and Interferometry with a Single Atom** *Phys. Rev. Lett.* **110**, 203001 (2013)
15. S. Korenblit, D. Kafri, W. C. Campbell, R. Islam, E. E. Edwards, Z.-X. Gong, G.-D. Lin, L.-M. Duan, J. Kim, K. Kim, and C. Monroe. **Quantum Simulation of Spin Models on an Arbitrary Lattice with Trapped Ions** *New J. Phys.* **14**, 095024 (2012)
14. Matthew T. Hummon, Timur V. Tscherbul, Jacek Klos, Hsin-I Lu, Edem Tsikata, Wesley C. Campbell, Alexander Dalgarno, and John M. Doyle. **Cold N + NH Collisions in a Magnetic Trap** *Phys. Rev. Lett.* **106**, 053201 (2011)
13. W. C. Campbell, J. Mizrahi, Q. Quraishi, C. Senko, D. Hayes, D. Hucul, D. N. Matsukevich, P. Maunz, and C. Monroe. **Ultrafast Gates for Single Atomic Qubits** *Phys. Rev. Lett.* **105**, 090502 (2010)
12. 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. **Search for the electric dipole moment of the electron with thorium monoxide** *J. Phys. B* **43**(7), 074007 (2010)
11. D. Hayes, D. N. Matsukevich, P. Maunz, D. Hucul, Q. Quraishi, S. Olmschenk, W. Campbell, J. Mizrahi, C. Senko, and C. Monroe. **Entanglement of Atomic Qubits Using an Optical Frequency Comb** *Phys. Rev. Lett.* **104**, 140501 (2010)
10. E Tsikata, W C Campbell, M T Hummon, H-I Lu, and J M Doyle. **Magnetic Trapping of NH Molecules with 20 s Lifetimes** *New J. Phys.* **12**, 065028 (2010)

9. Wesley C. Campbell and John M. Doyle. *Cooling, Trap Loading, and Beam Production Using a Cryogenic Helium Buffer Gas*. Published as Chapter 13 in *Cold molecules: theory, experiment, applications*, edited by Roman Krems, Bretislav Friedrich, and William C. Stwalley (CRC Press, Boca Raton, FL, 2009), p. 473-508
8. Wesley C. Campbell, Timur V. Tscherebul, Hsin-I Lu, Edem Tsikata, Roman V. Krems, and John M. Doyle. **Mechanism of Collisional Spin Relaxation in $^3\Sigma$ Molecules** *Phys. Rev. Lett.* **102**, 013003 (2009)
7. Wesley C. Campbell, Gerrit C. Groenenboom, Hsin-I Lu, Edem Tsikata, and John M. Doyle. **Time-Domain Measurement of Spontaneous Vibrational Decay of Magnetically Trapped NH** *Phys. Rev. Lett.* **100**, 083003 (2008)
6. Matthew T. Hummon, Wesley C. Campbell, Hsin-I Lu, Edem Tsikata, Yihua Wang, and John M. Doyle. **Magnetic trapping of atomic nitrogen (^{14}N) and cotrapping of NH ($X^3\Sigma^-$)** *Phys. Rev. A* **78**, 050702(R) (2008)
5. Wesley C. Campbell, Edem Tsikata, Hsin-I Lu, Laurens D. van Buuren, and John M. Doyle. **Magnetic Trapping and Zeeman Relaxation of NH ($X^3\Sigma^-$)** *Phys. Rev. Lett.* **98**, 213001 (2007)
4. D. Egorov, W. C. Campbell, B. Friedrich, S. E. Maxwell, E. Tsikata, L. D. van Buuren, and J. M. Doyle. **Buffer-gas cooling of NH via the beam loaded buffer-gas method** *Eur. Phys. J. D* **31**, 307 (2004)
3. J. G. E. Harris, R. A. Michniak, S. V. Nguyen, W. C. Campbell, D. Egorov, S. E. Maxwell, L. D. van Buuren, and J. M. Doyle. **Deep Superconducting Magnetic Traps for Neutral Atoms and Molecules** *Rev. Sci. Inst.* **75**, 17 (2004)
2. V. Milner, J. L. Hanssen, W. C. Campbell and M. G. Raizen. **Optical Billiards for Atoms** *Phys. Rev. Lett.* **86**, 1514 (2001)
1. Daniel R. Spiegel, Alexis L. Thompson and Wesley C. Campbell. **Forced Rayleigh scattering studies of tracer diffusion in a nematic liquid crystal: The relevance of complementary gratings** *J. Chem. Phys.* **114**, 3842 (2001)