# CONGJUN WU

Curriculum Vitae [as of January 6, 2018]

## CONTACT INFORMATION

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## RESEARCH AREA

My research is on the study **new states of matter** in condensed matter and cold atom systems, including unconventional magnetism and superconductivity, orbital physics, topological insulators and superconductors, quantum phase transitions and criticality, strongly correlated bosonic and fermionic systems with cold atoms, and quantum Monte-Carlo simulations.

## EDUCATION

- Ph. D. in Physics, Stanford University, Jun. 2002 - Sept. 2005.
  Advisor: Prof. Shou-Cheng Zhang.
- University of Illinois at Urbana-Champaign, May 2000 - May 2002.
  Advisor: Prof. Eduardo H. Fradkin.
- M.S. in Physics, Peking University, Beijing, China, Sept. 1997 - Jun. 2000.
  Advisor: Prof. Zhao-Bin Su.
- B.S. in Physics, Tsinghua University, Beijing, China, Sept. 1992 - Jul. 1997.

## EMPLOYMENT

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|---|---|
| *Jul. 2017-* | Professor, Department of Physics, University of California, San Diego (UCSD) |
| *Jul. 2011- Jun. 2017* | Associate Professor, Department of Physics, UCSD. |
| *Jul. 2007- Jun. 2011* | Assistant Professor, Department of Physics, UCSD. |
| *Aug. 2005- Jun. 2007* | Postdoctoral Research Associate, Kavli Institute for Theoretical Physics, UCSB. |

## TOTAL CITATIONS: 4370 (Web of Knowledge), 6340 (Google Scholar)

## H-INDEX: 35

## HONORS

- US Air Force Office of Scientific Research (AFOSR) Young Investigator Award, 2011.
- The most influential paper award from Chinese Physics Society 2013 for *Wu, Mondragon-Shem, and Zhou, Chin. Phys. Lett. 28, 086104 (2011).*
- "Outstanding Young Researcher Award" of Overseas Chinese Physics Association, 2008.
- Alfred P. Sloan Research Fellowship, 2008.

## SCIENTIFIC DUTIES

- Serve in the Editorial Broad for *"Chinese Physics Letters"* since 2015.
- Serve in the Editorial Board for *"Scientific Report"* since 2011.

- Proposal Reviewer for U. S. National Science Foundation, Division of Materials Research and Division of Physics; U. S. Army Research Office; U.S. Air Force Office of Scientific Research; Research Grants Council of Hong Kong; the Foundation for Fundamental Research on Matter, the physics research council in the Netherlands.
- Referee for *Nature*; *Nature Physics*, *Physical Review Letters*, *Physical Review A*, and *Physical Review B*; *Nuclear Physics B*; *Physics Letters A*; *Europhysics Letters*.

**WORKSHOP ORGANIZATION**

- "Orbital Physics in Cold Atom Systems", Institute of Physics, Chinese Academy of Sciences, Beijing, Jan.5-6, 2013.
- "New States of Matter with Ultra Cold Atoms", Wuhan University, Dec 10 - 12, 2017.

**REVIEW ARTICLES**

- Review article on spin-3/2 cold atomic systems, Mod. Phys. Lett. B, **20**, 1707 (2006).
- Review article on unconventional Bose-Einstein Condensation, Mod. Phys. Lett. B, **23**, 1 (2009).
- Review article on synthetic spin-orbit coupling, J. Phys. B: At. Mol. Opt. Phys. **46**, 134001 (2013).
- Review article on electric and magnetic dipolar Fermi gases, J. Phys.: Condens. Matter **26**, 493203 (2014) .

## Commentary Articles

- **Congjun Wu**, *"Exotic many-body physics with large-spin Fermi gases"*, Physics 3, 92 (2010).
- **Congjun Wu**, *"Mott made easy"*, Nature Physics 8, 784?85(2012).

**PHYSICS COLLOQUIA (11)**

1. Department of Physics, **Simon Fraser University**, *"Novel orbital physics – Unconventional BEC and Curie-Weiss Metal states in optical lattices"*, Nov. 17, 2017
2. Department of Physics, **University of British Columbia**, *Novel orbital physics – "Unconventional BEC and Curie-Weiss Metal states in optical lattices"*, Nov. 16, 2017.
3. Department of Physics, **University of California, San Diego**, *"Novel orbital physics – Unconventional BEC and Curie-Weiss Metal states in optical lattices"*, Nov. 9, 2017.
4. Center for Nonlinear Studies, **Los Alamos National Lab**, Condensed Matter Science Colloquium, "*Novel orbital phases in optical lattices – unconventional BEC and itinerant ferromagnetism*", Dec. 14, 2016.
5. Department of Physics, **Huazhong University of Science & Technology**, Physics Colloquia, "*New progress on itinerant ferromagnetism and the Curie-Weiss Metal State*", Jun 23, 2016.
6. Department of Physics, **University of Texas at Dallas**, Physics Colloquia, "*Unconventional orbital phases with cold atoms* ", Sept, 2015.
7. Department of Physics, **Tulan University**, Physics Colloquia, "*Exact results on itinerant ferromagnetism*", Oct 22, 2014.
8. Department of Physics, **University of Houston**, Physics Colloquia, "*Unconventional metamagnetism and orbital ordering in transition metal oxides* ", March 27, 2012.
9. Institut fur Laserphysik, **University of Hamburg**, Germany, Unconventional Bose-Einstein condensation beyond the no-node paradigm", Jan. 31, 2012.
10. Department of Physics, **Washington State University**, Physics Colloquia, "*Orbital Phases of cold atoms: unconventional BEC, ferromagnetism, and unconventional Cooper pairing*", Nov. 17, 2009.
11. Department of Physics, **Washington University in St. Louis**, Physics Colloquia, "*Unconven-*

*tional magnetism and dynamic generation of spin-orbit coupling*", Jan. 17, 2007.

**INVITED CONFERENCE TALKS (26)**

12. 12th International Conference on Materials and Mechanisms of Superconductivity and High Temperature Superconductors, Beijing, Aug 19-24, 2018, invited talk (scheduled).
13. Wyoming Summer School in honor of Professor Lu Sham's 80th Birthday, 22-28 July, 2018 (scheduled).
14. AFOSR Program Review at Arlington, Jun 18-22, 2018 (scheduled).
15. **2018 International Conference on Emergent Phenomena in Quantum Materials**, New York University in Shanghai, May 30 - Jun 1 (scheduled).
16. **"Novel superconductors: materials and properties"**, Nordita, Stockholm, May 7-11, 2018 (scheduled).
17. **"Quantum material workshop"**, Fudan University, Shanghai, April 20 -22, 2018 (scheduled).
18. **"Sign 2017, International workshop in the sign problem in QCD and beyond"**, "Fermion positivity and sign problem", University of Washington, Seattle, March 2017.
19. **The 2nd Condensed Matter Conference**, Chinese Physics Society, the symposium on many-body physics, "Quantum dynamics of the XXZ spin chain in a longitudinal magnetic field", Nanjing, July 2016.
20. **The first Condensed Matter Conference**, Chinese Physics Society, "Topological and strongly correlation physics in the $p_x, p_y$ orbital bands in the honeycomb lattice – from solid states to optical lattices", Beijing, July 17, 2015.
21. **Topological and Strongly Correlated Phases in Cold Atoms**, "Topological and strongly correlation physics in the $p_x, p_y$ orbital bands in the honeycomb lattice – from solid states to optical lattices", Princeton Center for Theoretical Sciences, April 30, 2015.
22. **The Topology and Mathematical Physics conference**, "Quaternion analyticity and 3D SU(2) Landau levels", Center of Mathematical Sciences and Applications, Harvard University, Sept 17, 2014.
23. **The Quantum Gas Conference**, "Novel Sp(2N)/SU(2N) quantum magnetism and Mott physics – large spin is different", Center of Advanced Study, Tsinghua University, Aug 26, 2014.
24. **The Chengdu Condensed Matter Conference** "Topological and strongly correlated physics in the $p_x$/$p_y$-orbital bands of the honeycomb lattice-from solid states to optical lattices", Chengdu, China, July 14, 2014.
25. **The 6th International Symposium on Cold Atom Physics**, "Quaternionic states of matter from synthetic gauge fields", Taiyuan, China, Jun 16, 2014.
26. **The 7th Cross-Strait and International Conference on Quantum Manipulation**, title TBA, Institute of Physics, Chinese Academy of Sciences, Beijing, June 28- 30, 2013.
27. **International workshop on Orbital Physics in Cold Atom Systems**, "Novel states of matter of ultra-cold atoms in high bands in optical lattices", Institute of Physics, Chinese Academy of Sciences, Beijing, Jan.5-6, 2013.
28. **2012 Energy, Materials and Nanotechnology (EMN) Meeting**, the parallel session of topological insulators, *"Isotropic Landau Levels of Relativistic and Non-Relativistic Fermions in 3D Flat Space"*, April 16-20, Orlando, Florida, 2012.
29. **The 26th International Conference on Low Temperature Physics**, the parallel session of quantum gases, *"Hidden symmetries and exotic quantum magnetism of large-spin alkali and alkaline-earth fermions"*, Aug 12, Beijing, 2011.
30. **Physics Driven by Spin-orbital Coupling in Transition Metal Compounds**, *"New developments of p-orbital physics – unconventional BEC and fermionic insulators"*, Institute of Physics, Chinese Academy of Sciences, Jun 20-22, Beijing, China, 2011.

31. **Future and Prospect of Topological Insulator**, "*Topological orbital states with cold atoms"*, Institute of Physics, Chinese Academy of Sciences, July 5 to July 10, Beijing and Weihai, China, 2010.
32. **Exotic Insulating Phases of Matter**, The Johns Hopkins University, "*Topological orbital states with cold atoms"*, Jan. 14-16, 2010.
33. **Canadian Institute for Advanced Research, Cold Atoms Meeting**, Halifax, Canada "*Novel orbital physics with fermions in optical lattices*, August 12-16, 2009.
34. **American Physical Society March Meeting 2009**, Pittsburgh, PA, "*Novel orbital physics with fermions in optical lattices*, Mar. 20, 2009.
35. **New Directions in Low-Dimensional Electron Systems (Conference)**, Kavli Institute for Theoretical Physics, University of California, Santa Barbara, Feb 23, 2009.
36. **The 39th Winter Colloquium on the PHYSICS OF QUANTUM ELECTRONICS**, "*Novel orbital physics with fermions in optical lattices*. Jan. 8, 2009.
37. **Academic conference for the 80-year anniversary of Institute of Physics, Chinese Academy of Sciences**, Beijing, "*Novel Orbital Physics with Cold Atoms in Optical Lattices"*, Jun. 20, 2008.
38. Department of Physics, University of Maryland, **Condensed Matter Theory Center Symposium**, "*Pomeranchuk instability and dynamic generation of spin-orbit coupling*", Nov. 8, 2006.

**INVITED CONDENSED MATTER SEMINAR TALKS (65)**

39. Department of Physics, **Peking University**, "*Topological superconductivity with spin-$\frac{3}{2}$ half-Heusler semi-metal beyond triplet pairing"*, Dec 21, 2017 (scheduled).
40. Department of Physics, **East China Normal University**, "*Novel orbital physics – unconventional BEC and Curie-Weiss Metal states in optical lattices*", Dec 15, 2017.
41. Department of Physics, **Fudan University**, "*Enhance topological gap in 2D materials to the scale of atomic spin-orbit coupling*", Dec 14, 2017.
42. Department of Physics, **Fudan University**, "*Unconventional magnetism and spontaneous spin-orbit ordering*, July 2017.
43. Department of Physics, **Beijing Normal University**, "*Unconventional magnetism and spontaneous spin-orbit ordering*, July, 2017.
44. **"Majorana flatband, magnetic domains, and Septet superconductivity"**, Majorana workshop, Shanghai Jiaotong University, Jun 2017.
45. Department of Physics, **Johns Hopkins University**, "*Unconventional magnetism and spontaneous spin-orbit ordering*, March 29, 2017.
46. Condensed Matter Theory Center, **University of Maryland**, "*Orbital phases in optical lattices and solids: unconventional BEC and large gap topological states*, March 28, 2017.
47. Department of Physics, **University of California, San Diego**, "*Unconventional magnetism and spontaneous spin-orbit ordering*, Jan, 2017.
48. Department of Physics, **Purdue University**, "*Unconventional orbital phases with cold atoms* ", March 03, 2016.
49. Department of Physics, **University of British Columbia**, "Novel Sp(2N)/SU(2N) quantum magnetism and Mott physics - large spins are different", Nov 16, 2015.
50. Department of Physics, **University of Washington**, "Topological and strong correlation physics in the px/py-orbital bands of the honeycomb lattice from solid states to optical lattices" April 1, 2015.
51. **INT workshop, University of Washington**, "Novel Sp(2N)/SU(2N) quantum magnetism and Mott physics - large spins are different", March 25, 2015.
52. **Institute of theoretical atomic, molecular and optical physics, Harvard**, "Topological and

strongly correlation physics in the $p_x, p_y$ orbital bands in the honeycomb lattice – from solid states to optical lattices" Nov 21, 2014.

53. Department of physics, **MIT**, "Topological and strongly correlation physics in the $p_x, p_y$ orbital bands in the honeycomb lattice – from solid states to optical lattices", Nov 19, 2014.
54. Department of Physics, **Penn. State University**, "Topological and strongly correlation physics in the $p_x$/$p_y$ orbital bands in the honeycomb lattice – from solid states to optical lattices", Nov. 4, 2014, scheduled.
55. Department of Physics, **Boston College**, "Novel Sp(2N)/SU(2N) quantum magnetism and Mott physics – large spin is different", Oct. 15, 2014.
56. Department of Physics, **Harvard University**, "Quaternionic analytic Landau level in 3D", Oct 17, 2013.
57. Workshop for celebration Prof. Shou-cheng Zhang's 50 birthday, "Quaternionic BEC and Landau levels", March 23-25, 2013.
58. KITP workshop "Frustrated Magnetism and quantum spin liquids" "Power-law Correlated 2D SU(6) Quantum Paramagnets", Sept. 18, 2012.
59. Workshop on "Topological insulators and superconductors", "Unconventional magnetism in transition metal oxides", July, 2012.
60. Department of Physics, **UCSD**, "Quantum Monte-Carlo simulation of novel 2D quantum magnetism with power-law correlations", Nov 21, 2012.
61. Department of Physics, **The Florida State University**, "Isotropic Landau Levels of Relativistic and Non-Relativistic Fermions in 3D Flat Space", September 14, 2012.
62. Department of Physics, **University of British Columbia**, Canada, *"Isotropic Landau Levels of Relativistic and Non-Relativistic Fermions in 3D Flat Space"*, March 20, 2012.
63. Department of Physics, **University of California, Irvine**, "*Unconventional metamagnetism and orbital ordering in transition metal oxides* ", Feb 8, 2012.
64. Department of Physics, **Tsinghua University**, *"Unconventional Bose-Einstein condensation beyond the no-node paradigm"*, Aug 23, 2011.
65. Department of Physics, **University of Science and Technology of China**, "*Unconventional metamagnetic transition and orbital ordering in transition metal oxides*", July 29, 2010.
66. Key Lab of Quantum Information **University of Science and Technology of China**, "*Unconventional Bose-Einstein condensations beyond the no-node paradigm*", July 25, 2010.
67. Center for quantum information, **Tsinghua University**, *"Unconventional Bose-Einstein condensation beyond the no-node paradigm"*, July 19, 2011.
68. Department of Physics, **Wuhan University**, *"Unconventional metamagnetism and orbital ordering in transition metal oxides"*, July 5, 2011.
69. Department of Physics, **Wuhan University**, *"Novel p-orbital physics in optical lattices - unconventional BECs, exotic band and Mott insulators of fermions"*, July 4, 2011.
70. Center of Advanced Study, **Tsinghua University**, *"Novel orbital physics in the $p$-band"*, Jun. 28, 2011.
71. **Aspen physics workshop** "Few and many-body physics of cold quantum gases near resonances", Jun 16, 2011, *"Hidden symplectic symmetry in large spin ultra-cold fermion systems"*.
72. Department of Physics, **University of Texas, Austin**. March 3, 2011, '*Unconventional metamagnetic transition in the $t_{2g}$ orbital system of $Sr_3Ru_2O_7$*.
73. Department of Physics, **Rice University**, "*Novel orbital physics with cold atoms – Unconventional BEC, Ferromagnetism, and $f$-wave Cooper pairing states*", Nov. 2, 2010.
74. **Institute of Physics, Chinese Academy of Sciences**, "*Unconventional metamagnetic transition in the $t_{2g}$ orbital system of $Sr_3Ru_2O_7$*", Aug 17, 2010.
75. **Quantum simulation workshop**, Key Lab of Quantum Information University of Science and

Technology of China, "*Unconventional metamagnetic transition in the $t_{2g}$ orbital system of $Sr_3Ru_2O_7$*", July 30, 2010.

76. **Quantum simulation workshop**, Key Lab of Quantum Information University of Science and Technology of China, *"Hidden symmetries and quantum phases in large spin cold atom systems"*, July 29, 2010.
77. **Quantum simulation workshop**, Key Lab of Quantum Information University of Science and Technology of China, "*Novel orbital physics in cold atom optical lattices*", July 26, 2010.
78. Department of Physics, **University of California, Santa Crutz**, "*Unconventional metamagnetic transition in the $t_{2g}$ orbital system of $Sr_3Ru_2O_7$*", May 21, 2010.
79. Kavli Institute for Theoretical Physics, **University of California, Santa Barbara**, "*Novel orbital physics with cold atoms – Unconventional BEC, Cooper pairing, and frustration"*, Jul. 29, 2009.
80. Department of Physics, **University of California, San Diego** , condensed matter seminar, "*Novel Orbital Physics with Cold atoms in Optical lattices*" , May 27, 2009.
81. Department of Physics, **California Institute of Technology**, condensed matter seminar, "*Novel Orbital Physics with Cold atoms in Optical lattices*" , Nov 21, 2008.
82. Department of Physics, **University of California, Riverside**, condensed matter seminar, "*Novel Orbital Physics with Cold atoms in optical lattices*", Oct. 29, 2008.
83. Department of Physics, **University of California, Los Angels**, condensed matter seminar, "*Novel Orbital Physics with Cold atoms in Optical lattices*" , Oct 22, 2008.
84. Department of Physics, **Stanford University**, condensed matter seminar, "Novel orbital Physics with Cold atoms in Optical Lattices", Oct. 16, 2008.
85. Department of Physics, **University of Michigan**, condensed matter seminar, "*Orbital Physics with Cold atom optical lattices*", Sept. 16, 2008.
86. Department of Physics, **University of California, Davis**, condensed matter seminar, "*Novel Orbital Physics with Cold Atoms in Optical Lattices*", April 17, 2008.
87. Department of Physics, **University of Toronto**, condensed matter seminar, "*Novel features of orbital physics of cold bosons and fermions in optical lattices*", Nov. 19, 2007.
88. Department of Physics, **University of California, Irvine**, condensed matter seminar, "*Novel features of orbital physics of cold bosons and fermions in optical lattices*", Nov. 14, 2007.
89. Microsoft station-Q, **University of California, Santa Barbara**, "*Novel features of orbital physics of cold bosons and fermions in optical lattices*", Oct. 23, 2007.
90. Kavli Institute for Theoretical Physics, **University of California, Santa Barbara**, "*Unconventional magnetism: electron liquid crystal states and dynamic generation of spin-orbit coupling*", May 16, 2007.
91. Institute of Physics, **Chinese Academy of Sciences**, Beijing, Condensed Matter Seminar, "*Unconventional magnetism: electron liquid crystal states and dynamic generation of spin-orbit coupling*", Mar. 11, 2007.
92. Center of Advanced Studies,**Tsinghua University**, Beijing, Condensed Matter Seminar, "*Unconventional magnetism: electron liquid crystal states and dynamic generation of spin-orbit coupling*", Mar. 7, 2007.
93. Department of Physics, **University of Hong Kong**, Condensed Matter Seminar, "*Unconventional magnetism and dynamic generation of spin-orbit coupling*", Feb. 28, 2007.
94. Department of Physics, **University of Michigan**, Condensed Matter Seminar, "*Unconventional magnetism and dynamic generation of spin-orbit coupling*", Feb. 20, 2007.
95. Department of Physics, **University of Illinois at Urbana-Champaign**, Condensed Matter Seminar, "*Unconventional magnetism: electron liquid crystal states and dynamic generation of spin-orbit coupling*", Feb. 15, 2007.
96. Department of Physics, **University of Maryland**, Joint Quantum Institute seminar, "*Exploring*

*new states of matter in the p-orbital bands of optical lattices*", Feb. 05, 2007.

97. Kavli Institute for Theoretical Physics, **University of California, Santa Barbara**, ''*Exploring new states of matter in the p-orbital bands of optical lattices*", Feb. 01, 2007.
98. Department of Physics, **Pennsylvania State University, Condensed Matter Seminar**, "*Unconventional magnetism and dynamic generation of spin-orbit coupling*", Jan. 24, 2007.
99. Department of Physics, **University of California, San Diego**, Condensed Matter Seminar, "*Pomeranchuk instability and dynamic generation of spin-orbit coupling*", Nov. 15, 2006.
100. Department of Physics, **Ohio State University**, Cold Atom Physics Seminar, "*Quantum phases of spin-3/2 fermions*", May 09, 2006.
101. Department of Physics, **University of Michigan**, FOCUS (Frontiers in Optical Coherent and Ultrafast Science) Seminar, "*Hidden symmetry and novel phases in spin-3/2 cold atomic systems*", Apr. 06, 2006.
102. Department of Physics, **Princeton University**, Condensed Matter Seminar, "*Hidden symmetry and novel phases in spin-3/2 cold atomic systems*", Jan. 23, 2006.
103. Department of Physics, **University of Illinois at Urbana-Champaign**, Condensed Matter Seminar, "*Hidden symmetry and novel phases in spin-3/2 cold atomic systems*", Dec. 08, 2005.

# CONGJUN WU'S PUBLICATIONS AND PREPRINTS

## Review Articles

1. Yi Li, **Congjun Wu**, *"Unconventional symmetries of Fermi liquid and Cooper pairing properties with electric and magnetic dipolar fermions"*, J. Phys.: Condens. Matter 26 493203 (2014) .
2. Xiangfa Zhou, Yi Li, Zi Cai, **Congjun Wu**, *"Unconventional states of bosons with synthetic spin-orbit coupling"*, J. Phys. B: At. Mol. Opt. Phys. 46 134001 (2013).
3. **Congjun Wu**, *"Unconventional Bose-Einstein Condensations Beyond the 'No-node' Theorem"*, Mod. Phys. Lett.**23**, 1 (2009).
4. **Congjun Wu**, *"Hidden symmetry and quantum phases in spin 3/2 cold atomic systems*", Mod. Phys. Lett. B **20**, 1707 (2006).

## Commentary Articles

5. **Congjun Wu**, *"Exotic many-body physics with large-spin Fermi gases"*, Physics 3, 92 (2010).
6. **Congjun Wu**, *"Mott made easy"*, Nature Physics 8, 78485(2012).

## Book Chapter

7. Wenjun Zheng, Jiangping Hu, and **Congjun Wu**, *"Dynamic stripes, RVB spin liquid and high Tc superconductivity - a game of two players"*. Chapter 10 in *"Models and methods of high-Tc superconductivity: Some frontal aspects V2, 2003"*, Nova Science Publishers, Inc.

## Research Articles

### 1. Itinerant and unconventional magnetism

8. Guang Yang, Shenglong Xu, Wei Zhang, Tianxing Ma, **Congjun Wu** *"Room temperature magnetism on the zigzag edges of phosphorene nanoribbons"*, Phys. Rev. B **94**, 075106 (2016).
9. Shenglong Xu, Yi Li, **Congjun Wu**, *"Thermodynamic properties of a 2D itinerant ferromagnet - a sign-problem free quantum Monte Carlo study"*, Phys. Rev. X 5, 021032, (2015) .
10. Yi Li, E. H. Lieb, **Congjun Wu**, *"Exact Results on Itinerant Ferromagnetism in Multi-orbital Systems on Square and Cubic Lattices"*, Phys. Rev. Lett. 112, 217201 (2014) .
11. Wei-Cheng Lee, **Congjun Wu**, *"Microscopic Theory of the Thermodynamic Properties of $Sr_3Ru_2O_7$"*, Chin. Phys. Lett. 33, 037201 (2016).
12. Wei-Cheng Lee, D. P. Arovas, **Congjun Wu**, *"Quasiparticle Interference in the Unconventional Metamagnetic Compound $Sr_3Ru_2O_7$"*, Phys. Rev. B **81**, 184403 (2010).
13. Wei-cheng Lee, **Congjun Wu**, *"Spectroscopic Imaging Scanning Tunneling Microscopy as a Probe to Orbital Ordering"*, Phys. Rev. Lett. 103, 176101 (2009).
14. Wei-cheng Lee, and **Congjun Wu**, *"Theory of unconventional metamagnetic electron states in orbital band systems"*, Phys. Rev. B 80, 104438 (2009).
15. **Congjun Wu**, Kai Sun, Eduardo Fradkin, and Shou-Cheng Zhang *"Fermi liquid instabilities in the spin channel"*, Phys. Rev. B **75**, 115103 (2007).
16. **Congjun Wu** and Shou-Cheng Zhang, *"Dynamic generation of spin-orbit coupling"*, Phys. Rev. Lett. **93**, 36403 (2004).

### 2. Novel quantum magnetism of high symmetries

17. Shenglong Xu, Julio Barreiro, Yu Wang, **Congjun Wu**, "Interaction effects from the parity of N in SU(N) symmetric fermion lattice systems", arXiv:1707.01463.
18. Zhichao Zhou, Da Wang, **Congjun Wu**, Yu Wang *"Finite-temperature valence-bond-solid transitions and thermodynamic properties of interacting SU(2N) Dirac fermions"*, Phys. Rev. B **95**,

085128 (2017).

19. Zhichao Zhou, Da Wang, Zi Yang Meng, Yu Wang, **Congjun Wu**, *"Mott insulating states and quantum phase transitions of correlated SU(2N) Dirac fermions"*, Phys. Rev. B **93**, 245157 (2016).
20. Zhichao Zhou, Zi Cai, **Congjun Wu**, Yu Wang, *"Quantum Monte Carlo simulation of thermodynamic properties of SU(2N) ultracold fermions in optical lattices"*, Phys. Rev. B 90, 235139 (2014) .
21. Da Wang, Yi Li, Zi Cai, **Congjun Wu**, *"Competing orders in the 2D half-filled SU(2N) Hubbard model through the pinning field quantum Monte-Carlo simulations"*, Phys. Rev. Lett. 112, 156403 (2014).
22. Zi Cai, Hsiang-hsuan Hung, Lei Wang, **Congjun Wu**, *"Quantum magnetic properties of the SU(2N) Hubbard model in the square lattice: a quantum Monte Carlo study"*, Phys. Rev. B 88, 125108 (2013)
23. Zi Cai, Hsiang-hsuan Hung, Lei Wang, Dong Zheng, **Congjun Wu**, *"Pomeranchuk cooling of the SU(2N) ultra-cold fermions in optical lattices"*, Phys. Rev. Lett. 110, 220401 (2013).
24. Hsiang-hsuan Hung, Yupeng Wang, **Congjun Wu**, *"Quantum magnetism of ultra-cold fermion systems with the symplectic symmetry"*, Phys. Rev. B **84**, 054406 (2011).
25. **Congjun Wu**, Jiangping Hu and Shou-Cheng Zhang, *"Quintet pairing and non-Abelian vortex string in spin-3/2 cold atomic systems"*, Int. J. Mod. Phys. B **24**, 311 (2010).
26. **Congjun Wu**, Daniel Arovas, and Hsiang-Hsuan Hung *"A $\Gamma$-matrix generalization of the Kitaev model"*, Phys. Rev. B 79, 134427 (2009).
27. Cenke Xu, and **Congjun Wu** , *"Resonating plaquette phases in large spin cold atom systems"*, Phys. Rev. B **77**, 134449 (2008).
28. Shu Chen, **Congjun Wu**, Shou-Cheng Zhang, and Yupeng Wang, *"Exact spontaneous plaquette ground states for spin-3/2 ladder models"*, Phys. Rev. B **72**, 214428 (2005).
29. **Congjun Wu**, *"Competing orders in the one dimensional spin 3/2 fermionic system"*, Phys. Rev. Lett. **95**, 266404 (2005).
30. C. H. Chern, H. D. Chen, **Congjun Wu**, Jiangping Hu, and Shou-Cheng Zhang, "*Non-Abelian Berry's phase and Chern numbers in higher spin pairing condensates*", Phys. Rev. B **69**, 214512 (2004).
31. **Congjun Wu**, Jiangping Hu, and Shou-Cheng Zhang, "*Exact SO(5) symmetry in spin 3/2 fermionic systems*", Phys. Rev. Lett. **91** , 186402 (2003).

**3. Topological insulators**

32. Gu-Feng Zhang, Yi Li, **Congjun Wu**, *"The honeycomb lattice with multi-orbital structure: topological and quantum anomalous Hall insulators with large gaps"*, Phys. Rev. B 90, 075114 (2014)
33. Yi Li, Shou-Cheng Zhang, **Congjun Wu**, *"Topological insulators with SU(2) Landau levels"*, Phys. Rev. Lett. 111, 186803 (2013)
34. Yi Li, Xiangfa Zhou, **Congjun Wu**, *"2D and 3D topological insulators with isotropic and parity-breaking Landau levels"*, Phys. Rev. B **85**, 125122 (2012).
35. Yi Li, Kenneth Intriligator, Yue Yu, **Congjun Wu**, *"Isotropic Landau levels of Dirac fermions in high dimensions"*, Phys. Rev. B **85**, 085132 (2012).
36. Yi Li, **Congjun Wu**, "High-Dimensional Topological Insulators with Quaternionic Analytic Landau Levels", Phys. Rev. Lett. **110**, 216802 (2013)
37. Dong Zheng, **Congjun Wu**, Guang-Ming Zhang, *"Particle-hole symmetry and interaction effects in the Kane-Mele-Hubbard model"*, Phys. Rev. B 84, 205121 (2011).
38. Machi Zhang, Hsiang-hsuan Hung, Chuanwei Zhang, **Congjun Wu**, *"Quantum anomalous Hall*

*states in the p-orbital honeycomb optical lattices"*, Phys. Rev. A 83, 023615 (2011).

39. Xiong-Jun Liu, Xin Liu, **Congjun Wu**, Jairo Sinova *"Quantum Anomalous Hall Effect with Cold Atoms Trapped in a Square Lattice"*, Phys. Rev. A 81, 033622 (2010).
40. Wei-Cheng Lee, **Congjun Wu**, Daniel P. Arovas, Shou-Cheng Zhang *"Quasiparticle Interference on the Surface of the Topological Insulator $Bi_2Te_3$"*, Phys. Rev. B 80, 245439 (2009).
41. J. Maciejko, C. Liu, Y. Oreg, X.-L. Qi, **Congjun Wu**, and Shou-cheng Zhang *"Kondo effect in the helical edge liquid of the quantum spin Hall state"*, Phys. Rev. Lett. 102, 256803 (2009).
42. Shi-liang Zhu, Hao Fu, **Congjun Wu**, Shou-Cheng Zhang, and Lu-Ming Duan, "*Spin Hall effects for cold atoms in a light induced gauge potential*", Phys. Rev. Lett. **97**, 240401 (2006).
43. **Congjun Wu**, B. Andrei Bernevig, and Shou-Cheng Zhang, "*The helical liquid and the edge of quantum spin Hall systems*", Phys. Rev. Lett. **96**, 106401(2006).
44. Jiangping Hu, B. Andrei Bernevig, and **Congjun Wu**, "*Spin current in spin-orbit coupling systems*", Int. J. Mod. Phys. B **17**, 5991 (2003).

**4. Topological and Unconventional Superconductivities**

45. Wang Yang, Chao Xu, **Congjun Wu**, *"Spontaneous surface magnetization and chiral Majorana modes in the $p\pm$ is superconductors"*, arXiv:1711.05241.
46. Wang Yang, Tao Xiang, **Congjun Wu**, *"Majorana surface modes of nodal topological pairings in spin-3/2 semi-metals"*, Phys. Rev. B 96, 144514 (2017).
47. Wang Yang, Yi Li, **Congjun Wu**, *"Topological septet pairing with spin-3/2 fermions – high partial-wave channel counterpart of the $^3$He-B phase"*, Phys. Rev. Lett. **117**, 075301 (2016).
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