

Curriculum Vitae

Manuel Endres

Assistant Professor and Rosenberg Scholar, California Institute of Technology

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ACADEMIC EMPLOYMENT

- 2019- **California Institute of Technology**, Rosenberg Scholar
- 2016- **California Institute of Technology**, Assistant Professor
- 2015-2016 **California Institute of Technology**, Visiting Faculty Associate
- 2014-2016 **Harvard Quantum Optics Center**, Independent HQOC Prize Postdoctoral Fellow
- 2013-2014 **Max-Planck-Institute of Quantum Optics**, Postdoctoral Fellow with I. Cirac

EDUCATION

- 2013 **Ludwig-Maximilians-Universität Munich.**
PhD physics (summa cum laude). Advisor: I. Bloch. Work carried out at Max-Planck-Institute of Quantum Optics
- 2002-2008 **Philipps-Universität Marburg**
Dipl. Phys. Work carried out at the Johannes Gutenberg-Universität Mainz
- 2005-2006 **University of Amsterdam**, Courses from MSc in theoretical physics

AWARDS AND SCHOLARSHIPS

- 2018 **AFOSR Young Investigator Program Award**, Air Force Office for Scientific Research
- 2018 **NSF CAREER Award**, National Science Foundation
- 2017 **Sloan Research Fellowship in Physics**, Alfred P. Sloan Foundation
- 2014 **Otto Hahn Medal**, Max Planck Society
- 2014 **HQOC Prize Postdoctoral Fellowship**, Harvard Quantum Optics Center
- 2014 **Karel Urbanek Fellowship**, Stanford University, Applied Physics Department (offered)
- 2013 **Springer Theses**, PhD thesis selected for publication as a book
- 2013 **PhD prize**, Ludwig-Maximilians-Universität Munich (including all departments)
- 2004 **Fulbright Scholarship**, Fulbright Commission (offered)
- 2003-2008 **German Merit Foundation Scholarship**, German Merit Foundation (nationwide)

PUBLICATIONS

31. *High-Fidelity Control, Detection, and Entanglement of Alkaline-Earth Rydberg Atoms*
I. S. Madjarov, J. P. Covey, A. L. Shaw, J. Choi, A. Kale, A. Cooper, H. Pichler, V. Schkolnik, J. R. Williams, M. Endres
Nature Phys. (2020), online 10.1038/s41567-020-0903-z
30. *An atomic array optical clock with single-atom readout*
I. S. Madjarov, A. Cooper, A. L. Shaw, J. P. Covey, V. Schkolnik, T. H. Yoon, J. R. Williams, M. Endres
Phys. Rev. X **9**, 041052 (2019)
29. *Integrating Neural Networks with a Quantum Simulator for State Reconstruction*
G. Torlai, B. Timar, EPL Van Nieuwenburg, H. Levine, A. Keesling, A. Omran, H. Bernien, M. Greiner, V. Vuletić, , M. D. Lukin, R. Melko, M. Endres
Phys. Rev. Lett. **123**, 230504 (2019)
28. *2000-times repeated imaging of strontium atoms in clock-magic tweezer arrays*
J. P. Covey, I. S. Madjarov, A. Cooper, M. Endres
Phys. Rev. Lett. **122**, 173201 (2019)
27. *Telecom-band quantum optics with ytterbium atoms and silicon nanophotonics*
J. P. Covey, A. Sipahigil, S. Szoke, N. Sinclair, M. Endres, O. Painter
Phys. Rev. Applied **11**, 034044 (2019)
26. *Generation and manipulation of Schrödinger cat states in Rydberg atom arrays*
A. Omran, H. Levine, A. Keesling, G. Semeghini, T. T. Wang, S. Ebadi, H. Bernien, A. S. Zibrov, H. Pichler, S. Choi, J. Cui, M. Rossignolo, P. Rembold, S. Montangero, T. Calarco, M. Endres, M. Greiner, V. Vuletić, M. D. Lukin
Science **365**, 570-574 (2019)
25. *Probing quantum critical dynamics on a programmable Rydberg simulator*
A. Keesling, A. Omran, H. Levine, H. Bernien, H. Pichler, S. Choi, R. Samajdar, S. Schwartz, P. Silvi, S. Sachdev, P. Zoller, M. Endres, M. Greiner, V. Vuletic, M. D. Lukin
Nature **568**, 207 (2019)
24. *Alkaline earth atoms in optical tweezers*
A. Cooper, J. P. Covey, I. S. Madjarov, S. G. Porsev, M. S. Safronova, M. Endres
Phys. Rev. X **8**, 041055 (2018)
23. *Berry-electrodynamics - Anomalous drift and pumping from time-dependent Berry connection*
S. Chaudhary, M. Endres, G. Refael
Phys. Rev. B **98**, 064310 (2018)
22. *Scrambling and thermalization in a diffusive quantum many-body system*
A. Bohrdt, C. B. Mendl, M. Endres, M. Knap
New Journal of Physics **19**, 063001 (2017)

21. *High-Fidelity Control and Entanglement of Rydberg-Atom Qubits*
H. Levine, A. Keesling, A. Omran, H. Bernien, S. Schwartz, A. S. Zibrov, M. Endres, M. Greiner, V. Vuletić, and M. D. Lukin
Phys. Rev. Lett. **12360**, 064310 (2018)
20. *Probing many-body dynamics on a 51-atom quantum simulator*
H. Bernien, S. Schwartz, A. Keesling, H. Levine, A. Omran, H. Pichler, S. Choi, A. S. Zibrov, M. Endres, M. Greiner, V. Vuletić, M. D. Lukin
Nature **551**, 579 (2017)
19. *Atom-by-atom assembly of defect-free one-dimensional cold atom arrays*
M. Endres, H. Bernien, A. Keesling, H. Levine, E. R. Anschuetz, A. Krajenbrink, C. Senko, V. Vuletic, M. Greiner, M. D. Lukin
Science **354**, 1024 (2016)
18. *Bloch state tomography using Wilson lines*
T. Li, L. Duca, M. Reitter, F. Grusdt, E. Demler, M. Endres, M. Schleier-Smith, I. Bloch, U. Schneider
Science **352**, 1094-1097 (2016).
17. *Destruction of string order after a quantum quench*
M. C. Strinati, L. Mazza, M. Endres, D. Rossini, R. Fazio
Phys. Rev. B **94**, 024302 (2016).
16. *Landau levels in strained optical lattices*
B. Tian, M. Endres, D. Pekker
Phys. Rev. Lett. **115**, 236803 (2015).
15. *The Massive Goldstone (Higgs) Mode in Two-Dimensional Ultra-cold Atomic Lattice Systems*
L. Liu, K. Chen, M. Endres, Y. Deng, L. Pollet, N. Prokof'ev
Phys. Rev. B **92**, 174521 (2015).
14. *Spatially Resolved Detection of a Spin-Entanglement Wave in a Bose-Hubbard Chain*
T. Fukuhara, S. Hild, J. Zeiher, P. Schauß, I. Bloch, M. Endres, C. Gross
Phys. Rev. Lett. **115**, 035302 (2015).
13. *Detecting two-site spin-entanglement in many-body systems with local particle-number fluctuations*
L. Mazza, D. Rossini, R. Fazio, M. Endres
New J. Phys. **17**, 013015 (2015).
12. *Out-of-equilibrium dynamics and thermalization of string order*
L. Mazza, D. Rossini, M. Endres, R. Fazio
Phys. Rev. B, Rapid Communication **90**, 020301 (2014).
11. *Single-site- and single-atom-resolved measurement of correlation functions.*
M. Endres, M. Cheneau, T. Fukuhara, C. Weitenberg, P. Schauß, C. Gross, L. Mazza, M.C. Banuls, L. Pollet, I. Bloch, S. Kuhr
Appl. Phys. B **113**, 27-39 (2013).

10. *Microscopic observation of magnon bound states and their dynamics*
T. Fukuhara, P. Schauß, M. Endres, S. Hild, M. Cheneau, I. Bloch, C. Gross
Nature **502**, 76-79 (2013)
9. *Non-local order in Mott insulators, Duality and Wilson Loops*
S. P. Rath, W. Simeth, M. Endres, W. Zwerger
Ann. Phys. **334**, 256-271 (2013)
8. *Quantum dynamics of a mobile spin impurity*
T. Fukuhara, A. Kantian, M. Endres, M. Cheneau, P. Schauß, S. Hild, D. Bellem, U. Schollwöck, T. Giamarchi, C. Gross, I. Bloch, S. Kuhr
Nature Phys. **9**, 235–241 (2013)
7. *Observation of spatially ordered structures in a two-dimensional Rydberg gas*
P. Schauß, M. Cheneau, M. Endres, T. Fukuhara, S. Hild, A. Omran, T. Pohl, C. Gross, S. Kuhr, I. Bloch
Nature **491**, 87-91 (2012)
6. *The ‘Higgs’ amplitude mode at the two-dimensional superfluid/Mott insulator transition*
M. Endres, T. Fukuhara, D. Pekker, M. Cheneau, P. Schauß, C. Gross, E. Demler, S. Kuhr, I. Bloch
Nature **487**, 454-458 (2012)
5. *Light-cone-like spreading of correlations in a quantum many-body system*
M. Cheneau, P. Barmettler, D. Poletti, M. Endres, P. Schauß, T. Fukuhara, C. Gross, I. Bloch, C. Kollath, S. Kuhr
Nature **481**, 484-487 (2012)
4. *Observation of Correlated Particle-Hole Pairs and String Order in Low-Dimensional Mott Insulators*
M. Endres, M. Cheneau, T. Fukuhara, C. Weitenberg, P. Schauß, C. Gross, L. Mazza, M.C. Banuls, L. Pollet, I. Bloch, S. Kuhr
Science **334**, 200-203 (2011)
3. *Coherent light scattering from a two-dimensional Mott insulator*
C. Weitenberg, P. Schauß, T. Fukuhara, M. Cheneau, M. Endres, I. Bloch, S. Kuhr.
Phys. Rev. Lett. **106**, 215301 (2011)
2. *Single-spin addressing in an atomic Mott insulator*
C. Weitenberg, M. Endres, J. F. Sherson, M. Cheneau, P. Schauß, T. Fukuhara, I. Bloch, S. Kuhr
Nature **471**, 319-324 (2011)
1. *Single-atom-resolved fluorescence imaging of an atomic Mott insulator*
J. F. Sherson, C. Weitenberg, M. Endres, M. Cheneau, I. Bloch, S. Kuhr
Nature **467**, 68-72 (2010)

BOOKS AND OTHER PUBLICATIONS

2. *Quantum simulation: Choose your own interaction*
J. Thompson, M. Endres
Nature Photonics, News and Views **9**, 285-287 (2015)
1. *Probing Correlated Quantum Many-Body Systems at the Single-Particle Level*
M. Endres
Springer Theses Book ISBN 978-3-319-05753-8 (2014)

PATENTS

2. *Controlling Alkaline Earth Atoms In Tweezer Arrays For Quantum Computing Applications*
2018, Co-inventor (provisional application)
1. *Neutral Atom Quantum Information Processor*
2018, Co-inventor (pending)

INVITED EXTERNAL TALKS

33. **June 2020**, *Quantum Science with Tweezer Arrays*, APS DAMOP Meeting, Portland (online only)
32. **March 2020**, *Quantum Science with Tweezer Arrays*, APS March Meeting, Denver (online only)
31. **Feb 2020**, *Quantum Science with Tweezer Arrays*, Applied Physics/Physics Colloquium, Stanford
30. **Dec 2019**, *Quantum Science with Tweezer Arrays*, IQOQI Seminar, Innsbruck
29. **Nov 2019**, *Quantum Science with Tweezer Arrays*, MCQST-Technion Symposium, Garching
28. **Nov 2019**, *Quantum Science with Tweezer Arrays*, SFB/ZOQ Seminar, Hamburg
27. **Nov 2019**, *Quantum Science with Tweezer Arrays*, AMOQI seminar, Berkeley
26. **Sep 2019**, *Quantum Science with Tweezer Arrays*, Workshop: Long range Interactions in Quantum Systems, Gif-sur-Yvette,
25. **July 2019**, *Quantum Science with Tweezer Arrays*, Workshop: Realizations and Applications of Quantum Coherence in Non- Equilibrium Systems, Aspen
24. **June 2019**, *Quantum Science with Tweezer Arrays*, Quantum Seminar, IST Austria,
23. **Feb 2019**, *Assembled Atomic Arrays*, Emerging Directions in Quantum Science Workshop, KITP
22. **Feb 2019**, *Quantum science with alkali and alkaline-earth arrays*, SQuInT workshop, Albuquerque

21. **Feb 2019**, *Alkaline Earth Atoms in Optical Tweezer Arrays*, CUA seminar, MIT
20. **Oct 2018**, *Strontium atoms in optical tweezers*, 7th International Workshop on Ultra-cold Group II Atoms, Beijing
19. **June 2018**, *Quantum simulation with alkali and alkaline-earth Rydberg-arrays*, SoCal condensed matter seminar, UC Riverside
18. **June 2018**, *Quantum science with alkali and alkaline-earth Rydberg-arrays*, AMO seminar, Stanford
17. **June 2018**, *Quantum simulation with alkali and alkaline-earth Rydberg-arrays*, APS DAMOP Meeting, Fort Lauderdale
16. **Nov 2016**, *Atom-by-atom assembly*, Workshop "Synthetic quantum matter", KITP
15. **June 2015**, *Higgs mode + X*, Conference "Cold Atoms meet High Energy Physics", ECT Trento
14. **May 2015**, *Spin-Entanglement detection in Bose-Hubbard chains*, International Workshop "Entanglement in strongly correlated quantum matter", KITP
13. **June 2014**, *Probing Quantum Many-Particle Systems at the Single Particle Level*, International Workshop "Quantum Matter", Benasque
12. **March 2014**, *Probing Quantum Many-Particle Systems at the Single Particle Level*, California Institute of Technology
11. **February 2014**, *Probing Quantum Many-Particle Systems at the Single Particle Level*, Georgia Institute of Technology
10. **January 2014**, *Probing Quantum Many-Particle Systems at the Single Particle Level*, Stanford University
9. **January 2014**, *Probing Quantum Many-Particle Systems at the Single Particle Level*, HQOC, Harvard University
8. **January 2014**, *Probing Quantum Many-Particle Systems at the Single Particle Level*, Institute for Quantum Computing, Waterloo
7. **January 2014**, *Non-equilibrium dynamics of spin impurities*, Quantum Innovators Workshop, Waterloo
6. **August 2013**, *Probing Quantum Many-Particle Systems on the Single Particle Level*, Tsinghua University, Beijing
5. **June 2013**, *Probing Quantum Many-Particle Systems on the Single Particle Level*, Scuola Normale, Pisa
4. **June 2012**, *Studying Quantum Many-Particle Systems on the Single-Atom Level*, Caltech Theory Seminar, Pasadena

3. **May 2012**, *Studying Quantum Many-Particle Systems on the Single-Atom Level*, University of Science and Technology of China, Shanghai Branch
2. **November 2011**, *Observation of Correlated Particle-Hole Pairs and String Order in Low-Dimensional Mott Insulators*, Condensed Matter Theory Seminar, Frankfurt
1. **May 2009**, *Towards Single Site Addressability in Optical Lattices*, NIST Gaithersburg