CHIH-CHUN CHIEN's Curriculum Vitae

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Education

2003-2009	PhD, Department of Physics, The University of Chicago Advisor: Dr. Kathryn Levin Thesis: Ultra-cold Fermi Gases with Tunable Attractive interactions: Population Imbalance and Optical Lattices
2001-2003	MS, Department of Physics, National Taiwan University Advisor: Dr. Ning-Ning Pang and Dr. Wen-Jer Tzeng Thesis: Statistical Physics of Discrete Surface Growth Models
1997-2001	BS, National Taiwan University

Employment

2014.01-present	Assistant Professor, Physics Group, School of Natural Sciences, University of California, Merced
2011.03-2013.12	J. R. Oppenheimer Postdoctoral Fellow, Los Alamos National Laboratory
2009.12-2011.02	Director's Postdoctoral Fellow, Los Alamos National Laboratory
2009.04-2009.11	Postdoctoral Researcher, James Franck Institute, University of Chicago

Research

2010-present	Collaboration with Frederick Cooper, Eddy Timmermans, Bogdan Damski, Michael Zwolak, Massimiliano Di Ventra and others on quantum dynamics of ultra-cold atoms, quantum and thermal transport in nano systems, quantum field theories of condensed matter.
2005-2009	Professor Kathryn Levin's group Theories of superfluidity and superconductivity Models of ultra cold atoms
2004-2005	Professor Woowon Kang's group Experiments on quantum Hall effects
2001-2003	Professor Ning-Ning Pang's group Dynamic surface growth phenomena Stochastic processes and complex systems

Research Interest (A Partial List)

1. **Ultra-cold atoms**: Superfluidity and magnetism of ultra-cold atoms in optical lattices; BEC-BCS crossover theories and their applications; Hybrid quantum systems involving cold atoms,

trapped ions, and optical cavities; Quantum transport in confined geometries; Quantum field theories of cold atoms; Quantum computations; Collective excitations; Fluctuation effects.

2. **Strongly correlated electrons**: Topics related to high-Tc superconductivity; Spin systems; Symmetry breaking and restoration; Exotic phases and orders in novel materials; Disordered or frustrated systems; Quantum phase transitions.

3. **Transport and non-equilibrium phenomena**: Transport properties of biomaterial and nano-devices; Energy transport and conversion in novel devices; Structural phase transitions in biomaterial; Quench dynamics and spontaneous emergence of topological defects.

Honors

2011 J. R. Oppenheimer Postdoctoral Fellowship, Los Alamos National Lab.
(The first Taiwanese winner of this prize in 37 years.)
2011 Theoretical Postdoctoral Fellowship (3-year appointment),
Joint Quantum Institute and University of Maryland. (declined)
2009 Director's Postdoctoral Fellowship, Los Alamos National Laboratory.
2007 Bloomenthal Fellowship for Theoretical Physics (for the best theoretical research in physics graduate students), The University of Chicago.
2003 Dean's Award of Outstanding Thesis, National Taiwan University.
2002 Theoretical Physics Summer Fellowship, National Center for Theoretical Physics, Taiwan.
2001 Dean's Award (Top 5% of class 2001), National Taiwan University.

Professional Service

Referee for: Physical Review Letters, Physical Review B, Physical Review A, Journal of Physics B, Journal of Physics: Conference Series, New Journal of Physics, Physics Letters A, Journal of Physics: Condensed Matter, International Journal of Quantum Chemistry, Physica B.

Teaching Experience

2008 Summer teaching assistant, The University of Chicago
Course: Fundamental physics.
2003-2007 Teaching assistant, The University of Chicago
Courses: Fundamental physics, Quantum Mechanics Labs.
2002-2003 Teaching assistant, National Taiwan University
Course: Fundamental physics. Fundamental physics labs.
2001 Physics Camp Instructor, National Taiwan University
Course: Introduction to special relativity.

Presentations (most recent 3 years)

2013.12 3rd International Conference on Nanotek & Expo, Las Vegas, NV, Invited talk:
DNA Heattronics: Designing thermal devices utilizing structural transitions.

2013.05 Seminar, Oregon State University, OR:
Mean-Field Theories for Atomic Gases from Path Integral Formalism.

2013.04 BLABS seminar, Los Alamos National Laboratory:
Resuscitating Large-N Theory for Atomic Gases.

2013.03 APS March Meeting, Baltimore, MD. Contributed talk:
Controllable Transport of Ultra-Cold Atoms in 1D Optical Lattices with Peierls Substitution.

2013.02 Colloquium, Washington State University, WA:
Atomtronics: Building devices with cold-atoms and optical lattices.

2013.01 Seminar, University of California, Merced, CA:
Non-equilibrium physics in atomic and molecular systems with applications.

2013.01 Colloquium, National Taiwan University, Taiwan.
Atomtronics: Building devices with cold-atoms and optical lattices.

2013.01 Seminar, Institute of Atomic and Molecular Sciences, Taiwan.
Non-equilibrium physics in atomic and molecular systems with applications.

2012.12 BLABS seminar, Los Alamos National Laboratory:
Atomtronics: Building devices with cold-atoms and optical lattices.

2012.11 Annual World Congress of NanoMedicine, Shenzhen, China. Invited talk (declined):
DNA heattronics: Tuning thermal transport via structures and structural transitions.

2012.08 Dynamics and Thermodynamics in Isolated Quantum Systems, Santa Barbara, CA. Poster:
Density- and Interaction- Induced Transport of Ultra-Cold Atoms in 1D Optical Lattices

2012.06 2012 QAMTS conference, Santa Fe, NM. Talk:
Quantum transport of ultra-cold atoms tunneling in optical lattices.

2012.03 UCSD condensed matter seminar, San Diego, CA:
Applications of micro-canonical simulations to transport phenomena in ultra-cold atoms.

2012.02 APS March Meeting, Boston, MA. Contributed talk:
Steady-state current, spin statistics, and interaction-induced transport in ultra-cold atoms.

2011.10 Quantum Lunch Talk, Los Alamos National Lab:
Auxiliary field theory of ultra-cold atoms and how it solves a 60-year-old problem.

2011.09 Los Alamos National Lab LDRD Day. Poster:
A unified theory of superconductivity and superfluidity.

2011.03 APS March Meeting, Dallas, TX. Contributed talk:
Momentum-resolved RF spectroscopy of polarized Fermi gases.

2011.03 Los Alamos National Lab., BLABS seminar:
Micro-canonical simulations: Testing mesoscopic and semi-classical theories.

2011.02 CNLS postdoc lecture series, Los Alamos National Lab:
Pitfalls in calculating correlation functions and response functions in BCS-BEC crossover.

Publication List

- (Updated on 12/24/2013) There are 8 Physical Review Letters, 1 Nanotechnology, 1 Europhysics Letter, 11 Rapid Communications in Physical Review A, B, and E, one Key Issue in Reports of Progress in Physics, 1 invited review in New Journal of Physics, and 1 review in Journal of Low Temperature Physics. 9 articles have been selected in Virtual Journal Series by AIP.
- The citation numbers are from ISI Web of Science (ISI). The total number of citations is 467.
- H-index: 14.

Peer reviewed: (I also listed recently submitted papers.)

59. K.Velizhanin, **C.C.Chien**, Y.Dubi, and M.Zowlak, *Intrinsic thermal conductance, extended reservoir simulations, and Kramers transition rate theory*, arXiv: 1312.5422 (submitted to Physical Review X).

58. H.Guo, Y.Li, Y.He, and **C.C.Chien**, *Density and Spin Linear Response of Atomic Fermi Superfluids with Population Imbalance in BCS-BEC Crossover*, arXiv: 1308.1304 (submitted to Journal of Physics B).

57. G.W.Chern, **C.C.Chien**, and M.Di Ventra, *Dynamically generated flat-band phases in optical kagome lattices*, arXiv: 1307.6128 (submitted to Physical Review Letters).

56. H.Guo, Y. He, **C.C.Chien**, and K.Levin, *The Compressibility in Strongly Correlated Superconductors and Superfluids: From BCS to BEC*, Physical Review A 88, 043644 (2013). Number of citations: 0 (ISI).

55. J.F.Dawson, F.Cooper, **C.C.Chien**, and B.Mihaila, *Leading-Order Auxiliary Field Theory of the Bose-Hubbard Model*, Physical Review A 88, 023607 (2013). Number of citations: 0 (ISI).

54. K.Doi, M.Tsutsui, T. Ohshiro, **C.C.Chien**, M.Zwolak, M.Taniguchi, T.Kawai, S.Kawano, and M.Di Ventra, *Electrochemical response of biased nanoelectrodes in solution* , arXiv: 1302.3016 (submitted to Journal of Physical Chemistry C).

53. H. Guo, **C.C.Chien**, Y. He, and K.Levin, *Fundamental Constraints on Linear Response Theories of Fermi Superfluids Above and Below T_c*, International Journal of Modern Physics B 27, 1330010 (2013). (Invited review) Number of citations: 0 (ISI).

52. **C.C.Chien** and F.Cooper, *Quench Dynamics and Emergence of Phase Separation in Two-Component Atomic Bose Gases at Zero and High Temperatures*, Physical Review A 87, 045602 (2013). Number of citations: 1 (ISI).

51. **C.C.Chien** and M. Di Ventra, *Controlling Transport of Ultra-Cold Atoms in 1D Optical Lattices with Artificial Gauge Fields*, Physical Review A 87, 023609 (2013). Number of citations: 1 (ISI).

50. H. Guo, **C.C.Chien**, and Y. He, *Theories of Linear Response in BCS Superfluids and How They Meet Fundamental Constraints*, Journal of Low Temperature Physics 172, 5 (2013). (Review article) Number of citations: 3 (ISI).

49. **C.C.Chien**, K.A.Velizhanin, Y.Dubi, and M.Zwolak, *Tunable Thermal Switching via DNA-Based Nano Devices*, Nanotechnology 24, 095704 (2013). Number of citations: 2 (ISI). (See the NanoTechWeb news at http://nanotechweb.org/cws/article/lab/52720 .)

48. **C.C.Chien**, F. Cooper, and E. Timmermans, *Large-N approximation for single- and two-component dilute Bose gases*, Physical Review A 86, 023634 (2012). Number of citations: 1 (ISI).

47. **C.C.Chien** and M. Di Ventra, *Dynamical crossover between the infinite-volume and empty-lattice limits of ultra-cold fermions in 1D optical lattices*, Europhysics Letters 99, 40003 (2012). Number of citations: 2 (ISI).

46. **C.C.Chien**, D.Gruss, M.Di Ventra, and M.Zwolak, *Interaction-induced conducting-nonconducting transition of ultra-cold atoms in 1D optical lattices*, New Journal of Physics 15, 063026 (2013). Number of citations: 1 (ISI).

45. **C.C.Chien**, J. She, and F. Cooper, *Mean-field description of pairing effects, BKT physics, and superfluidity of 2D interacting Bose gases*, arXiv: 1203.3254 (submitted to Annals of Physics).

44. **C.C.Chien**, H. Guo and K. Levin, *Comment on "Density and Spin response of a strongly-interacting Fermi gas in the attractive and quasi-repulsive regime"*, Physical Review Letters 109, 118901 (2012). Number of citations: 2 (ISI).

43. H. Guo, **C.C.Chien**, and Y. He, *Gauge Invariant Linear Response Theory of Relativistic BCS superfluids*, Physical Review D 85, 074025 (2012). Number of citations: 1 (ISI).

42. F.Cooper, **C.C.Chien**, B.Mihaila, J.F.Dawson, and E.Timmermans, *Composite-Field Goldstone States and Higgs Mechanism in Dilute Bose Gases*, Physical Review A 85, 023631 (2012). Number of citations: 2 (ISI).

41. **C.C.Chien**, M.Zwolak, and M.Di Ventra, *Bosonic and fermionic transport phenomena of ultra-cold atoms in 1D optical lattices*, Physical Review A 85, 041601 (2012). (Rapid Communication) Number of citations: 7 (ISI).

40. D.Wulin, G. Guo, **C.C.Chien**, and K.Levin, *A Pre-formed Pair Approach to Pseudogap Effects in the ab-Plane Optical Conductivity of the Cuprates*, Physical Review B 86, 134518 (2012). Number of citations: 2 (ISI).

39. B.Mihaila, F.Cooper, J.F.Dawson, **C.C.Chien**, and E.Timmermans, *Analytical limits for cold atom Bose gases with tunable interactions*, Physical Review A 84, 023603 (2011). Number of citations: 4 (ISI).

38. B.Mihaila, J.F.Dawson, F.Cooper, **C.C.Chien**, and E.Timmermans, *Auxiliary field formalism for dilute fermionic atom gases with tunable interactions*, Physical Review A 83, 053637 (2011). Number of citations: 3 (ISI).

37. F.Cooper, B.Mihaila, J.F.Dawson, **C.C.Chien**, and E.Timmermans, *Auxiliary-field approach to dilute Bose gases with tunable interactions*, Physical Review A 83, 053622 (2011). Number of citations: 6 (ISI).

36. D.Wulin, H.Guo, **C.C.Chien**, and K.Levin *Spin Transport in Cold Fermi gases: A Pseudogap Interpretation of Spin Diffusion Experiments at Unitarity*, Physical Review A 83, 061601 (2011). (Rapid Communication. Selected in Virtual Journal of Atomic Quantum Fluids, vol. 3.) Number of citations: 6 (ISI).

35. **C.C.Chien**, *Spatially varying interactions induced in atomic gases by optical Feshbach resonance* , Physics Letters A 376, 729 (2012). Number of citations: 3 (ISI).

34. K.Velizhanin, **C.C.Chien**, Y.Dubi, and M.Zwolak, *Driving denaturation: Nanoscale thermal transport as a probe of DNA melting*, Physical Review E 83, 050906(R) (2011). (Rapid Communication) Number of citations: 3 (ISI).

33. D.Wulin, B.M.Fregoso, H.Guo, **C.C.Chien**, and K.Levin, *Conductivity in pseudogapped superconductors: A sum-rule-consistent preformed-pair scenario*, Physical Review B 84, 140509 (2011). (Rapid Communication) Number of citations: 3 (ISI).

32. H.Guo, D.Wulin, **C.C.Chien**, and K.Levin, *Transport Analogies in Bad Metals and Perfect Fluids: Insights into the Conductivity in high T_c Superconductors*, New Journal of Physics 13, 075011 (2011). (Invited review in the special issue "Focus on strongly correlated quantum fluids") Number of citations: 5 (ISI).

31. F.Cooper, **C.C.Chien**, B.Mihaila, J.F.Dawson, and E.Timmermans, *Non-perturbative predictions for cold atom Bose gases with tunable interactions*, Physical Review Letters 105, 240402 (2010). (Selected in Virtual Journal of Atomic Quantum Fluids, vol. 3.) Number of citations: 12 (ISI).

30. H.Guo, D.Wulin, **C.C.Chien**, and K.Levin, *Microscopic Approach to Viscosities in Superfluid Fermi Gases: From BCS to BEC* , Physical Review Letters 107, 020403 (2011). (Selected in Virtual Journal of Atomic Quantum Fluids, vol. 3.) Number of citations: 13 (ISI).

29. **C.C.Chien** and B.Damski, *Dynamics of a quantum quench in an ultra-cold atomic BCS superfluid*, Physical Review A 82, 063616 (2010). Number of citations: 2 (ISI).

28. P.Jiang, **C.C.Chien**, I.Yang, W.Kang, K.W.Baldwin, L.N.Pfeiffer, K.W. West, *Zero-Bias Anomalies in Narrow-Constrction Tunnel Junctions in the Quantum Hall Regime* , Physical Review Letters 105, 246801 (2010). Number of citations: 1 (ISI)

27. H.Guo, **C.C.Chien**, and K.Levin, *Establishing the Presence of Coherence in Atomic Fermi Superfluids: Spin-Flip and Spin-Preserving Bragg Scattering at Finite Temperatures*, Physical Review Letters 105, 120401 (2010). (Selected in Virtual Journal of Atomic Quantum Fluids, vol. 2.) Number of citations: 20 (ISI).

26. **C.C.Chien** and K.Levin, *Fermi liquid theory of ultra-cold trapped Fermi gases: Extracting the Landau Parameters* , Physical Review A 82, 013603 (2010). (Selected in Virtual Journal of Atomic Quantum Fluids, vol. 2.) Number of citations: 4 (ISI).

25. D.Wulin, Y.He, **C.C.Chien**, K.Levin, D.K.Morr, *Quasiparticle interference in temperature dependent-STM as a probe of superconducting coherence*, Physica C 470, S904 (2010). Number of citations: 0 (ISI).

24. D.Wulin, **C.C.Chien**, D.K.Morr, K.Levin, *Contrasting Nodal and Anti-Nodal Behavior in the Cuprates Via Multiple Gap Spectroscopies*, Physical Review B 81, 100504(R) (2010). (Rapid Communication) Number of citations: 3 (ISI).

23. **C.C.Chien**, H.Guo, Y.He, K.Levin, *Comparative Study of BCS-BEC Crossover Theories above T_c: the Nature of the Pseudogap in Ultra-Cold Atomic Fermi Gases*, Physical Review A 81, 023622 (2010). (Selected in Virtual Journal of Atomic Quantum Fluids, vol. 2.) Number of citations: 17 (ISI).

22. D.Wulin, Y.He, **C.C.Chien**, K.Levin, D.K.Morr, *Model for the temperature dependence of the quasiparticle interference pattern in the measured scanning tunneling spectra of underdoped cuprate superconductors*, Physical Review B 80, 134504 (2009). (Selected in Virtual Journal of Applications of Superconductors, vol. 17.) Number of citations: 13 (ISI).

21. **C.C.Chien**, Y.He, Q.J.Chen, K.Levin, *Two Energy Gap Preformed-Pair Scenario For the Cuprates: Implications for Angle-Resolved Photoemission Spectroscopy*, Physical Review B 79, 214527 (2009). (Selected in Virtual Journal of Applications of Superconductors, vol. 17.) Number of citations: 21 (ISI).

20. H.Guo, **C.C.Chien**, Q.J.Chen, Y.He, K.Levin, *Finite-Temperature Behavior of an Interspecies Fermionic Superfluid with Population Imbalance*, Physical Review A 80, 011601(R) (2009). (Rapid Communication. Selected in Virtual Journal of Atomic Quantum Fluids, vol. 1.) Number of citations: 6 (ISI).

19. H.Guo, **C.C.Chien**, Y.He, *Relativistic BCS-BEC crossover of a two-species Fermi gas with number density asymmetry at zero temperature*, Nuclear Physics A 823, 83 (2009). Number of citations: 7 (ISI).

18. Q.J.Chen, Y.He, **C.C.Chien**, K.Levin, *Theory of Radio Frequency Spectroscopy Experiments in Ultracold Fermi Gases and Their Relation to Photoemission Experiments in the Cuprates*, Reports on Progress in Physics 72, 122501 (2009). (Key Issue) Number of citations: 15 (ISI).

17. K.Levin, Q.J.Chen, **C.C.Chien**, Y.He, *Comparison of Different Pairing Fluctuation Approaches to BCS-BEC Crossover*, Annals of Physics 325, 233 (2010). Number of citations: 15 (ISI).

16. **C.C.Chien**, Q.J.Chen, K.Levin, *Fermions with attractive interactions on optical lattices and implication for correlated systems*, Physical Review A 78, 043612 (2008). Number of citations: 11 (ISI).

15. Y.He, **C.C.Chien**, Q.J.Chen, K.Levin, *Temperature and final state effects in radio frequency spectroscopy experiments on atomic Fermi gases*, Physical Review Letters 102, 020402 (2009). Number of citations: 14 (ISI).

14. Y.He, **C.C.Chien**, Q.J.Chen, K.Levin, *Radio frequency spectroscopy of trapped Fermi gases with population imbalance*, Physical Review A 77, 011602 (2008). (Rapid Communication) Number of citations: 12 (ISI).

13. **C.C.Chien**, Y.He, Q.J.Chen, K.Levin, *Superfluid-insulator transitions at non-integer filling in optical lattices of fermionic atoms*, Physical Review A 77,011601 (2008). (Rapid Communication) Number of citations: 12 (ISI).

12. Y.He, **C.C.Chien**, Q.J.Chen, K.Levin, *Thermodynamics and superfluid density in BCS-BEC crossover with and without population imbalance*, Physical Review B 76, 224516 (2007). Number of citations: 23 (ISI).

11. Y.He, Q.J.Chen, **C.C.Chien**, K.Levin, *First and second sound modes at finite temperature in trapped Fermi gases from BCS to BEC*, Physical Review A 76, 051602 (2007). (Rapid Communication) Number of citations: 13 (ISI).

10. Q.J.Chen, **C.C.Chien**, Y.He, K.Levin, *Fermionic superfluidity: From high T-c superconductors to ultracold fermi gases* , Journal of Superconductivity and Novel Magnetism 20, 515 (2007). Number of citations: 4 (ISI).

9. **C.C.Chien**, Q.J.Chen, Y.He, K.Levin, *Superfluid phase diagrams of trapped Fermi gases with population imbalance*, Physical Review Letters 98, 110404 (2007). Number of citations: 39 (ISI).

8. Y.He, **C.C.Chien**, Q.J.Chen, K.Levin, *Single-plane-wave Larkin-Ovchinnikov-Fulde-Ferrell state in BCS–Bose-Einstein condensation crossover*, Physical Review A 75, 021602 (2007). (Rapid Communication) Number of citations: 21 (ISI).

7. Q.J.Chen, Y.He, **C.C.Chien**, K.Levin, *Theory of Superfluids with Population Imbalance: Finite Temperature and BCS-BEC Crossover Effects*, Physical Review B 75, 014521 (2007). Number of citations: 14 (ISI).

6. Q.J.Chen, Y.He, **C.C.Chien**, K.Levin, *Stability conditions and phase diagrams for two component Fermi gases with population imbalance*, Physical Review A 74, 063603 (2006). Number of citations: 17 (ISI).

5. **C.C.Chien**, Q.J.Chen, Y.He, K.Levin, *Finite temperature effects in trapped Fermi gases with population imbalance*, Physical Review A 74, 021602 (2006). (Rapid Communication) Number of citations: 17 (ISI).

4. **C.C.Chien**, Q.J.Chen, Y.He, K.Levin, *Intermediate temperature superfluidity in an atomic Fermi gas with population imbalance*, Physical Review Letters 97, 090402 (2006). Number of citations: 44 (ISI).

3. **C.C.Chien**, Y.He, Q.J.Chen, K.Levin, *Ground State Description of a Single Vortex in an Atomic Fermi gas: From BCS to Bose-Einstein Condensation*, Physical Review A 73, 041603 (2006). (Rapid Communication) Number of citations: 14 (ISI).

2. **C.C.Chien**, N.N.Pang, W.J.Tzeng, *"Initial-stage growth phenomena and distribution of local configurations of the restricted solid-on-solid model"*, Physical Review E 70, 021602 (2004). Number of citations: 6 (ISI).

1. **C.C.Chien**, N.N.Pang, W.J.Tzeng, *"Restricted solid-on-solid model: From local morphology to correlation functions and scaling exponents"*, International Journal of Modern Physics B 18, 827 (2004). Number of citations: 0 (ISI).

Not peer reviewed:

1. **C.C.Chien**, *Ultra-cold Fermi Gases with Tunable Attractive Interactions: Population Imbalance and Optical Lattices*, Ph.D Thesis, University of Chicago, 2009.

2. **C.C.Chien**, *Statistical Physics of Discrete Surface Growth Models*, M.S. Thesis, National Taiwan University, 2003. (Dean's Award of Outstanding Thesis)

References

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