

Curriculum Vitae – Martin Zwierlein, MIT

Address: Martin Zwierlein
 Thomas A. Frank Professor of Physics
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Education:

1998-2002 Studies of Physics in Bonn, Germany and Ecole Normale Supérieure, Paris, France
 2002-2006 Ph.D. in Physics, MIT, Cambridge, USA , experimental Ph.D. Thesis on „High-Temperature Superfluidity in an Ultracold Fermi Gas“ (Prof. W. Ketterle)

Employment:

2006-2007 Research Associate, University of Mainz, Germany (Prof. Immanuel Bloch)
 Since 2007 Faculty member, MIT, Cambridge, Department of Physics:
 Assistant Professor of Physics (2007-2012)
 Associate Professor of Physics with tenure (2012-2013)
 Full Professor of Physics (since 07/2013)

- Research area: atomic physics, ultracold gases of atoms and molecules
- Techniques: laser cooling, magnetic and optical trapping of multiple atomic species, ultracold molecules, Fermi gas microscopy
- Precision measurements in many-body physics; exploration of novel forms of matter using quantum mixtures of ultracold atoms and molecules; creation of model systems for condensed matter and nuclear physics

Honors and Awards:

- Fellow, Studienstiftung des deutschen Volkes, 1998 – 2002
- Martin Deutsch Prize for Excellence in Experimental Physics, MIT, 2004
- Klung-Wilhelmy-Weberbank Prize, Freie Universität Berlin, 2007
- Fellow, Alfred P. Sloan Foundation, 2008 – 2010
- Young Investigator Award, Air Force Office of Scientific Research, 2010
- Young Investigator Award, Office of Naval Research, 2010
- Young Faculty Award, Defense Advanced Research Projects Agency, 2010
- Presidential Early Career Award for Scientists and Engineers, Office of Science and Technology Policy Executive Office of the President, 2010
- Fellow, David and Lucile Packard Foundation, 2010-2015
- William W. Buechner Teaching Prize, MIT, 2012
- Thomson Reuters Highly Cited Researcher
- Fellow, American Physical Society (2016)
- I.I. Rabi Prize, American Physical Society, 2017
- Thomas A. Frank Chair, MIT, 2018 – current
- Vannevar Bush Faculty Fellow, Department of Defense, 2019 – current
- Alexander von Humboldt Research Prize, 2020

Memberships:

American Physical Society (Fellow, 2016), German Physical Society, European Physical Society

Ten selected publications:

1. Zoe Z. Yan, Yiqi Ni, Carsten Robens, Martin W. Zwierlein
Bose polarons near quantum criticality
Science, **368**, 190-194 (2020)
2. M.A. Nichols, L.W. Cheuk, M. Okan, T.R. Hartke, E. Mendez, T. Senthil, E. Khatami, H. Zhang, and M.W. Zwierlein
Spin Transport in a Mott Insulator of Ultracold Fermions
Science **363**, 383 (2019)
3. J.W. Park, Z.Z. Yan, H. Loh, S.A. Will, and M.W. Zwierlein
Second-Scale Nuclear Spin Coherence Time of Trapped Ultracold NaK Molecules
Science **357**, 372 (2017)
4. L.W. Cheuk, M.A. Nichols, K.R. Lawrence, M. Okan, H. Zhang, E. Khatami, N. Trivedi, T. Paiva, M. Rigol, and M.W. Zwierlein.
Observation of spatial charge and spin correlations in the 2D Fermi-Hubbard model.
Science, **353**, 1260 (2016)
5. Jee Woo Park, Sebastian A. Will, and Martin W. Zwierlein.
Ultracold Dipolar Gas of Fermionic $^{23}\text{Na}^{40}\text{K}$ Molecules in their Absolute Ground State.
Phys. Rev. Lett. **114**, 205302 (2015).
6. Lawrence W. Cheuk, Matthew A. Nichols, Melih Okan, Thomas Gersdorf, Vinay V. Ramasesh, Waseem S. Bakr, Thomas Lompe, Martin W. Zwierlein
Quantum Gas Microscope for Fermionic Atoms
Phys. Rev. Lett. **114**, 193001 (2015)
7. Tarik Yefsah, Ariel T. Sommer, Mark J. H. Ku, Lawrence W. Cheuk, Wenjie Ji, Waseem S. Bakr, Martin W. Zwierlein
Heavy Solitons in a Fermionic Superfluid
Nature **499**, 426-430 (2013)
8. Lawrence W. Cheuk, Ariel T. Sommer, Zoran Hadzibabic, Tarik Yefsah, Waseem S. Bakr, Martin W. Zwierlein
Spin-Injection Spectroscopy of a Spin-Orbit Coupled Fermi Gas
Phys. Rev. Lett. **109**, 095302 (2012)
9. Mark Ku, Ariel Sommer, Lawrence Cheuk, Martin W. Zwierlein.
Revealing the Superfluid Lambda Transition in the Universal Thermodynamics of a Unitary Fermi Gas.
Science **335**, 563 (2012).
10. A. Schirotzek, C.H. Wu, A. Sommer, M.W. Zwierlein
Observation of Fermi polarons in a tunable Fermi liquid of ultracold atoms
Phys. Rev. Lett. **102**, 230402 (2009)

Biosketch Martin Zwierlein

Martin Zwierlein studied physics at the University of Bonn and at the Ecole Normale Supérieure in Paris. His doctoral thesis in the group of Wolfgang Ketterle at MIT focused on the observation of superfluidity in ultracold fermionic gases, a novel form of strongly interacting matter. After a postdoctoral stay at the University of Mainz in the group of Immanuel Bloch, he joined the MIT physics department in 2007. He was promoted to Associate Professor with tenure in 2012, and Full Professor in 2013. Since 2018 he holds the Thomas A. Frank Chair of Physics.

Martin Zwierlein studies strongly interacting quantum gases of fermionic atoms and molecules. These gases allow the realization of new states of matter and serve as model systems for other Fermi systems, such as neutron stars or high-temperature superconductors. A recent accomplishment was the accurate determination of the equation of state of strongly interacting Fermi gases, which provided a stringent test of many-body theories. Scaled to the density of electrons in a metal, these gases would become superfluid far above room temperature. The group has recently realized a quantum gas microscope for fermionic atoms, allowing single-site, single-atom resolved imaging. This enabled the observation of charge and spin correlations, and the direct measurement of transport coefficients in the Fermi-Hubbard model. This model is believed to hold the key for our understanding of high-temperature superconductivity, but its transport properties cannot be calculated accurately on a classical computer. The group also created the first Fermi gas of chemically stable molecules, whose strong dipole-dipole interactions are predicted to lead to novel states of matter such as p-wave superfluids, quantum crystals and supersolids.

His awards include the Klung-Wilhelmy-Weberbank-Prize, Freie Universität Berlin (2007), Young Investigator Awards from the Air Force Office of Scientific Research, the Office of Naval Research and DARPA (2010), a David and Lucile Packard Fellowship (2010), a Presidential Early Career Award for Scientists and Engineers (2010), the American Physical Society's I.I. Rabi Prize in Atomic, Molecular and Optical Physics (2017), the Vannevar Bush Faculty Fellowship (2019) and the Alexander von Humboldt Research Prize (2020).