

# 1 Curriculum Vitae

**Menderes Işkın**

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## 1.1 Employment and education

- **YÖK Doçent:** (2013 - present).
- **Assistant Professor:** Koç University, Department of Physics, Istanbul, Turkey (2009 - present).
- **Postdoctoral researcher:** Joint Quantum Institute, National Institute of Standards and Technology and University of Maryland, MD, USA (2007 - 2009).
- **PhD in Physics:** Georgia Institute of Technology, School of Physics, Atlanta, GA, USA (2002 - 2007).
- **BS in Physics:** Bilkent University, Department of Physics, Ankara, Turkey (1997 - 2002).

## 1.2 Teaching

- **Koç University:** taught PHYS 101 & 102 General Physics I & II, PHYS 301 Statistical Physics, PHYS 302 Electromagnetism, PHYS 312 Advanced Electromagnetism, PHYS 403 Solid State Physics, PHYS 409 Condensed Matter Physics, PHYS 501 Classical Mechanics, PHYS 503 Quantum Mechanics, PHYS 509 Condensed Matter Physics, and PHYS 580 Ultracold Quantum Fields I & II.
- **Georgia Institute of Technology:** worked 7 semesters as a teaching assistant and grader for multiple undergraduate and advanced graduate physics courses; worked 6 semesters as an instructor and demonstrator for introductory physics laboratory classes for engineering and physics majors; worked 1 semester as a physics/science tutor for engineering and physics majors in the Office of Minority Educational Development.

### 1.3 MS/PhD/Postdoc advisees

- **Dr. Onur R. Umucalılar:** Postdoc (2014-2016).
- **Dr. Ahmet T. Bölükbaşı:** Postdoc (2012-2014).
- **Nur Aslan:** PhD (2015-2019).
- **Enis Doko:** PhD (2010-2015).
- **Selahattin Kalafat:** MS, *Ultracold spin-polarized Fermi gases with spin-orbit coupling* (2010-2012).

### 1.4 Publications and preprints

- E. Doko, A. L. Subaşı, and **M. Iskin**, *Rotating a Rashba-coupled Fermi gas in two dimensions*, see arXiv:1510.02334.
- **M. Iskin**, *Topological superfluids on a square optical lattice with non-Abelian gauge fields: Effects of next-nearest-neighbor hopping in the BCS-BEC evolution*, see arXiv:1509.08219.
- **M. Iskin**, *Time-of-flight images of Mott insulators in the Hofstadter-Bose-Hubbard model*, Phys. Rev. A **92**, 023636 (2015); see also arXiv:1504.02399.
- **M. Iskin**, *Attractive Hofstadter-Hubbard model with imbalanced chemical and vector potentials*, Phys. Rev. A **91**, 053606 (2015); see also arXiv:1501.01176.
- **M. Iskin**, *Stripe-ordered superfluid and supersolid phases in the attractive Hofstadter-Hubbard Model*, Phys. Rev. A **91**, 011601(R) (2015); see also arXiv:1406.6890.
- A. T. Bolukbasi and **M. Iskin**, *Superfluid-Mott insulator transition in spin-orbit coupled Bose-Hubbard model*, Phys. Rev. A **89**, 033603 (2014); see also arXiv:1401.0527.
- **M. Iskin**, *Superfluid phases of ultracold Fermi gases on a checkerboard superlattice*, Phys. Rev. A **88**, 053606 (2013); see also arXiv:1304.8111.
- **M. Iskin**, *Spin-orbit coupling induced Fulde-Ferrell-Larkin-Ovchinnikov-like Cooper pairing and skyrmion-like polarization textures in optical lattices*, Phys. Rev. A **88**, 013631 (2013); see also arXiv:1304.1473.
- **M. Iskin** and A. L. Subaşı, *Topological superfluid phases of an atomic Fermi gas with equal Rashba-Dresselhaus spin-orbit coupling and in- and out-of-plane Zeeman fields*, Phys. Rev. A **87**, 063627 (2013); see also arXiv:1211.4020.

- **M. Iskin**, *Mastering the Ultracold*, KU Frontiers Magazine (2012); and its Turkish version *Aşırı soğuşa hakim olmak ama neden?*, KU Fener Magazine.
- **M. Iskin**, *Trapped Fermi gases with Rashba spin-orbit coupling in two dimensions*, Phys. Rev. A **86**, 065601 (2012); see also arXiv:1206.1240.
- E. Doko, A. L. Subaşı, and **M. Iskin**, *Counterflow of spontaneous mass currents in trapped spin-orbit coupled Fermi gases*, Phys. Rev. A **85**, 053634 (2012); see also arXiv:1112.4468.
- **M. Iskin**, *Vortex line in spin-orbit coupled atomic Fermi gases*, Phys. Rev. A **85**, 013622 (2012); see also arXiv:1111.6450.
- **M. Iskin** and A. L. Subaşı, *Quantum phases of atomic Fermi gases with anisotropic spin-orbit coupling*, Phys. Rev. A **84**, 043621 (2011); see also arXiv:1108.4263.
- **M. Iskin** and A. L. Subaşı, *Mass-imbalanced Fermi gases with spin-orbit coupling*, Phys. Rev. A **84**, 041610(R) (2011); see also arXiv:1107.2376.
- **M. Iskin** and A. L. Subaşı, *Stability of spin-orbit coupled Fermi gases with population imbalance*, Phys. Rev. Lett. **107**, 050402 (2011); see also arXiv:1106.0473.
- **M. Iskin**, *Route to supersolidity for the extended Bose-Hubbard model*, Phys. Rev. A **83**, 051606(R) (2011); see also arXiv:1101.6067.
- **M. Iskin**, *Artificial gauge fields for the Bose-Hubbard model on a checkerboard superlattice and extended Bose-Hubbard model*, Eur. Phys. J. B **85**, 76 (2012); see also arXiv:1101.0504.
- **M. Iskin**, *Mean-field theory for the Mott insulator–paired superfluid phase transition in the two-species Bose-Hubbard model*, Phys. Rev. A **82**, 055601 (2010); see also arXiv:1010.2688.
- **M. Iskin**, *Isothermal-sweep theorems for ultracold quantum gases in a canonical ensemble*, Phys. Rev. A **83**, 033613 (2011); see also arXiv:1009.2648.
- **M. Iskin** and A. L. Subaşı, *Cooper pairing and BCS-BEC evolution in mixed-dimensional Fermi gases*, Phys. Rev. A **82**, 063628 (2010); see also arXiv:1004.3111.
- **M. Iskin** and C. A. R. Sá de Melo, *Ultracold fermions in real or fictitious magnetic fields: the BCS-BEC evolution and the type-I–type-II transition*, Phys. Rev. A **83**, 045602 (2011); see also arXiv:1003.2405.

- **M. Iskin**, *Dimer-atom scattering between two identical fermions and a third particle*, Phys. Rev. A **81**, 043634 (2010); see also arXiv:1003.0106.
- **M. Iskin**, *Strong-coupling expansion for the two-species Bose-Hubbard model*, Phys. Rev. A **82**, 033630 (2010); see also arXiv:1001.0021.
- Itay Hen, **M. Iskin**, and M. Rigol, *Phase diagram of hard-core Bose-Hubbard model on a checkerboard superlattice*, Phys. Rev. B **81**, 064503 (2010), see also arXiv:0911.0890.
- **M. Iskin** and J. K. Freericks, *Dynamical mean-field theory for light fermion-heavy boson mixtures on optical lattices*, Phys. Rev. A **80**, 053623 (2009); see also arXiv:0908.4589.
- **M. Iskin** and J. K. Freericks, *Momentum distribution of the insulating phases of the extended Bose-Hubbard model*, Phys. Rev. A **80**, 063610 (2009); see also arXiv:0905.1027.
- **M. Iskin** and J. K. Freericks, *Strong-coupling perturbation theory for the extended Bose-Hubbard model*, Phys. Rev. A **79**, 053634 (2009), see also arXiv:0903.0845.
- **M. Iskin** and E. Tiesinga, *Rotation-induced superfluid-normal phase separation in trapped Fermi gases*, Phys. Rev. A **79**, 053621 (2009); see also arXiv:0811.3010.
- **M. Iskin** and C. J. Williams, *Trapped fermion mixtures with unequal masses: a Bogoliubov-de Gennes approach*, see arXiv:0810.5065. [unpublished]
- **M. Iskin**, *Vortex core states in superfluid Fermi-Fermi mixtures with unequal masses*, Phys. Rev. A **78**, 021604(R) (2008); see also arXiv:0804.1035.
- **M. Iskin** and C. A. R. Sá de Melo, *Evolution from BCS to Berezinskii-Kosterlitz-Thouless Superfluidity in one-dimensional optical lattices*, Phys. Rev. Lett. **103**, 165301 (2009), see also arXiv:0803.1498.
- **M. Iskin** and C. J. Williams, *Population imbalanced fermions in harmonically trapped optical lattices*, Phys. Rev. A **78**, 011603(R) (2008); see also arXiv:0802.3945.
- **M. Iskin** and C. J. Williams, *Trapped p-wave superfluids: a local density approach*, Phys. Rev. A **77**, 041607(R) (2008); see also arXiv:0801.3795.
- **M. Iskin** and C. A. R. Sá de Melo, *Quantum phases of Fermi-Fermi mixtures in optical lattices*, Phys. Rev. A **78**, 013607 (2008); see also arXiv:0712.3472.

- **M. Iskin** and C. J. Williams, *Trap-imbalanced fermion mixtures*, Phys. Rev. A **77**, 013605 (2008); see also arXiv:0710.0353.
- **M. Iskin** and C. A. R. Sá de Melo, *Fermi-Fermi mixtures in the strong attraction limit*, Phys. Rev. A **77**, 013625 (2008); see also arXiv:0709.4424.
- **M. Iskin** and C. A. R. Sá de Melo, *Mixtures of ultracold fermions with unequal masses*, Phys. Rev. A **76**, 013601 (2007); see also cond-mat/0703258.
- **M. Iskin** and C. A. R. Sá de Melo, *Superfluid and insulating phases of fermion mixtures in optical lattices*, Phys. Rev. Lett. **99**, 080403 (2007); see also cond-mat/0612496.
- **M. Iskin** and C. A. R. Sá de Melo, *Ultracold heteronuclear molecules and ferroelectric superfluids*, Phys. Rev. Lett. **99**, 110402 (2007); see also cond-mat/0610380.
- **M. Iskin** and C. A. R. Sá de Melo, *Evolution of two-band superfluidity from weak to strong coupling*, J. Low Temp. Phys. **149**, 29 (2007).
- **M. Iskin** and C. A. R. Sá de Melo, *Asymmetric two-component Fermi gas with unequal masses*, cond-mat/0606624. [unpublished]
- **M. Iskin** and C. A. R. Sá de Melo, *Two-band superfluidity from the BCS to the BEC limit*, Phys. Rev. B **74**, 144517 (2006); see also cond-mat/0603601.
- **M. Iskin** and C. A. R. Sá de Melo, *Two-species fermion mixtures with population imbalance*, Phys. Rev. Lett. **97**, 100404 (2006); see also cond-mat/0604184.
- **M. Iskin** and C. A. R. Sá de Melo, *Nonzero orbital angular momentum pairing in superfluid Fermi gases*, Phys. Rev. A **74**, 013608 (2006); see also cond-mat/0602157.
- **M. Iskin** and C. A. R. Sá de Melo, *Evolution from BCS to BEC superfluidity in p-wave Fermi gases*, Phys. Rev. Lett. **96**, 040402 (2006); see also cond-mat/0510300.
- **M. Iskin** and C. A. R. Sá de Melo, *Superfluidity of p-wave and s-wave atomic Fermi gases in optical lattices*, Phys. Rev. B **72**, 224513 (2005); see also cond-mat/0508134.
- **M. Iskin** and C. A. R. Sá de Melo, *Exotic p-wave superfluidity of single hyperfine state Fermi gases in optical lattices*, cond-mat/0502148. [unpublished]

- **M. Iskin** and C. A. R. Sá de Melo, *BCS-BEC crossover of collective excitations in two-band superfluids*, Phys. Rev. B **72**, 024512 (2005); see also cond-mat/0408586.
- **M. Iskin** and I. O. Kulik, *Persistent currents in helical structures*, Phys. Rev. B **70**, 195411 (2004); see also cond-mat/0403677.

## 1.5 Talks and presentations

- *Attractive Hofstadter-Hubbard model with imbalanced chemical and vector potentials*, invited talk at Faculty of Engineering and Natural Sciences, Sabancı University, Istanbul, Turkey (May 2015).
- *Süper-iletkenler ve Süper-akışkanlar: Maddenin Kuantum Hali*, invited UNIV-101 presentation at Koç University, Istanbul, Turkey (May 2015).
- *Attractive Hofstadter-Hubbard model with imbalanced chemical and vector potentials*, oral presentation at the APS March meeting 2015, San Antonio, TX, USA (March 2015).
- *Süper-iletkenlik: Maddenin Kuantum Hali*, invited oral presentation at Koç University Board of Trustees Meeting, Koç Holding, Istanbul, Turkey (February 2015).
- *Stripe-ordered superfluid and supersolid phases in the attractive Hofstadter-Hubbard Model*, invited talk at the Department of Physics, METU, Ankara, Turkey (December 2014).
- *BCS-BEY geçişinde Hofstadter-Hubbard modeli*, invited talk at the Department of Physics, Mimar Sinan University, Istanbul, Turkey (November 2014).
- *Attractive Hofstadter-Hubbard model with imbalanced chemical and vector potentials*, invited oral presentation at ‘Advanced Workshop on Landau-Zener Interferometry and Quantum Control in Condensed Matter’, ICTP-ECAR, Izmir, Turkey (October 2014).
- *Mean-field approach to spin-orbit coupled Fermi and Bose gases in optical lattices*, oral presentation at the APS DAMOP meeting 2014, Madison, WI, USA (June 2014).
- *Spin-yörünge etkileşimli Fermiyonik gazların süperakışkan özellikleri*, invited talk at Department of Physics, Istanbul Technical University, Istanbul, Turkey (March 2014).

- *Mean-field approach to spin-orbit coupled Fermi and Bose gases in optical lattices*, oral presentation at the APS March meeting 2014, Denver, CO, USA (March 2014).
- *Spin-yörünge etkileşimli Fermiyonik gazların süperakışkan özellikleri*, invited oral presentation at ‘19. Yoğun Madde Fiziği Ankara Toplantıları’, Bilkent University, Ankara, Turkey (December 2013).
- *Cooper çiftlerinin yoğuşması ve maddenin süperakışkan halleri*, invited oral presentation at ‘TÜBA-GEBİP Konya Toplantısı’, Necmettin Erbakan University, Konya, Turkey (October 2013).
- *Topological superfluid phases of spin-orbit coupled Fermi gases*, invited lecture at the ‘ITAP International Summer School on Topological Materials: New Physics and Gateway to New Critical Technologies’, Turunç, Marmaris, Turkey (July 2013).
- *Spin-yörünge eşleşmeli Fermiyon gazları: topolojik nokta, yüzük ve kürelerin hikayesi*, invited talk at Department of Physics, Istanbul University, Istanbul, Turkey (May 2013).
- *Spin-yörünge eşleşmeli Fermiyon gazları: topolojik nokta, yüzük ve kürelerin hikayesi*, invited talk at Department of Physics, Marmara University, Istanbul, Turkey (April 2013).
- *Quantum phases of an atomic Fermi gas with ERD spin-orbit coupling and in- and out-of-plane Zeeman fields*, oral presentation at the APS March meeting 2013, Baltimore, MD, USA (March 2013).
- *Trapped Fermi gases with Rashba spin-orbit coupling*, oral presentation at ‘19th Istanbul Statistical Physics Symposium’, SabancıUniversity, Istanbul, Turkey (July 2012).
- *Spin-orbit coupled Fermi gases: story of topological spheres, rings, and points*, invited talk at Faculty of Engineering and Natural Sciences, SabancıUniversity, Istanbul, Turkey (April 2012).
- *Spin-orbit coupled Fermi gases: story of topological spheres, rings, and points*, invited talk at Department of Physics, Bogazici University, Istanbul, Turkey (April 2012).
- *Quantum phases of spin-orbit coupled Fermi gases with population imbalance*, oral presentation at the APS March meeting 2012, Boston, MA, USA (March 2012).
- *Spin-orbit coupled Fermi gases in the BCS-BEC evolution*, invited talk at Department of Physics, Bilkent University, Ankara, Turkey (November 2011).

- *Quantum phases of spin-orbit coupled Fermi gases*, poster presentation at ‘Bose-Einstein Condensation - Frontiers in Quantum Gases’, Sant Feliu de Guixols, Costa Brava, Spain (September 2011).
- *Stability of spin-orbit coupled Fermi gases*, oral presentation at ‘18th Istanbul Statistical Physics Symposium’, SabanciUniversity, Istanbul, Turkey (July 2011).
- *Stability of spin-orbit coupled Fermi gases with population imbalance*, oral presentation at the APS DAMOP meeting 2011, Atlanta, GA, USA (June 2011).
- *Cold bosonic atoms on optical lattices*, invited oral presentation in ‘2nd Greek-Turkish Conference on Statistical Mechanics and Dynamical Systems’, Turunc, Marmaris, Turkey (August 2010).
- *Cold bosonic atoms on optical lattices: ‘quantum simulators’ for the Bose-Hubbard type models*, invited oral presentation in ‘17th Istanbul Statistical Physics Symposium’, SabanciUniversity, Istanbul, Turkey (July 2010).
- *Creating spatially modulated superfluidity with ultracold atomic Fermi gases*, invited talk at Department of Physics, Istanbul Technical University, Istanbul, Turkey (March 2010).
- *Rotation induced superfluid-normal phase separation in trapped Fermi gases*, invited oral presentation at the Cambridge-ITAP Workshop for Young Scientists, Turunc, Marmaris, Turkey (September 2009).
- *Strong-coupling expansion for Bose-Hubbard type models*, invited lecture at the Cambridge-ITAP Workshop for Young Scientists, Turunc, Marmaris, Turkey (September 2009).
- *Creating a spatially modulated superfluid phase with trapped Fermi-Fermi mixtures*, invited talk at Department of Physics, Georgetown University, Washington, DC, USA (April 2009).
- *Trapped fermion mixtures with unequal masses: a Bogoliubov-de Gennes approach*, oral presentation at the APS DAMOP meeting 2009, Charlottesville, VA, USA (May 2009).
- *Rotation induced superfluid-normal phase separation in trapped Fermi gases*, oral presentation at the APS March meeting 2009, Pittsburgh, PA, USA (March 2009).
- *Two-species Fermi-Fermi mixtures: a new frontier in ultracold atomic physics*, invited talk at Department of Physics, Bilkent University, Ankara, Turkey (December 2008).



- *Two-species Fermi-Fermi mixtures: a new frontier in ultracold atomic physics*, invited talk at Department of Physics, Koc University, Istanbul, Turkey (November 2008).
- *Ground state phases of Fermi-Fermi mixtures with mismatched Fermi surfaces*, invited talk at QI-BEC, NIST, Gaithersburg, MD, USA (July 2008).
- *Evolution from BCS to BKT superfluidity in one-dimensional optical lattices*, oral presentation at the APS March meeting 2008, New Orleans, LA, USA (March 2008).
- *Trap-imbalanced fermion mixtures*, invited talk at QI-BEC, NIST, Gaithersburg, MD, USA (October 2007).
- *BCS to BEC evolution and quantum phase transitions in superfluid Fermi gases*, talk at School of Physics, Georgia Institute of Technology, Atlanta, GA, USA (July 2007).
- *Two-species fermion mixtures with mass and population imbalance*, oral presentation at the APS March meeting 2007, Denver, CO, USA (March 2007).
- *Superfluid and insulating phases of fermion mixtures*, invited talk at QI-BEC, NIST, Gaithersburg, MD, USA (February 2007).
- *Evolution from BCS to BEC superfluidity in p-wave Fermi gases*, oral presentation at the APS March meeting 2006, Baltimore, MD, USA (March 2006).
- *Quantum phase transitions in p-wave Fermi gases*, invited oral presentation in ‘Workshop on strongly correlations in ultracold systems’, Aspen Center for Physics, Aspen, CO, USA (January 2006).
- *Exotic p-wave superfluidity of single hyperfine state Fermi gases in optical lattices*, oral presentation at the APS March meeting 2005, Los Angeles, CA, USA (March 2005).
- *BCS-BEC crossover of collective excitations in two-band superfluids*, poster presentation in ‘Workshop on novel electronic materials’, University of Kentucky, Lexington, KY, USA (April 2005).

## 1.6 Awards, grants and honors

- **Awards:**
  - Feyzi Akkaya Science Foundation (FABED) Eser Tümen Distinguished Young Scientist Award (2014).

- METU Prof. Mustafa N. Parlar Foundation Research Encouragement Award (2013).
- Koç University’s College of Sciences Outstanding Faculty Award (2012).
- Scientific and Technological Research Council of Turkey’s Basic Sciences Encouragement Award (TÜBİTAK-TEŞVİK) (2012).
- Turkish Physical Society’s Prof. Dr. Şevket Erk Young Scientist Award (2012).
- Turkish Academy of Sciences’ The Young Scientist Award (TÜBA-GEBİP) (2011-2014).

- **Grants:**

- TÜBİTAK Research Grant (MFAG-1001-114F232) (2014-2017).
- TÜBİTAK 3501 Career Grant (MFAG-3501-110T839) (2011-2014).
- European Commission’s FP7 Marie-Curie International Reintegration Grant (FP7-PEOPLE-IRG-2010-268239) (2010-2014).

- **Fellowships:**

- Gilbert F. Amelio Fellowship for ‘*Best achievement in research by a graduate student*’, School of Physics, Georgia Institute of Technology, Atlanta, GA, USA (2007).

- **Assistantships/Scholarships:**

- Recipient of the Harvard-Koç University Visiting Scholar Program (Summer 2013).
- Full graduate teaching/research assistantship including tuition and monthly stipend for pursuing Ph.D. study, School of Physics, Georgia Institute of Technology, Atlanta, GA, USA (2002 - 2007).
- Full undergraduate scholarship including tuition and monthly stipend for pursuing B.S. study, Department of Physics, Bilkent University, Ankara, Turkey (1997 - 2002).

## 1.7 Academic Services

- Member of Turkish Physics Olympiad Team Recruitment Committee (2014)
- Referee for Phys. Rev. A and B since 2005.
- Referee for Phys. Rev. Lett. since 2006.
- Referee for New J. of Phys. (2006-2007, 2014).

- Referee for Europhysics Lett. and Eur. Phys. J. B; Mod. Phys. Lett. B; Physica B; J. Phys.: Condens. Matter (2011).
- Referee for J. Low Temp. Phys. (2013)

## 1.8 References

- **Prof. Carlos A. R. Sá de Melo**, School of Physics, Georgia Institute of Technology.
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  - E-mail: carlos.sademelo@physics.gatech.edu
- **Prof. Carl J. Williams**, Atomic Physics Division, National Institute of Standards and Technology.
  - Address: 100 Bureau Drive, Gaithersburg, MD 20899-8420, USA.
  - Phone: +1 (301) 975-3531.
  - E-mail: carl.williams@nist.gov
- **Prof. Jim K. Freericks**, Department of Physics, Georgetown University.
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  - Phone: +1 (202) 687-6159.
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- **Prof. Eite Tiesinga**, Atomic Physics Division, National Institute of Standards and Technology.
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- **Prof. Igor O. Kulik**, Retired from Bilkent University, Visiting Scholar in the Department of Physics and Astronomy, The State University of New York at Stony Brook.
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