Maissam Barkeshli

Email mbarkeshli@gmail.com
Phone +1 408 621 2556

CITIZENSHIP USA

DEGREES AND POSITIONS HELD

University of Maryland, College Park College Park, Maryland, USA

- Assistant Professor, Department of Physics, 8/2016 - present
- Fellow, Joint Quantum Institute

Microsoft Research, Station Q Santa Barbara, California USA

- Postdoctoral Fellow, 9/2013 - 8/2016

Stanford University Stanford, California USA

- Simons Postdoctoral Fellow, Condensed Matter Theory Group, 9/2010-9/2013

Massachusetts Institute of Technology Cambridge, Massachusetts USA

Ph.D. in Physics, 2005 - 2010

- Thesis Advisor: Professor Xiao-Gang Wen
- Area of Study: Theoretical Condensed Matter Physics
- Thesis Title: *Topological order in the Fractional Quantum Hall States*

University of California, Berkeley Berkeley, California USA

B.S., Electrical Engineering and Computer Science, December 2004
B.A., Physics, December 2004

- Honors Thesis: *A New Model for the Microstrip DC Superconducting Quantum Interference Device Amplifier*
- Thesis Supervisor: Professor John Clarke

AWARDS

- Simons Postdoctoral Fellowship, Stanford University, 2010-2013
- Praecis Presidential Fellowship, MIT, 2005
- University of California, Berkeley, Regents Scholar, 2000 - 2004

Publications (Refereed and preprints)

The most current publication list can be found at http://arxiv.org/a/barkeshli_m_1

1. **M. Barkeshli**, *Charge 2e/3 superconductivity and topological degeneracies without localized zero modes in bilayer fractional quantum Hall states*, arXiv:1604.00683, Phys. Rev. Lett. 117, 096803 (2016)

2. **M. Barkeshli**, M. Freedman, *Modular transformations through sequences of topological charge projections*, arXiv:1602.01093, accepted to Phys. Rev. B

3. **M. Barkeshli**, J.D. Sau, *Physical Architecture for a Universal Topological Quantum Computer based on a Network of Majorana Nanowires*, arXiv:1509.07135 (submitted)

4. M. Cheng, M. Zaletel, **M. Barkeshli**, A. Vishwanath, P. Bonderson, *Translational symmetry and microscopic constraints on symmetry-enriched topological phases: a view from the surface*, arXiv:1511.02263, (submitted)

5. **M. Barkeshli**, C. Nayak, *Superconductivity Induced Topological Phase Transition at the Edge of Even Denominator Fractional Quantum Hall States*, arXiv:1507.06305 (submitted)

6. J. Cano, M. Cheng, **M. Barkeshli**, D. J. Clarke, C. Nayak, *Chirality-Protected Majorana Zero Modes at the Gapless Edge of Abelian Quantum Hall States*, arXiv:1505.07825, Phys. Rev. B 92, 195152 (2015) [Editor's Suggestion]

7. **M. Barkeshli**, M. Mulligan, M. P. A. Fisher, *Particle-Hole Symmetry and the Composite Fermi Liquid*, arXiv:1502.05404, Phys. Rev. B 92, 165125 (2015) [Editor's Suggestion]

8. M. Peterson, Y.-L. Wu, M. Cheng, **M. Barkeshli**, Z. Wang, S. Das Sarma, *Abelian and Non-Abelian States in $\nu = 2/3$ Bilayer Fractional Quantum Hall Systems*, arXiv:1502.02671, Phys. Rev. B 92, 035103 (2015)

9. **M. Barkeshli**, P. Bonderson, M. Cheng, Z. Wang, *Symmetry, Defects, and Gauging of Topological Phases*, arXiv:1410.4540, accepted to Phys. Rev. B

10. **M. Barkeshli**, N.Y. Yao, C.R. Laumann, *Continuous Preparation of a Fractional Chern Insulator*, arXiv:1407.7034, Phys. Rev. Lett. 115, 026802 (2015)

11. **M. Barkeshli**, H.-C. Jiang, R. Thomale, X.-L. Qi, *Generalized Kitaev Models and Slave Genons*, arXiv:1405.1780, Phys. Rev. Lett. **114**, 026401 (2015)

12. A. Vaezi, **M. Barkeshli**, *Fibonacci Anyons From Abelian Bilayer Quantum Hall States*, arXiv:1403.3383, Phys. Rev. Lett. **113**, 236804 (2014)

13. **M. Barkeshli**, Erez Berg, Steven Kivelson, *Coherent Transmutation of Electrons into Fractionalized Anyons*, arXiv:1402.6321, Science, 346 6210 (2014)

14. **M. Barkeshli**, Yuval Oreg, X.-L. Qi, *Experimental Proposal to Detect Topological Ground State Degeneracy*, arXiv:1401.3750, submitted

15. **M. Barkeshli**, *Transitions Between Chiral Spin Liquids and Z2 Spin Liquids*, arXiv:1307.8194, submitted

16. **M. Barkeshli**, C.M. Jian, and X.-L. Qi, *Theory of defects in Abelian topological states*, arXiv:1305.7203, Phys. Rev. B 88, 235103 (2013)

17. **M. Barkeshli**, C.M. Jian, and X.-L. Qi, *Classification of Topological Defects in Abelian Topological States*, arXiv:1304.7579, Phys. Rev. B 88, 241103(R) (2013)

18. Raghu Mahajan, **M. Barkeshli** and Sean Hartnoll, *Non-Fermi liquids and the Wiedemann-Franz law*, arXiv:1304.4249, Phys. Rev. B 88, 125107 (2013)

19. **M. Barkeshli** and X.-L. Qi, *Synthetic Topological Qubits in Conventional Bilayer Quantum Hall Systems*, arXiv:1302.2673, Phys. Rev. X 4, 041035 (2014)

20. **M. Barkeshli**, C.M. Jian, and X.-L. Qi, *Twist defects and projective non-abelian statistics*, arXiv:1208.4834 , Phys. Rev. B **87**, 045130 (2013) [Editor's Suggestion]

21. **M. Barkeshli**, Hong Yao, and Steven A. Kivelson, *Gapless Spin Liquids: Stability and Possible Experimental Relevance*, arXiv:1208.3869 , Phys. Rev. B 87, 140402(R) (2013)

22. **M. Barkeshli** and John McGreevy, *Continuous transitions between composite Fermi liquid and Landau Fermi liquid: a route to fractionalized Mott insulators*, arXiv:1206.6530, Phys. Rev. B **86**, 075136 (2012) [Editors' Suggestion]

23. A.C. Potter, **M. Barkeshli**, J. McGreevy, and T. Senthil, *Quantum spin liquids and the metal-insulator transition in doped semiconductors*, arXiv:1204.1342, Phys. Rev. Lett. **109**, 077205 (2012)

24. **M. Barkeshli** and John McGreevy, *Continuous transition between fractional quantum Hall and superfluid states*, arXiv:1201.4393, Phys. Rev. B 89, 235116 (2014)

25. **M. Barkeshli** and Xiao-Liang Qi, *Topological Nematic States and Non-Abelian Lattice Dislocations*, arXiv:1112.3311, Phys. Rev. X **2**, 031013 (2012)

26. **M. Barkeshli**, S.B. Chung, and X.-L. Qi, *Dissipationless phonon Hall viscosity,* Phys. Rev. B **85**, 245107 (2012)

27. **M. Barkeshli** and Xiao-Liang Qi, *Topological Response Theory of Doped Topological Insulators,* Phys. Rev. Lett. **107**, 206602 (2011)

28. **M. Barkeshli** and X.-G. Wen, *Phase transitions in Z_N gauge theory and twisted Z_N topological phases,* Phys. Rev. B **86**, 085114 (2012)

29. **M. Barkeshli** and X.-G. Wen, *Bilayer quantum Hall phase transitions and the orbifold non-Abelian fractional quantum Hall states,* Phys. Rev. B **84**, 115121 (2011)

30. B. Swingle, **M. Barkeshli** , J. McGreevy, and T. Senthil, *Correlated Topological Insulators and the Fractional Magnetoelectric Effect,* Phys. Rev. B **83**, 195139 (2011)

31. **M. Barkeshli** and X.-G. Wen, *Anyon Condensation and Topological Phase Transitions in Non-Abelian States,* Phys. Rev. Lett. **105** 216804 (2010)

32. **M. Barkeshli** and X.-G. Wen, *Effective Field theory and Projective Construction for the Z_k Parafermion Fractional Quantum Hall States*, Physical Review B **81** 155302 (2010)

33. **M. Barkeshli** and X.-G. Wen, *$U(1) \times U(1) \rtimes Z_2$ Chern-Simons Theory and Z_4 Parafermion Fractional Quantum Hall States*, Physical Review B **81** 045323 (2010)

34. **M. Barkeshli** and X.-G. Wen, *Non-Abelian Two-component Fractional Quantum Hall States,* Phys. Rev. B **82** 233301 (2010)

35. **M. Barkeshli** and X.-G. Wen, *Classification of Abelian and Non-Abelian Multilayer Fractional Quantum Hall States Through the Pattern of Zeros,* Phys. Rev. B **82**, 245301 (2010)

36. **M. Barkeshli** and X.-G. Wen, *Structure of Quasiparticles and Their Fusion Algebra in Fractional Quantum Hall States*, Physical Review B **79** 195132 (2009)

37. **M. Barkeshli** , *Dissipationless Information Erasure and Landauer's Principle* (2005), arXiv:0504323

Seminars/Talks Given

1. *New paths to creating and manipulating topologically protected degeneracies in quantum many-body states*, KITP invited talk for Fall Program on Synthetic Matter, September 2016

2. *New paths to creating and manipulating topologically protected degeneracies in quantum many-body states*, JQI Seminar, Joint Quantum Institute, University of Maryland, September 2016

3. *Realizing Modular Transformations in Physical Systems*, Invited talk, Geometrical Degrees of Freedom in Topological Phases, Banff International Research Station, Banff, Canada, August 2016

4. *Symmetry Enriched Topological Phases of Matter and G-crossed Braided Tensor Categories*, Invited (Beach) talk, Summer workshop on Mathematics and Physics, Simons Center for Geometry and Physics, Stony Brook, July 2016

5. *Symmetry Enriched Topological Phases of Matter and G-crossed Braided Tensor Categories*, Invited talk, SIAM, Boston, MA, July 2016

6. *New paths to realizing and manipulating topological degeneracies*, Invited talk, Quantum Matter 2, Benasque, Spain, July 2016

7. *Quantum phase transitions between bosonic fractional quantum Hall states, superfluids, and Mott insulators*, Invited conference talk, Conformal Field Theories and Renormalization Group Flows in Dimensions $d > 2$, Galileo Galilei Institute, Florence, Italy, June 2016

8. *Modular Transformations Through Sequences of Topological Charge Projections*, Invited Talk, Station Q retreat, April 2016

9. *Modular Transformations Through Sequences of Topological Charge Projections*, Invited Conference Talk, Geometry of Quantum States in Condensed Matter Systems, Simons Center for Geometry and Physics, Stony Brook University, April 2016

10. *Physical Architecture for a Universal Topological Quantum Computer from a network of Majorana nanowires*, Invited Speaker, CMTC Symposium, University of Maryland, March 2016

11. *Physical Architecture for a Universal Topological Quantum Computer from a network of Majorana nanowires*, Invited Condensed Matter Seminar, Caltech, Feburary 2016

12. *Superconductivity Induced Topological Phase Transition at the Edge of Even Denominator FQH states*, Invited Talk, Emergent Phenomena in Quantum Hall Systems, Tata Institute for Fundamental Research, Mumbai, January 2016

13. *Particle-Hole Symmetry and the Composite Fermi Liquid*, Invited talk, Strongly Interacting Topological Phases Conference, Banff International Research Station, September 2015

14. *Boundaries, defects, and exotic zero modes in topological phases of matter*Summer School on Emergent Phenomena in Quantum Materials, Cornell University, August 2015

15. *Genons, Parafermions and Fibonaccis in Bilayer Fractional Quantum Hall Systems*, Invited Talk, Parafermion workshop, Army Research Office, August 2015

16. *Extrinsic Defects and Possible New Experimental Probes of Topological Order*, Invited Special Joint Quantum Institute Seminar, University of Maryland, College Park, May 2015

17. *Particle-Hole Symmetry and the Composite Fermi Liquid*, Invited Kadanoff Seminar, University of Chicago, May 2015

18. *Extrinsic Defects and Possible New Experimental Probes of Topological Order*, Invited Condensed Matter Theory Group Seminar, University of Colorado, Boulder, May 2015

19. *Particle-Hole Symmetry and the Composite Fermi Liquid*, Invited Condensed Matter Seminar, Stanford University, April 2015

20. *Particle-Hole Symmetry and the Composite Fermi Liquid*, Invited LASSP-LEP joint seminar, Cornell University, April 2015

21. *Coherent Transmutation of Electrons into Fractionalized Anyons*, APS Contributed Talk, March 2015

22. *Extrinsic Defects and Possible New Experimental Probes of Topological Order*, Invited LASSP Seminar, Cornell University, February 2015

23. *Extrinsic Defects and Possible New Experimental Probes of Topological Order*, Invited Condensed Matter Seminar, Johns Hopkins University, February 2015

24. *Extrinsic Defects and Possible New Experimental Probes of Topological Order*, Invited Condensed Matter Seminar, Purdue University, February 2015

25. *Symmetry, Defects, and Gauging of Topological Phases*, Invited talk, Progress and Applications of Modern Quantum Field theory, Aspen Center for Physics Winter Program, Februrary 2015

26. *Symmetry, Defects, and Gauging of Topological Phases*, 45 minute Invited talk, Joint Mathematics Meeting of American Mathematical Society and Mathematical Association of America, San Antonio, January 2015

27. *Extrinsic Defects and Possible New Experimental Probes of Topological Order*, Invited Condensed Matter Seminar, UC San Diego, December 2014

28. *Synthetic Topological Qubits in Conventional Bilayer Quantum Hall Systems*, Workshop for Innovative Nanoscale Devices (WINDS), Kapuna Coast, HI, December 2014

29. *Coherent Transmutation of Electrons into Fractionalized Anyons*, Invited Talk, CMTC Symposium, University of Maryland, College Park, November 2014

30. *Extrinsic Defects and Possible New Experimental Probes of Topological Order*, Invited Condensed Matter Seminar, University of Toronto, October 2014

31. *Defects: A New Window into Topological Quantum Matter*, Invited Seminar, Institute of Condensed Matter Theory, UIUC, October 2014

32. *Defects: A New Window into Topological Quantum Matter*, Invited Colloquium, Perimeter Institute, October 2014

33. *Extrinsic Defects and Possible New Experimental Probes of Topological Order*, Invited Talk, Topological Phases of Quantum Matter, Erwin Schrodinger Institute for Mathematical Physics, Vienna, August 2014

34. *Coherent Transmutation of Electrons into Fractionalized Anyons*, Invited talk, Topology and Entanglement in Correlated Quantum Systems, Max Planck Institute, Dresden, July 2014

35. *Defects: A New Window Into Topological Order*, Invited Condensed Matter Seminar, University of Washington, Seattle May 2014

36. *Defects: A New Window Into Topological Order*, Invited Condensed Matter Seminar, CUNY March 2014

37. *Defects: A New Window into Topological Order*, Invited Condensed Matter Seminar, University of Maryland, College Park, March 2014

38. *Experimental Proposal to Detect Topological Ground State Degeneracy*, Contributed Talk, APS March Meeting, Denver, March 2014

39. *Defects: A New Window Into Topological Order*, Invited Condensed Matter Seminar, Harvard University, Februrary 2014

40. *Universal Experimental Signatures of Topological Order in Quantum Spin Liquids*, Aspen Winter Conference on Unconventional Order in Strongly Correlated Electron Systems, January 2013

41. *Topological Line Junctions and Defects in Topological States*, Invited Condensed Matter Seminar, Weizmann Institute, October 2013

42. *Defects in Topologically Ordered Quantum Matter*, Invited Strongly Correlated Informal Theory Seminar, Cornell University, October 2013

43. *Defects in Topologically Ordered Quantum Matter*, Invited talk, Simons Center program on Topological States of Matter, Stony Brook SUNY, June 2013

44. *Defects in Topologically Ordered Quantum Matter*, Invited talk, Entanglement and Emergence II Conference, Perimeter Institute, May 2013

45. *Defects in Topologically Ordered Quantum Matter*, Invited Joint Condensed Matter / High Energy Theory seminar, Boston University, May 2013

46. *Genons, twist defects, and projective non-Abelian braiding statistics*, Invited talk, APS March Meeting, Baltimore 2013

47. *Synthetic non-Abelian anyons in conventional bilayer quantum Hall systems*, Aspen Winter Conference on Topological States of Matter, January 2013

48. *Synthetic topological qubits in conventional bilayer quantum Hall systems*, Microsoft Station Q, November 2012

49. *Genons, twist defects, and projective non-Abelian braiding statistics*, International Workshop on Topological Order and Quantum Computation, Moorea 2012

50. *Bandwidth-tuned continuous transitions in quantum Hall states*, Condensed Matter Seminar, Tsinghua University, Beijing, July 2012

51. *Twisted Topological Order*, Condensed Matter Seminar, International Center for Quantum Materials Summer School, Peking University, Beijing, June 2012

52. *Bandwidth-tuned continuous transitions in quantum Hall states*, Simons Fellows Meeting, SUNY Stony Brook, April 2012

53. *Topological Nematic States and Non-Abelian Lattice Dislocations*, Condensed Matter Seminar, University of Maryland, College Park, March 2012

54. *Topological Nematic States and Non-Abelian Lattice Dislocations*, Contributed Talk, APS March Meeting, Boston 2012

55. *Topological Nematic States and Non-Abelian Lattice Dislocations*, Condensed Matter Seminar, MIT, February 2012

56. *Topological Nematic States and Non-Abelian Lattice Dislocations*, Condensed Matter Seminar, UC Berkeley, February 2012

57. *Dissipationless Phonon Hall Viscosity*, KITP workshop on Topological Insulators and Superconductors, October 2011

58. *Dissipationless Phonon Hall Viscosity*, Aspen Center for Physics, August 2011

59. *Topological Response Theory of Doped Topological Insulators*, Contributed Talk, APS March Meeting, Dallas 2011

60. *Bilayer quantum Hall phase transitions and non-Abelian fractional quantum Hall states*, Condensed Matter Seminar, Princeton University, February 2011

61. *Bulk Effective Field Theories for Non-Abelian Fractional Quantum Hall States*, Weizmann Institute, January 2011

62. *Topologically Ordered Quantum States of Matter*, Physics Colloquium, University of Oslo, August 2010

63. *Bilayer quantum Hall phase transitions and non-Abelian fractional quantum Hall states*, Condensed Matter Seminar, University of Oslo, August 2010

64. *Bilayer quantum Hall phase transitions and non-Abelian fractional quantum Hall states*, Tsinghua University, Beijing, July 2010

65. *Continuous Topological Phase Transitions in Fractional Quantum Hall States*, Stanford University, February 2010

66. *Continuous Topological Phase Transitions in Fractional Quantum Hall States*, Microsoft Station Q, December 2009

67. *Continuous Topological Phase Transitions in Fractional Quantum Hall States*, MIT Informal Condensed Matter Seminar, November 2009

68. *Towards a theory of topological phases in quantum Hall systems: the pattern of zeros approach*, MIT Informal Condensed Matter Seminar, April 2009

Workshops/Conferences/Summer Schools attended

1. Participant, Synthetic Quantum Matter, KITP Fall Program, 2016
2. Participant, Symmetry, Topology, and Quantum Phases of Matter: From Tensor Networks to Physical Realizations, KITP Fall Program, 2016
3. Invited Speaker (Scheduled), Topological Quantum Matter Conference, KITP, October 2016
4. Invited Speaker, Geometrical Degrees of Freedom in Topological Phases Conference, Banff International Research Station, Banff, Canada, August 2016
5. Invited Speaker, Summer workshop on Mathematics and Physics, Simons Center for Geometry and Physics, Stony Brook, July 2016
6. Invited Speaker, Minisymposium on Mathematical Models for Topological Phases of Matter, SIAM Annual Meeting, Boston, July 2016
7. Invited Speaker, Quantum Matter II Conference, Centro de Ciencias, Benasque, Spain, July 2016
8. Invited Speaker, Conformal Field Theories and Renormalization Group Flows in Dimensions $d > 2$, Galileo Galilei Institute, Florence, Italy, June 2016
9. Invited Speaker, Geometry of Quantum States in Condensed Matter Systems Conference, Simons Center for Geometry and Physics, Stony Brook University, April 2016
10. Invited Speaker, Emergent Phenomena in Quantum Hall Systems, Tata Institute for Fundamental Research, Mumbai, January 2016
11. Microsoft Station Q, Fall Meeting, December 2015
12. Invited Speaker, Strongly Interacting Topological Phases Conference, Banff International Research Station, September 2015
13. Invited Speaker, Summer School on Emergent Phenomena in Quantum Materials, Cornell University, August 2015
14. Microsoft Station Q Summer Meeting, June 2015
15. Invited Speaker, Progress and Applications of Modern Quantum Field theory, Aspen Center for Physics Winter Program, Februrary 2015
16. Invited Speaker, Joint Mathematics Meeting of American Mathematical Society and Mathematical Association of America, San Antonio, January 2015
17. Microsoft Station Q, Fall Meeting, December 2014
18. Invited Speaker Workshop for Innovative Nanoscale Devices (WINDS), Kohala Coast, Hawaii, December 2014
19. Invited Speaker, Condensed Matter Theory Center Symposium, University of Maryland, November 2014
20. Invited Speaker, Topological Phases of Quantum Matter, Erwin Schrodinger Institute for Mathematical Physics, Vienna, August 2014

21. Invited Speaker, Topology and Entanglement in Correlated Quantum Systems, Max Planck Institute, Dresden, July 2014

22. Microsoft Station Q, Summer Meeting, June 2014

23. KivelsonFest, Stanford University, June 2014

24. Non-Fermi Liquids Workshop, Stanford University, April 2014

25. Symmetry Protected Topological Phases Workshop, Princeton University, March 2014

26. APS March Meeting, Denver, March 2014

27. New Perspectives on Thermalization, Aspen Center for Physics Winter Program, March 2014

28. Invited Speaker, Unconventional Order in Strongly Correlated Electron Systems, Aspen Center for Physics Winter Program, January 2014

29. Microsoft Station Q, Fall Meeting, December 2013

30. Invited Speaker, Topological States of Matter, Simons Center, Stony Brook SUNY, June 2013

31. Invited Speaker, Emergence and Entanglement II, Perimeter Institute, May 2013

32. Invited Speaker, APS March Meeting, Baltimore, March 2013

33. Invited Speaker, Aspen Center for Physics Winter Conference on Topological States of Matter, January 2013

34. Microsoft Station Q, Fall Meeting, December 2012

35. Invited Speaker, Microsoft Station Q International Workshop on Topological Order and Quantum Computation, Moorea 2012

36. Invited speaker, International Center for Quantum Materials Summer School, Peking University, Beijing, June 2012

37. Invited Lecturer for CIFAR Quantum Materials Summer School, May 2012

38. Simons Fellows Meeting, SUNY Stony Brook, April 2012

39. APS March Meeting, Boston 2012

40. KITP Workshop on Topological Insulators and Superconductors, September-October 2011

41. Aspen Center for Physics, Summer Program on Topological States of Matter, 8/7/11 - 8/21/11

42. Workshop and School on Topological Aspects of Condensed Matter Physics, ICTP Trieste, Italy, June-July 2011

43. APS March Meeting, Dallas 2011

44. Winter School in Theoretical Physics, "Topological states in condensed matter physics," Institute for Advanced Study, Hebrew University, Jerusalem, Dec. 2010 - Jan. 2011.

45. Princeton Condensed Matter Physics Summer School, August 2010

46. Boulder School for Condensed Matter and Materials Physics, "Computational and Conceptual Approaches to Quantum Many-Body Systems," July 2010

47. Microsoft Station Q Fall Meeting, December 2009

48. Microsoft Station Q Summer Meeting, June 2009

49. Microsoft Station Q Fall Meeting, December 2008

50. Emergent Gravity Conference, MIT, August 2008

51. Princeton Condensed Matter Physics Summer School, August 2007

52. Caltech Computing Beyond Silicon Summer School (invited), June-July 2004