
DAVID MINOT WELD

Department of Physics, University of California Santa Barbara

Tel: +1(805)893-7634 Email: weld@physics.ucsb.edu Web: web.physics.ucsb.edu/~weld/

Research Interests

Quantum interactive dynamics, Floquet engineering, anyons, quantum simulation, quantum sensing, quasiperiodicity, transport, quantum interfaces.

Education

Ph.D. in Physics, Stanford University April 2007

Dissertation: *Design, Construction, and Operation of an Apparatus for Detecting Short-Length-Scale Deviations From Newtonian Gravity.*

B.A. in Physics, Harvard University June 1998

Magna cum laude, phi beta kappa

Research Experience

Assistant, Associate, and Full Professor Sept. 2011 – present

University of California, Santa Barbara

Research Scientist July 2010 – Sept. 2011

Massachusetts Institute of Technology

Led ^{87}Rb BEC experiment and initiated a new ^7Li BEC experiment.

Postdoctoral Fellow Jan. 2007 – July 2010

Massachusetts Institute of Technology

Proposed, developed the theory of, and demonstrated spin gradient thermometry and spin gradient demagnetization cooling of ultracold atoms.

Graduate Student Researcher Sept. 1999 – Nov. 2006

Stanford University

Developed a novel cryogenic probe of weak mass-dependent forces, and used it to constrain deviations from Newtonian gravity at length scales of $10\text{ }\mu\text{m}$.

Honors & Awards

Moore Foundation Experimental Physics Investigator 2023

Chancellor's Faculty Award for Undergraduate Research Mentoring 2021

Richard Whited Endowed Chair in Interdisciplinary Science 2011 – 2017

National Science Foundation CAREER Award 2016

UC President's Research Catalyst Award (Lead PI) 2015

Presidential Early Career Award for Scientists & Engineers (ARO PECASE) 2014

Hellman Family Faculty Fellow 2013

Alfred P. Sloan Research Fellow 2013

Young Investigator Prize, Air Force Office of Scientific Research 2012

Selected Publications

Thermodynamic engine with a quantum degenerate working fluid. E.Q. Simmons, R. Sajjad, K. Keithley, H. Mas, J.L. Tanlimco, E. Nolasco-Martinez, Y. Bai, G.H. Fredrickson, and D.M. Weld. arXiv:2304.00659 (2023).

Anomalous localization and multifractality in a kicked quasicrystal. T. Shimasaki, M. Prichard, H.E. Kondakci, J.E. Pagett, Y. Bai, P. Dotti, A. Cao, T.-C. Lu, T. Grover, and D.M. Weld. arXiv:2203.09442 (2022).

Interaction-driven breakdown of dynamical localization in a kicked quantum gas. A. Cao, R. Sajjad, H. Mas, E.Q. Simmons, J.L. Tanlimco, E. Nolasco-Martinez, T. Shimasaki, H.E. Kondakci, V. Galitski, and D.M. Weld. *Nature Physics* **18**, 1302 (2022).

Observation of the quantum boomerang effect. R. Sajjad, J.L. Tanlimco, H. Mas, A. Cao, E. Nolasco-Martinez, E.Q. Simmons, F.L.N. Santos, P. Vignolo, T. Macrì, and D.M. Weld. *Phys. Rev. X* **12**, 011035 (2022). (Featured with a commentary in *APS Physics*.)

Protecting qubit coherence by spectrally engineered driving of the spin environment. M. Joos, D. Bluvstein, Y. Lyu, D.M. Weld, and A.B. Jayich. *npj Quantum Information* **8**, 47 (2022).

Construction of Fractal Order and Phase Transition with Rydberg Atoms. N.E. Myerson-Jain, S. Yan, D.M. Weld, and C. Xu. *Phys. Rev. Lett.* **128**, 017601 (2022).

Transport controlled by Poincaré orbit topology in a driven inhomogeneous lattice gas. A. Cao, R. Sajjad, E.Q. Simmons, C.J. Fujiwara, T. Shimasaki, and D.M. Weld. *Phys. Rev. Research* **2**, 032032(R) (2020).

Transport in Floquet-Bloch bands. K.M. Fujiwara, K. Singh, Z.A. Geiger, R. Senaratne, S.V. Rajagopal, M. Lipatov, and D.M. Weld. *Phys. Rev. Lett.* **122**, 010402 (2019).

Quantifying and controlling prethermal nonergodicity in interacting Floquet matter. K. Singh, K.M. Fujiwara, Z.A. Geiger, E.Q. Simmons, M. Lipatov, A. Cao, P. Dotti, S.V. Rajagopal, R. Senaratne, T. Shimasaki, M. Heyl, A. Eckardt, and D.M. Weld. *Phys. Rev. X* **9**, 041021 (2019).

Phasonic Spectroscopy of a Quantum Gas in a Quasicrystalline Lattice. S.V. Rajagopal, T. Shimasaki, P. Dotti, M. Raciunas, R. Senaratne, E. Anisimovas, A. Eckardt, and D.M. Weld. *Phys. Rev. Lett.* **123**, 223021 (2019).

Observation and Uses of Position-space Bloch Oscillations in an Ultracold Gas. Z. Geiger, K.M. Fujiwara, K. Singh, R. Senaratne, S.V. Rajagopal, M. Lipatov, T. Shimasaki, R. Driben, V.V. Konotop, T. Meier, and D.M. Weld. *Phys. Rev. Lett.* **120**, 213201 (2018). (Selected as an Editor's Choice, featured with a commentary in *Physics*.)

Quantum Simulation of Ultrafast Dynamics Using Trapped Ultracold Atoms. R. Senaratne, S. V. Rajagopal, T. Shimasaki, P. E. Dotti, K. M. Fujiwara, K. Singh, Z.A. Geiger, and D.M. Weld. *Nature Communications* **9**, 2065 (2018).

Professional Activities, Mentoring, and Outreach

- *Leadership Activities:* Elected to the executive committee of DAMOP. Co-director of UCSB’s Eddleman Center for Quantum Innovation. Co-design lead for quantum simulation for the DOE Quantum Science Center. Executive committee member for the NSF Challenge Institute for Quantum Computation. Founding director of the California Institute for Quantum Emulation. Lead PI for the Broadly-tunable Illumination Facility for Research, Outreach, Scholarship, and Training (BIFROST), supported by the Army Research Office. Co-organizer of events including 2019 Workshop on Emerging Directions & Opportunities in Quantum Science (Santa Barbara, CA), 2021 workshop on Quantum Computing and Simulation on Near-Term Devices (Seattle, WA), and 2022 workshop on Challenges in Quantum Technology (Normandy, France).
- *Mentoring:* Recipient of 2021 Chancellor’s Faculty Award for Undergraduate Research Mentoring. Faculty Advisor for Training in Teaching and Mentoring at UCSB’s Center for Science and Engineering Partnerships. Faculty coordinator for graduate education at the NSF Quantum Foundry. Scientific mentor for 4 postdocs, 13 graduate students, and more than 30 undergraduates.
- *Outreach to K-12 Students:* Performed scientific demonstrations and presentations on topics such as superconductivity, Bose-Einstein condensation, and fractals for audiences ranging in age from second grade through high school.
- *Professional Development:* Founded the “UCSB SACNAS Career Pathways Program” which supports career preparation for URM STEM students at UC Santa Barbara. This successful program is supported by the DoD’s Research and Education Program for Historically Black Colleges and Universities and Minority-Serving Institutions.
- *Other Professional Activities:* Reviewer for Physical Review and Nature journals and others, reviewer for ARO, AFOSR, NSF, UCOP, and other funding agencies.

Advisors & Advisees

Graduate advisor: Aharon Kapitulnik.

Postdoctoral advisor: Wolfgang Ketterle.

Graduate advisees: Zachary Geiger, Ruwan Senaratne, Shankari Rajagopal, Cora Fujiwara, Kevin Singh, Peter Dotti, Ethan Q. Simmons, Roshan Sajjad, Jeremy Tanlimco, Jared Pagett, Eber Nolasco-Martinez, Jeremy Estes, Anna Dardia, Madeleine Leibovitch.

Postdoctoral advisees: Vyacheslav Lebedev, Eric Corsini, Toshihiko Shimasaki, Hector Mas, Esat Kondakci, Xiao Chai.