

# Mark H Fischer

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## *Personal Information*

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Date and Place of Birth	February 2, 1980, Winterthur, Switzerland
Citizenship	Switzerland
ResearcherID: K-2548-2013	
ORCID: 0000-0003-0810-6064	
Google Scholar ID: 7vCKz0wAAAAJ	

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## *Education*

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<b>Habilitation</b> University of Zurich (Switzerland)	07/2021
<b>Ph.D. in Physics</b> ETH Zurich (Switzerland) Advisor: Prof. Manfred Sigrist	09/2006 - 06/2010
<b>Diploma (MSc) in Physics</b> ETH Zurich (Switzerland) Advisor: Prof. Manfred Sigrist <i>Honors:</i> Diploma with distinction	10/2001 - 04/2006
<b>Languages:</b> German (mother tongue), English (fluent), French, Italian, Hebrew (basic)	

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## *Research & Professional Experience*

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<b>Senior Research Assistant</b> (permanent since 09/2020) with Prof. Titus Neupert University of Zurich, Switzerland	11/2018 -
<b>Senior Researcher</b> with Prof. Manfred Sigrist ETH Zurich, Switzerland	11/2016 - 10/2018
<b>'Swiss Friends of WIS' Fellow</b> with Prof. Ehud Altman and Dr. Erez Berg Weizmann Institute of Science, Israel	11/2013 - 10/2016
<b>Postdoctoral Researcher</b> with Prof. Eun-Ah Kim Cornell University, USA	09/2010 - 09/2013
<b>Research Assistant</b> with Prof. Manfred Sigrist ETH Zurich, Switzerland	09/2006 - 09/2010

*Publication & Presentation Summary*

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74 Publications (including 1 Book and 3 proceedings)  
43 Invited talks & seminars  
36 Conference contributions (talks & posters)

*Awards & Fellowships*

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Diploma with distinction, ETH Zurich, 2006  
Postdoctoral Fellowship of the Swiss Society of Friends of the Weizmann Institute of Science,  
2013 - 2016 (42.000 CHF per annum)

*Funding*

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“*Microscopies of Unconventional Superconductors*”,  
Project grant from the Swiss National Science Foundation, 2023-2026 (181.000 CHF)

*Research Interests & Skills*

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**Research Interests**

Unconventional and topological superconductivity  
Dynamics in (open) quantum systems  
Spin-orbit-coupling physics, in particular in confined and correlated multi-orbital systems  
Machine learning in condensed matter / statistical physics

**Computer Experience**

Languages: python, C++, Java, Mathematica, shell scripts  
Platforms: macOS, Linux, Unix

## Teaching

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### Graduate Lectures

- “Computational Quantum Physics”, ETH Zurich and University of Zurich (FS2023)
- “Machine Learning for the Sciences”, University of Zurich (FS2022)
- “Computational Quantum Physics”, ETH Zurich and University of Zurich (FS2021)
- “Introduction to Machine Learning for the Sciences”, University of Zurich and ETH Zurich (HS2020)
- “Computational Quantum Physics”, ETH Zurich and University of Zurich (FS2020)

### Teaching Assistant

- Graduate course “Solid State Theory”, ETH Zurich and University of Zurich (2019)
- Graduate seminar “QFT methods for mesoscopic transport,” ETH Zurich (2018)
- Graduate seminar “Strongly interacting one-dimensional systems,” ETH Zurich (2017)
- Graduate course “Quantum Mechanics I,” ETH Zurich (2009)
- Graduate course “Quantum Mechanics II,” ETH Zurich (2009)
- Graduate course “Statistical Physics,” ETH Zurich (2008)
- Graduate course “Solid State Theory,” ETH Zurich (2008)
- Graduate course “Thermodynamics,” ETH Zurich (2007)
- Graduate course “Superconductivity,” ETH Zurich (2007)
- Graduate course “Thermodynamics,” ETH Zurich (2006)
- Undergraduate courses “Calculus I&II,” ETH Zurich (2003-2005)

### Thesis supervision

- Sofie Castro Holbæk, PhD student at the University of Zurich (2023 - present)
- Bernhard Lüscher, PhD student at the University of Zurich (2022 - present)
- Nikita Astrakhantsev, PhD student at the University of Zurich (2019 - 2023)
- Anastasiia Skurativska, PhD student at the University of Zurich (2018 - 2022)
- Justyna Stefaniak, MSc student at ETH Zurich (2021)
- Philippe Suchsland, MSc student at ETH Zurich (2020)
- Simon Flury, MSc student at University of Zurich (2019)
- Maximilian Holst, MSc student at ETH Zurich (2018)
- Jurre Corver, MSc student at ETH Zurich (2017)

### Project supervision

- Maximilian Holst, PhD student at ETH Zurich (2019-2023)
- Bastian Zinkl, PhD student at ETH Zurich (2017/2018)
- Evert P. L. van Nieuwenburg, PhD student at ETH Zurich (2016/2017)
- Ronen Vosk, PhD student at the Weizmann Institute of Science (2014/2015)
- Kyungmin Lee, PhD student at Cornell University (2010 - 2013)
- Yi-Ting Hsu, PhD student at Cornell University (2010 - 2013)

*Service*

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**Conference Organization**

Trends in the Theory of Quantum Materials, ETH Zurich (2022)  
'Condensed Matter Theory in Zurich' Symposium, ETH Zurich (2021)  
Memorial Symposium for Alexey Soluyanov, University of Zurich (2019)  
Artificial Intelligence and the Scientific Method, ETH Zurich (2019)  
Strontium Ruthenate: 25 years of a puzzling superconductor, ETH Zurich (2019)  
UQUAM Workshop on Open Quantum Systems, Weizmann Institute of Science (2016)

**Outreach**

Presentation for the 'Tag der offenen Tür für Lehrpersonen',  
Department of Physics, University of Zurich (2023)  
'*Superconductivity – Current State, Records, and new Frontiers*',  
Progress in Physics (81) article in SPS Mitteilungen (2021) with Johan Chang  
Video contribution "What is Science?" for the science week of Campus Muristalden (2021)  
High-school summer program, "Photovoltaik & Thermoelektrischer Effekt", ETH Zurich (2018)  
High-school summer program, "Superconductivity", ETH Zurich (2008)  
"ETH unterwegs" ("ETH on the road"), high-school recruiting event, ETH Zurich (2006/2007)

**Other**

Department of Physics Delegate for the body of Senior Researchers and Teaching Staff (2021-)

*References*

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**Prof. Manfred Sigrist**

Institut für Theoretische Physik  
ETH Zürich  
8093 Zürich, Switzerland  
[sigrist@itp.phys.ethz.ch](mailto:sigrist@itp.phys.ethz.ch)

**Prof. Ehud Altman**

Department of Physics  
University of California Berkeley  
Berkeley, CA, 94720-7300, USA  
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**Prof. Titus Neupert**

Department of Physics  
University of Zurich  
8057 Zurich, Switzerland  
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**Prof. Eun-Ah Kim**

Laboratory of Atomic and Solid State Physics  
Cornell University  
Ithaca, NY 14853, USA  
[eun-ah.kim@cornell.edu](mailto:eun-ah.kim@cornell.edu)

**Prof. Erez Berg**

Department of Condensed Matter Physics  
Weizmann Institute of Science  
Rehovot 7610001, Israel  
[erez.berg@weizmann.ac.il](mailto:erez.berg@weizmann.ac.il)

*Professional Activities*

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**Invited Talks & Seminars**

- 43 March Meeting of the American Physical Society, Las Vegas, NV (March 2023),  
“*Nematic and spin-charge orders driven by hole-doping a charge-transfer insulator*”
- 42 Inaugural Lecture at the University of Zurich, Switzerland (October 2022),  
“*Not just perfect Conductors: Contemplating Symmetry and Topology in Unconventional Superconductors*”
- 41 Correlated Electron Days 2022, Ein Gedi, Israel (June 2022),  
“*Exotic H-T phase diagram of the locally non-centrosymmetric superconductor CeRh<sub>2</sub>As<sub>2</sub>*”
- 40 Topological Materials: From Weak to Strong Correlations, MPIPKS Dresden (April 2022),  
“*Exotic H-T phase diagram of CeRh<sub>2</sub>As<sub>2</sub>: Consequences of local inversion-symmetry breaking*”
- 39 LPS Orsay, Paris, France (March 2022),  
“*Unusual H-T phase diagram of CeRh<sub>2</sub>As<sub>2</sub>: theory of a locally non-centrosymmetric superconductor*”
- 38 University of Geneva, Geneva, Switzerland (October 2021),  
“*Unusual H-T phase diagram of CeRh<sub>2</sub>As<sub>2</sub>: theory of a locally non-centrosymmetric superconductor*”
- 37 Trends in Theory of Correlated Material, Kyoto, Japan (October 2019),  
“*A real-space perspective on topological superconductivity*”
- 36 The Ohio State University, Columbus, OH, USA (May 2019),  
“*Superconductivity without inversion and time-reversal symmetries*”
- 35 University of Innsbruck, Innsbruck, Austria (January 2019),  
“*Losing Fermions in 1D: many-body dynamics and particle statistics*”
- 34 University of Zurich, Zurich, Switzerland (December 2018),  
“*Superconductivity without inversion and time-reversal symmetries*”
- 33 California Institute of Technology, Pasadena, CA, USA (July 2018),  
“*Superconductivity without inversion and time-reversal symmetries*”
- 32 Microsoft Station Q, Santa Barbara, CA, USA (July 2018),  
“*Superconductivity without inversion and time-reversal symmetries*”
- 30 International Conference on Magnetism / SCES, San Francisco, CA, USA (July 2018),  
“*Superconductivity without inversion and time-reversal symmetries*”
- 30 Stanford University, Palo Alto, CA, USA (July 2018),  
“*Superconductivity without inversion and time-reversal symmetries*”
- 29 University of Geneva, Geneva, Switzerland (November 2017),  
“*MBL in a Cold-Atom Setting: Simulating Fermions in a 1D Open Quantum System*”
- 28 Tokyo Institute of Technology, Tokyo, Japan (September 2017),  
“*Superconductivity in time-reversal-symmetry-broken two-dimensional systems: application to FeSe*”
- 27 Kyoto University, Kyoto, Japan (September 2017),  
“*Superconductivity in time-reversal-symmetry-broken two-dimensional systems: application to FeSe*”
- 26 Trends in Theory of Correlated Material, Tsukuba, Japan (September 2017),  
“*Superconductivity in time-reversal-symmetry-broken two-dimensional systems: application to FeSe*”

- 25 Synthetic Quantum Matter, KITP, CA, USA (October 2016),  
“*Dynamics of a Many-Body-Localized System Coupled to a (Markovian) Bath*”
- 24 University of California Berkeley, CA, USA (September 2016),  
“*Dynamics of a Many-Body-Localized System Coupled to a Bath*”
- 23 International Conference on Strongly Correlated Electron Systems, Hangzhou, China (May 2016),  
“*Chiral d-wave superconductivity in SrPtAs*”
- 22 University of Florida, Gainesville, FL, USA (March 2016),  
“*SrPtAs’s Intriguing Chiral Superconductivity*”
- 21 University of California Riverside, CA, USA (March 2016),  
“*SrPtAs’s Intriguing Chiral Superconductivity*”
- 20 Iowa State University, Ames, IA, USA (January 2016),  
“*Pairing with a Whirl: SrPtAs’s Intriguing Superconductivity*”
- 19 Symposium on “Selected Topics in Science and Technology”, TU Munich, Garching, Germany (January 2016),  
“*Theory of Novel Quantum Phases in Novel Materials*”
- 18 Materials & Mechanisms of Superconductivity, Geneva, Switzerland (August 2015),  
“*Chiral d-wave superconductivity in SrPtAs*”
- 17 ETH Zurich, Zurich, Switzerland, (May 2015),  
“*A Macroscopic ‘Order Parameter’ for Many-Body Localization*”
- 16 Ludwig-Maximilians-Universität München, München, Germany, (May 2015),  
“*The Fate of Signatures of Many-Body Localization in an Open System*”
- 15 Aspen Winterconference on ‘Non-Equilibrium Quantum Matter’, Aspen, CO, (March 2015),  
“*Confronting Theory and Experiment on Many-Body Localization*”
- 14 University of Colorado, Boulder, CO, USA, (March 2015),  
“*A Macroscopic ‘Order Parameter’ for Many-Body Localization*”
- 13 University of Maryland, College Park, MD, USA, (March 2015),  
“*A Macroscopic ‘Order Parameter’ for Many-Body Localization*”
- 12 Harvard University, Cambridge, MA, USA, (March 2015),  
“*A Macroscopic ‘Order Parameter’ for Many-Body Localization*”
- 11 ETH Zurich, Zurich, Switzerland, (August 2014),  
“*Spin-transfer torque generated by a topological insulator*”
- 10 University of Toronto, Toronto, Canada (July 2014),  
“*Chiral d-wave superconductivity in SrPtAs*”
- 09 Weizmann Institute of Science, Rehovot, Israel, (March 2013),  
“*Spin-Orbit Coupling in LAO/STO interfaces: Magnetism and Orbital Order*”
- 08 Spin-Orbit Torque Workshop, King Abdullah University of Science and Technology, Thuwal, Kingdom of Saudi Arabia, (February 2013),  
“*Surface state driven spin-torque in topological-insulator / ferromagnetic-metal bilayers*”
- 07 ETH Zurich, Zurich, Switzerland, (September 2012),  
“*Spin-Orbit Coupling in LAO/STO interfaces: Magnetism and Orbital Order*”
- 06 University of Fribourg, Fribourg, Switzerland, (September 2012),  
“*Spin-Orbit Coupling in LAO/STO interfaces: Magnetism and Orbital Order*”

- 05 Karlsruhe Institute of Technology, Karlsruhe, Germany, (September 2012),  
“*Probing the Unconventional Superconductivity in LiFeAs*”
- 04 University of Basel, Basel, Switzerland, (September 2012),  
“*Spin-Orbit Coupling in LAO/STO interfaces: Magnetism and Orbital Order*”
- 03 Paul Scherrer Institute, Villigen, Switzerland, (September 2012),  
“*Superconductivity and Local Noncentrosymmetry: The Example of SrPtAs*”
- 02 University of Florida, Gainesville, FL, USA, (July 2009),  
“*Dimensional crossover in  $Sr_2RuO_4$  within slave-boson mean-field theory*”
- 01 University of Wisconsin, Madison, WI, USA, (Feb 2009),  
“*Dimensional crossover in  $Sr_2RuO_4$  within slave-boson mean-field theory*”

**Conference Contributions: Talks**

- 22 Joint Annual Meeting of the SPS and ÖPG, Basel, Switzerland (September 2023),  
“*Mechanism for  $\pi$  phase shifts in Little-Parks experiments on single crystals*”
- 21 March Meeting of the American Physical Society, Chicago, IL (March 2022),  
“*Generic H-T phase diagram of a staggered-Rashba superconductor*”
- 20 Joint Annual Meeting of the SPS and ÖPG, Innsbruck, Austria, (September 2021),  
“*Magnetic response and topology of a staggered-Rashba superconductor*”
- 19 March Meeting of the American Physical Society (March 2021),  
“*Spin response and topology of a staggered Rashba superconductor*”
- 18 Annual Meeting of the Swiss Physical Society, Zurich, Switzerland, (September 2019),  
“*Superconductivity without inversion and time-reversal symmetries*”
- 17 Swiss Workshop on Materials with Novel Electronic Properties, Les Diablerets, Switzerland (August 2018),  
“*Superconductivity without inversion and time-reversal symmetries*”
- 16 Symposium on Quantum Matter, Zurich, Switzerland (June 2018),  
“*Dynamics of Many-Body Localition in the Presence of a Bath*”
- 15 Oxide Superconducting Spintronics Workshop 2018, Amalfi, Italy, (April 2018),  
“*Superconductivity without inversion and time-reversal symmetries*”
- 14 Third International UQUAM workshop, Berlin, Germany, (October 2016),  
“*Dynamics of a many-body localized system coupled to a bath*”
- 13 March Meeting of the American Physical Society, Baltimore, MD, (March 2016),  
“*Dynamics of a Many-Body-Localized System Coupled to a Bath*”
- 12 Second International UQUAM workshop, Innsbruck, Austria, (September 2015),  
“*Coupling a many-body localized system to a bath*”
- 11 March Meeting of the American Physical Society, San Antonio, TX, (March 2015),  
“*Fluctuation effects in a two-component p-wave superconductor*”
- 10 Annual Meeting of the Israel Physical Society, Be’er Sheva, Israel, (December 2014),  
“*A Macroscopic ‘Order Parameter’ for Many-Body Localization*”
- 09 First International UQUAM workshop, Venice, Italy, (April 2014),  
“*Chiral d-wave superconductivity in SrPtAs*”
- 08 Annual Meeting of the Israel Physical Society, Rehovot, Israel, (December 2013),  
“*Chiral d-wave superconductivity in SrPtAs*”
- 07 Gordon Research Conference on Superconductivity, Les Diablerets, Switzerland, (May 2013),  
“*Superconductivity in the Locally-Non-Centrosymmetric Hexagonal SrPtAs*”
- 06 March Meeting of the American Physical Society, Baltimore, MD, (March 2013),  
“*Spin Torque in Topological Insulator/Ferromagnetic Metal Bilayers*”
- 05 March Meeting of the American Physical Society, Boston, MA, (February 2012),  
“*Origin of Anisotropic Magnetization in LAO/STO interfaces*”
- 04 March Meeting of the American Physical Society, Dallas, TX, (March 2011),  
“*Mean-Field Analysis of Nematicity in the Emery Model*”
- 03 March Meeting of the American Physical Society, Portland, OR, (March 2010),  
“*Influence of spin-orbit coupling on the metamagnetic transition in  $Sr_3Ru_2O_7$* ”



- 02 Swiss Workshop on Materials with Novel Electronic Properties, Les Diablerets, Switzerland, (August 2009),  
*"Spin-orbit coupling effects on metamagnetic transition in  $Sr_3Ru_2O_7$ "*
- 01 International Conference on Magnetism, Karlsruhe, Germany, (July 2009),  
*"Dimensional crossover in  $Sr_2RuO_4$  studied by a slave-boson mean-field theory "*

#### Conference Contributions: Posters

- 14 Gordon Research Conference on Superconductivity, Les Diablerets, Switzerland, (May 2024),  
*"Mechanisms for  $\pi$  phase shifts in Little-Parks experiments on single crystals"*
- 13 Gordon Research Conference on Superconductivity, Les Diablerets, Switzerland, (May 2019),  
*"Superconductivity without inversion and time-reversal symmetries"*
- 12 Gordon Research Seminar and Conference on Correlated Electron Systems, South Hadley, MA, (June 2014),  
*"Chiral d-wave superconductivity in SrPtAs"*
- 11 Gordon Research Conference on Superconductivity, Les Diablerets, Switzerland, (May 2013),  
*"Superconductivity in the Locally-Non-Centrosymmetric Hexagonal SrPtAs"*
- 10 Materials and Mechanisms of Superconductivity, Washington, D.C., (August 2012),  
*"Identifying fingerprints of low-energy bosonic mode in LiFeAs"*
- 09 Gordon Research Conference on Correlated Electron Systems, South Hadley, MA, (June 2012),  
*"Constraining Electron-Boson-Coupling Effects in LiFeAs"*
- 08 School and Workshop on Topological Aspects of Condensed Matter Physics, Trieste, Italy, (July 2011),  
*"Exotic Superconductivity and Non-Centrosymmetry in Crystal Lattices"*
- 07 Gordon Research Conference on Superconductivity, Waterville Valley, NH, (June 2011),  
*"Mean-Field Analysis of Intra-Unit-Cell Order in the Emery Model of the  $CuO_2$  Plane"*
- 06 Annual Meeting of the Swiss Physical Society, Basel, Switzerland, (June 2010),  
*"Effect of a Staggered Spin-Orbit Coupling on the Occurrence of a Nematic Phase in  $Sr_3Ru_2O_7$ "*
- 05 ETH Zurich Materials Research Center Graduate Symposium, Zurich, Switzerland, (June 2009),  
*"Dimensional Crossover in  $Sr_2RuO_4$ "*
- 04 ETH Zurich Materials Research Center Graduate Symposium, Zurich, Switzerland, (May 2008),  
*"Theoretical Study of the Electronic Properties of Strontium Ruthenates"*
- 03 Annual Meeting of the Swiss Physical Society, Geneva, Switzerland, (March 2008),  
*"Theoretical Study of Electronic Properties of Ruthenates"*
- 02 Swiss Workshop on Materials with Novel Electronic Properties, Les Diablerets, Switzerland, (September 2007),  
*"Dimensional crossover and metamagnetism in quasi 2D electron systems"*
- 01 ETH Zurich Materials Research Center Graduate Symposium, Zurich, Switzerland, (June 2007),  
*"Correlation effect in quasi two-dimensional electron systems"*

#### Contributions at Schools

- 03 Poster contribution at Multiorb summer school, Cargese, France, (August 2011),  
*"Mean-Field Analysis of Intra-Unit-Cell Order in the Emery Model"*
- 02 Participant seminar at the XIV Training Course in the Physics of Strongly Correlated Systems, Vietri sul Mare, Italy, (September 2009),  
*"Effects of spin-orbit coupling on the metamagnetic transition in  $Sr_3Ru_2O_7$ "*

- 01 Poster contribution at '50th Anniversary of BCS' summer school, Cargese, France, (July 2007),  
"Dimensional crossover and multiferroics in quasi 2D electron systems"