

# Curriculum Vitae

## Mohammad H. Hamidian

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### Education:

Ph.D. (Physics)	Cornell University	2011
M.Sc (Physics)	Cornell University	2010
M.Sc (Physics)	University of Toronto	2005
B.A.Sc. (Engineering Science)	University of Toronto	2004

### Research:

• Assistant Professor	University of California, Davis	2016-2018
• Research Associate	Harvard University	2015-present
• Visiting Scientist	Cornell University	2015-present
• Research Associate	Cornell University	2014-2015
• Post-doctoral Associate	Cornell University	2011-2014
• Graduate Research Assistant	Cornell University	2005-2011
• Graduate Research Assistant	University of Toronto	2004-2005
• Undergraduate Research Assistant	University of Toronto/CERN	2003

### Teaching:

• Teaching Assistant Trainer	Cornell University	2006-2008
• Teaching Asst - Electromagnetism	Cornell University	2006
• Teaching Asst - Physics of Music	Cornell University	2005
• Teaching Asst - Mechanics	Cornell University	2005
• Teaching Asst - Physics Lab	University of Toronto	2004-2005
• Teaching Asst - Calculus/Algebra	University of Toronto	2000-2004

### Leadership:

• Graduate Society (Budget Chair)	Cornell University	2008-2009
• Physics Student Society (President)	Cornell University	2007-2008
• Physics Student Society (President)	University of Toronto	2004-2005
• Engineering Science Union (President)	University of Toronto	2003-2004

### Honors and Awards:

• Lee-Osheroff-Richardson Science Prize	Oxford Instruments	2016
• Feynman Prize	Cornell University	2005
• Top Leaders Award	University of Toronto	2004
• Top Union President for Engineering	University of Toronto	2004

## **Publications:**

“Correlation Driven Magnetic Scattering of Topological Kondo Insulator Dirac Surface States”. H. Pirie, Yu Liu, J.P. Paglionne, D.K. Morr, Jennifer E. Hoffman, **M. H. Hamidian**. (*in preparation*).

“Commensurate-Incommensurate Transition at the Cuprate Quantum Critical Point”. T. Webb, Yi Yin, A. Soumyanarayanan, T. Williams, M.C. Boyer, K. Chatterjee, W.D. Wise, I. Zelkovic, T. Kondo, T. Takeuchi, H. Ikuta, P. Mistrak, R.S. Markiewicz, A. Bansil, E.W. Hudson, J.E. Hoffman, **M.H. Hamidian** (*In preparation – results available upon request*)

“Discovery of the Magnetic-Field Induced Pair Density Wave States in Cuprate Vortex Halo”. S.D. Edkins, K. Fujita, A. Mesaros, Andrey Kostin, A.P. Mackenzie, H. Eisaki, S. Uchida, P. Choubey, P.J. Hirschfeld, J.C. Séamus Davis, **M.H. Hamidian**. (*In preparation – preprint available upon request*)

“Vestigial Nematic Density Wave State in Underdoped  $\text{Bi}_2\text{S}_2\text{rCaCu}_2\text{O}_8$ ”. S. Mukhopadhyay, Chung Koo Kim, S. D. Edkins, **M. H. Hamidian**, H. Eisaki, S. Uchida, J. C. Séamus Davis, K. Fujita. (*Under Review 2018 – preprint available upon request*)

“Visualizing Heavy Fermions and their Cooper Pairing”. **M.H. Hamidian**, J. van Dyke, A. Kostin, D. Morr, J.C. Davis. **Invited paper** for *Report on the Progress of Physics*. *In preparation (2018)*

“Imaging Topologically Emergent Dirac States of a Kondo Insulator”. H. Pirie, Yang He, M.M. Yee, A. Soumyanarayanan, Dae-Jeong Kim, Z. Fisk, D.K. Morr, Jennifer E. Hoffman, **M. H. Hamidian**. ([Under Review 2017 – preprint available for download](#)).

“Universality of Commensurate  $4a_0$ -period Charge Density Modulations Throughout the Cuprate Pseudogap Regime”. A. Mesaros, K. Fujita, Stephen Edkins, **M. H. Hamidian**, H. Eisaki, S. Uchida, J.C. Davis, M. J. Lawler, Eun-Ah Kim, [PNAS, 113, 12661 \(2016\)](#).

“Detection of a Cooper-Pair Density Wave in  $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_8$ ”. **M. H. Hamidian\***, S. D. Edkins\*, Sang Hyun Joo\*, A. Kostin, H. Eisaki, S. Uchida, M. J. Lawler, E.-A. Kim, A. P. Mackenzie, K. Fujita, Jinho Lee, J. C. Davis. [Nature, 532, 343 \(2016\)](#).

“Atomic-scale Electronic Structure of the Cuprate  $d$ -symmetry Form Factor Density Wave State”. **M.H. Hamidian\***, S.D. Edkins\*, Chung Koo Kim, Takagi, H. Eisaki, S. Uchida, M.J. Lawler, E.-A. Kim, Subir Sachdev, J.C. Davis, K. Fujita. [Nature Physics, 12, 150 \(2016\)](#).

“Direct phase-sensitive identification of a  $d$ -form factor density wave in underdoped cuprates”. K. Fujita\*, **M.H. Hamidian\***, S.D. Edkins, Chung Koo Kim, Y. Kohsaka, M. Azuma, M. Takano, H. Takagi, H. Eisaki, S. Uchida, A. Allais, M.J. Lawler, E.-A. Kim, Subir Sachdev, J.C. Davis. [PNAS, 111, E3026 \(2014\)](#).

“Simultaneous Transitions in Cuprate Momentum-Space Topology and Electronic Symmetry Breaking”. K. Fujita, C.K. Kim, I. Lee, Jinho Lee, **M.H. Hamidian**, I. Firmo, S. Mukhopadhyay, H. Eisaki, S. Uchida, M.J. Lawler, E.A. Kim, J.C. Davis. [Science, 344, 612-616, \(2014\)](#).

“Spectroscopic Imaging STM: Atomic-scale Visualization of Electronic Structure and Symmetry in Underdoped Cuprates”. K. Fujita, **M.H. Hamidian**, I. Firmo, S. Mukopadhayah, C-K. Kim, H. Eisaki, S. Uchida, J.C. Davis. Book Chapter in *Experimental Methods for Strongly Correlated Systems*, Springer (2014).

“Picometer Registration of Zn Impurity States in  $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_8$  for Phase Determination in Intra-unit-cell Fourier Transform STM”. **M.H. Hamidian\***, I. Firmo\*, K. Fujita, S. Mukopadhayah, J.C. Davis, H. Eisaki, S. Uchida, M.J. Lawler, E.-A. Kim, J.W. Orenstein. [New J. Phys. 14 053017 \(2012\)](#).

“How Kondo Holes Create Intense Nanoscale Heavy Fermion Hybridization Disorder”. **M.H. Hamidian\***, A.R. Schmidt\*, I. Firmo, P. Bradley M. P. Allen, J.D. Garrett, T.J. Williams, G.M. Luke, Y. Dubi, A.V. Balatsky & J.C. Davis. [PNAS, 108, 18233 \(2011\)](#).

“Imaging the Fano Lattice to ‘Hidden Order’ Transition in URu<sub>2</sub>Si<sub>2</sub>”. A.R. Schmidt, **M.H. Hamidian**, P. Wahl, F. Meier, A.V. Balatsky, J.D. Garrett, T.J. Williams, G.M. Luke & J.C. Davis. [Nature 465 570-576 \(2010\)](#).

\* - indicates equal contribution to publication

### **Invited Talks (Conferences/Workshops):**

- “Colliding Fermi Surface and Pseudogap Momentum Space Frontier Sets Cuprate Quantum Critical Point” 2018  
12<sup>th</sup> Annual Conference on Materials and Mechanism of Superconductivity  
Beijing, China
- “Discovery of Field Induced Pair Density Wave State in Cuprate Vortex Halo” 2018  
International Conference on Superconductivity and Magnetism  
Antalya, Turkey
- “Visualizing Topologically Emergent Dirac States of a Kondo Insulator”  
APS March Meeting, Symposium Speaker  
Los Angeles, California 2018
- “Directly Imaging Cooper Pair Density Waves”  
SCES (Strongly Correlated Electron Systems) Conference  
Prague, Czech Republic 2017
- “Directly Visualizing the Super States of Nature: Discovery of the Cuprate Pair Density Wave”  
Workshop on Strong Correlations and Normal State of the High Temperature Superconductors  
Dresden, Germany 2016
- “New Visualization Techniques for Cuprate High Temperature Superconductors”.  
CIFAR Quantum Materials Program Meeting  
Montreal, Canada 2015
- “Phase Resolved Characterization the Cuprate *d*-Form Factor Density Wave with SI-STM”  
X-Ray Science Gordon Conference  
Easton, USA 2015
- “Atomic Scale Phase Sensitive Detection Methods for Broken Symmetries in the Cuprates”.  
International Symposium on Frontiers of Superconductivity Research.  
Chinese Academy of Sciences, China 2014
- “Direct Phase-Resolved Visualization of the *d*-Form Factor Density Wave in Underdoped Cuprates”.  
Mesoscale Science Frontiers Annual Conference.  
Santa Fe, New Mexico 2014
- “Imaging Electronic Structure: Lectures in Spectroscopic Imaging STM”.  
Canadian Institute For Advanced Study (CIFAR), Quantum Materials Division, Summer School  
Vancouver, Canada 2013
- “Visualizing Individual Kondo Holes: Textures in the Pond of Strong Correlations”.  
Dual Nature of *f*-electrons Workshop  
Himeji, Japan 2012
- “Fundamental Heavy Fermion Physics Revealed with Spectroscopic Imaging STM”.  
Conference on Quantum Matter from the Nano- to the Macroscale  
Dresden, Germany 2012

- “Imaging the Realm of the Strongly Correlated: From Heavy Fermions to High-Temperature Superconductivity”.  
Center for Emergent Superconductivity Workshop  
University of Illinois, Urbana-Champaign 2011
- “Visualizing the Formation of Heavy Fermions and the Impact of Kondo Holes”  
Nordic Conference on Correlated Electron Systems,  
Uppsala, Sweden 2011
- “Visualizing the Formation of Heavy Fermions and the Impact of Kondo Holes”  
Superconductivity: 100 Years Young, Workshop (Invited),  
IIP-Federal University of Rio Grande do Norte, Natal, Brazil 2011
- “Imaging the Fano Lattice to Hidden Order Transition in URu<sub>2</sub>Si<sub>2</sub>”  
(Substitution for J.C. Davis)  
ICTP Workshop on Principles and Design of Strongly Correlated Electronic Systems  
Trieste, Italy 2010
- “Imaging the Fano Lattice to Hidden Order Transition in URu<sub>2</sub>Si<sub>2</sub>”  
4-Corners of Southwest Ontario Workshop ,  
Perimeter Institute, Waterloo, Ontario, Canada 2010

### **Invited Talks (Seminars):**

- “Imaging Topologically Emergent States of Correlated Quantum Matter” 2018  
MIT, Condensed Matter Seminar  
Cambridge, Massachusetts
- “Scanning Josephson Tunneling Microscopy in Correlated Electronic Systems”  
University of Maryland, Laboratory of Physical Sciences Seminar  
College Park, Maryland 2017
- “Directly Imaging Cooper-Pair Density Waves”  
Harvard University, Center for Integrated Quantum Materials Seminar  
Cambridge, Massachusetts 2017
- “A Tale of (Almost) Two Density Waves”  
MIT, Condensed Matter Seminar  
Cambridge, Massachusetts 2017
- “Visualizing Topologically Induced Dirac States of a Kondo Insulator”  
University of Maryland, Condensed Matter Seminar  
College Park, Maryland 2017
- “Directly Visualizing the Super States of Nature”  
University of Texas A&M, Condensed Matter Seminar  
College Station, Texas 2016
- “Directly Visualizing the Super States of Nature”  
Carnegie Melon University, Condensed Matter Seminar  
Pittsburg, Pennsylvania 2016
- “Cooper Pair Condensate Visualization: Discovery of the Cuprate Pair Density Wave”  
Caltech, Condensed Matter Seminar

- Pasadena, California 2016
- “Discovery of the Cuprate Pair Density Wave”  
UC Davis, Physics Colloquium  
Davis, California 2016
  - “Cooper Pair Condensate Visualization: Discovery of the Cuprate Pair Density Wave”  
UCSD, Condensed Matter Seminar  
La Jolla, California 2016
  - “New Visualization Techniques for Cuprate High Temperature Superconductors”.  
Université Paris Sud, Condensed Matter Seminar  
Paris, France 2015
  - “Detection of Pair Density Wave State in Cuprate High Temperature Superconductors”.  
Max Planck Institute, Condensed Matter Seminar  
Dresden, Germany 2015
  - “Detection of Pair Density Wave State in Cuprate High Temperature Superconductors”.  
Leiden University, Condensed Matter Seminar  
Leiden, Netherlands 2015
  - “Detection of Pair Density Wave State in Cuprate High Temperature Superconductors”.  
Max Planck Institute, Condensed Matter Seminar  
Stuttgart, Germany 2015
  - “Imaging the Conflict Between  $d$ -symmetry Cooper-Pairs and  $d$ -Form Factor Density Waves in Underdoped Cuprates”.  
Condensed Matter Seminar,  
Rutgers University, USA 2015
  - “Imaging the Conflict Between  $d$ -symmetry Cooper-Pairs and  $d$ -Form Factor Density Waves in Underdoped Cuprates”.  
Condensed Matter Seminar,  
Academia Sinica, Taiwan 2014
  - “Direct Phase-Resolved Visualization of the Enhancement of  $d$ -Form Factor Density Wave in Cuprates Through Superconducting Vortex Cores”.  
Condensed Matter Seminar  
University of Waterloo, Canada 2014
  - “Visualizing the Formation of Heavy Fermions and their Destruction by Kondo Holes”  
Condensed Matter Seminar  
University of Toronto, Canada 2012
  - “Visualizing the Formation of Heavy Fermions and the Impact of Kondo Holes”  
General Colloquium  
University of Illinois at Chicago, Chicago, U.S.A. 2011
  - “Imaging the Fano Lattice to Hidden Order Transition in URu<sub>2</sub>Si<sub>2</sub>”  
Condensed Matter Seminar,  
Stanford University, Stanford, California, U.S.A. 2010

- “Imaging the Fano Lattice to Hidden Order Transition in URu<sub>2</sub>Si<sub>2</sub>”  
Condensed Matter Seminar  
McMaster University, Hamilton, Ontario, Canada 2010
- “Imaging the Fano Lattice to Hidden Order Transition in URu<sub>2</sub>Si<sub>2</sub>”  
Condensed Matter Seminar,  
Rutgers University, Piscataway, New Jersey, U.S.A. 2010

### **Services:**

Referee for *Nat. Comm.*, *Nat. Phys.*, *Science Advances*, *PRX*, *Physical Review Letters*, *Physical Review B*

Referee for NSF CAREER Program

Referee for NSF Condensed Matter Physics (CMP) Program

### **Theses:**

“Imaging the Realm of the Strongly Correlated: Visualizing Heavy Fermion Formation and the Impact of Kondo Holes”. Ph.D. Thesis, Cornell University (2011)

“A Solitary Wave Theory for the El-Nino-Southern Oscillation”. Master’s Thesis, University of Toronto (2005).

“Solving Quantum Dynamical Problems through Representations of Lie Algebras”. Undergraduate Thesis, University of Toronto (2004).