Meng, Zi Yang

Academic qualifications

University of Science and Technology of China	B.Sc. in Physics	2005
Universität Stuttgart, Germany	M.Sc. in Physics	2007
Universität Stuttgart, Germany	Ph.D. in Physics	2011

Previous academic positions

Professor	Institute of Physics, Chinese Academy of Sciences	2018.08 – 2019.02
Associate Professor	Institute of Physics, Chinese Academy of Sciences	2014.08 – 2018.07
Postdoctoral Fellow	University of Toronto	2013.08 – 2014.07
Postdoctoral Research Associate	Louisiana State University	2011.09 – 2013.07

Present academic position

Associate Professor (with tenure)	Department of Physics, The University of Hong Kong	2019.03 –

Research Interests & Expertise

Strongly correlated electron systems and quantum materials: quantum phase transitions, quantum magnetism and frustrated magnets, non-Fermi-liquid and itinerant quantum critical points, 2D quantum Moiré materials

Computational quantum many-body physics: large-scale quantum Monte Carlo simulations, self-learning and explainable-AI Monte Carlo methods, tensor- and neural-networks

Honours and Awards

2020/21 Tianhe Star Award for "*outstanding accomplishments and promotion of computational oriented research on the Tianhe supercomputers of China*"

2018 Highly Cited Research Article Award by Chinese Physics Society

2017 Outstanding Young Researcher Prize at the Institute of Physics, Chinese Academy of. Sciences
2016 Mercator Fellow of the DFG research unit FOR1807 "*Advanced Computational Methods. for Strongly Correlated Quantum Systems*"
2014 Young Thousand Talents Award of China

Representative publications in recent five years

1). *Scaling of entanglement entropy at deconfined quantum criticality*,
Jiarui Zhao, Yan-Cheng Wang, Zheng Yan, Meng Cheng*, **Zi Yang Meng*(corresponding author),**
Phys. Rev. Lett. 128, 010601 (2022)

2). *Exciton Proliferation and Fate of the Topological Mott Insulator in a Twisted Bilayer Graphene Lattice Model*,
Xiyue Lin, Bin-Bin Chen*, Wei Li, **Zi Yang Meng***, Tao Shi*
Phys. Rev. Lett. 128, 157201 (2022)

3). *Fractionalized conductivity and emergent self-duality near topological phase transitions*,
Yan-Cheng Wang, Meng Cheng, William Witczak-Krempa, **Zi Yang Meng*,**
Nature Communications 12, 5347 (2021)

4). *Realization of topological Mott insulator in a twisted bilayer graphene lattice model*,
Bin-Bin Chen, Yuan Da Liao, Ziyu Chen, Oskar Vafek, Jian Kang, Wei Li*, **Zi Yang Meng*,**
Nature Communications 12, 5480 (2021)

5). *Amplitude Mode in Quantum Magnets via Dimensional Crossover*,
Chengkang Zhou, Zheng Yan, Kai Sun, Oleg A. Starykh, **Zi Yang Meng***,
Phys. Rev. Lett. 126, 227201 (2021)

6). *Correlation-induced insulating topological phases at charge neutrality in twisted bilayer graphene*,
Yuan Da Liao, Jian Kang*, Clara N. Breiø, Xiao Yan Xu, Han-Qing Wu, Brian M. Andersen*, Rafael M. Fernandes*, **Zi Yang Meng*,**
Phys. Rev. X 11, 011014 (2021)

7). *Evidence of the Berezinskii-Kosterlitz-Thouless Phase in a Frustrated Magnet*,
Ze Hu, Zhen Ma, Yuan-Da Liao, Han Li, Chunsheng Ma, Yi Cui, Yanyan Shangguan, Zhentao Huang, Yang Qi*, Wei Li*, **Zi Yang Meng***, Jinsheng Wen*, Weiqiang Yu*,
Nature Communications 11,5631 (2020)

8). *Kosterlitz-Thouless melting of magnetic order in the triangular quantum Ising material $TmMgGaO_4$*,
Han Li, Yuan-Da Liao, Bin-Bin Chen, Xu-Tao Zen, Xian-Lei Sheng, Yang Qi*, **Zi Yang Meng*,** Wei Li*,
Nature Communications 11, 1111 (2020)

9). *Correlated states in twisted double bilayer graphene*,
Cheng Shen, Yanbang Chu, QuanSheng Wu, Na Li, Shuopei Wang, Yanchong Zhao, Jian Tang, Jieying Liu, Jinpeng Tian, Kenji Watanabe, Takashi Taniguchi, Rong Yang, **Zi Yang Meng (3rd senior author**), Dongxia Shi, Oleg V. Yazyev, Guangyu Zhang*,
Nature Physics 16, 520–525(2020)

10). *Quantum phases of $SrCu_2(BO_3)_2$ from high-pressure thermodynamics*,
Jing Guo, Guangyu Sun, Bowen Zhao, Ling Wang, Wenshan Hong, Vladimir A. Sidorov, Nvsen Ma, Qi Wu, Shiliang Li, **Zi Yang Meng*,** Anders W. Sandvik*, Liling Sun*,
Phys. Rev. Lett. 124, 206602 (2020)

11). *Itinerant Quantum Critical Point with Fermion Pockets and Hot Spots*,
Zi Hong Liu, Gaopei Pan, Xiao Yan Xu, Kai Sun, **Zi Yang Meng*,**
PNAS 116, 16760 (2019)

12). *Monte Carlo Study of Lattice Compact Quantum Electrodynamics with Fermionic Matter: the Parent State of Quantum Phases*,
Xiao Yan Xu, Yang Qi, Long Zhang, Fakher F. Assaad, Cenke Xu, **Zi Yang Meng*,**
Phys. Rev. X 9, 021022 (2019)

Invited Talks, Public lecture and Seminar in recent five years

Conference and Colloquium

1). A Sport and a Pastime: Model design and computation for quantum criticality, gauge fields and matter,
Quantum Criticality: Gauge Fields and Matter, Perimeter Institute, May 18, 2022
2). *Quantum Monte Carlo Simulations on Gauge fields couple to Matter fields*,
Gauge Workshop Munich 2022, Max Planck Institute of Quantum Optics, Munich, May 12, 2022
3). *Model design and computation in quantum many-body systems*,
Colloquium at School of Physics and Astronomy, Shanghai Jiao Tong University, May 11, 2022
4). *Hear the Shape of Quantum Drums via Qiu Ku (Pajamas)*,
Boundary and Bulk Criticality 2022, University of Würzburg, February 23, 2022
5). *Non-Fermi liquid and quantum criticality from lattice model simulations*,
Physical Society of Hong Kong 2020, July 25, 2020
6). *What we talk about When we talk about novel phases of quantum matter*,
Novel Phases of quantum Matter, Internal Centre for Theoretical Sciences, Tata Institute of Fundamental Research, Bangalore, January 1, 2020
7). *What we talk about When we talk about learning in many-body physics*,
Deep Learning and Physics 2019, Yukawa Institute for Theoretical Physics, University of Kyoto, Japan, November 2, 2019
8). *Dynamical Signatures of fractionalisation in frustrated magnets*,
Quantum Spin Liquid, Aspen Center for Physics, June 23-July 14, 2019
9). *Emergent Symmetry at deconfined quantum Criticality*,
XIth International Symposium: Quantum Theory and Symmetries (QTS), Centre de recherches mathematiques, Montreal, Canada, July 2, 2019
10). *Solving Metallic Quantum Criticality in a Casino (I) and (II)*,
Advances in Strongly Correlated Electronic Systems (ASCES 2019), Fine Theoretical Physics Institute, University of Minnesota, June 10 and 11, 2019
11). *What we talk about when we talk about fermion QCP*,
Boundary and Bulk Criticality 2019, University of Würzburg, October 2, 2019
12). *Revealing fermionic quantum criticality from new Monte Carlo techniques*,
2018 International Conference on Magnetism (ICM2018), San Francisco, July 16, 2018

Public Lecture

1). *AI and Computation Research: From Quantum Materials to Black Holes,*
Hong Kong Science Museum, January 15, 2022

Seminar Talks

1). *What is "Qiu Ku" and How to Measure Quantum Entanglement with It,*
Condensed Matter Seminar, Department of Physics, The Hong Kong University of Science and Technology, May 4, 2022
2). *Hearing the Shape of Quantum Drums via Qiu Ku,*
Condensed Matter Seminar, Niels Bohr Institute, University of Copenhagen, Dec 3, 2021
3). *Model design and Computational solution for quantum many-body systems,*
Correlated Electrons Virtual International Seminars (CEVIS), Korea Institute for Advanced Study and the University of Tokyo, Mar 4, 2021
4). *Lattice models and Monte Carlo solutions for quantum criticality,*
Condensed Matter Seminar, Department of Physics, Harvard University, February 14, 2020
5). *Lattice models and Monte Carlo solutions for quantum criticality,*
Condensed Matter Seminar, Department of Physics, Yale University, February 6, 2020
6). *Lattice models and Monte Carlo solutions for quantum criticality,*
Interdisciplinary QC/CM Seminar, Department of Physics, University of Michigan, February 27, 2020
7). *Deconfined quantum Criticality, emergent symmetry and QED3-Gross-Neveu transitions,*
Condensed Matter Seminar, Department of Physics, University of Montreal, June 27, 2019

Representative publications beyond recent five-year period

1). *Duality between the deconfined quantum-critical point and the bosonic topological transition***,**
Yan Qi Qin, Yuan-Yao He, Yi-Zhuang You, Zhong-Yi Lu, Arnab Sen, Anders W. Sandvik, Cenke Xu, **Zi Yang Meng*(corresponding author),**
Phys. Rev. X 7, 031052 (2017)

2). *Non-Fermi-liquid at (2+1)d ferromagnetic quantum critical point,*
Xiao Yan Xu, Kai Sun, Yoni Schattner, Erez Berg, **Zi Yang Meng*,**
Phys. Rev. X 7, 031058 (2017)

3). *Nearly deconfined spinon excitations in the square-lattice spin-1/2 Heisenberg antiferromagnet,*
Hui Shao, Yan Qi Qin, Sylvain Capponi, Stefano Chesi, **Zi Yang Meng***, Anders W. Sandvik*,
Phys. Rev. X 7, 041072 (2017)

4). *Self-Learning Monte Carlo Method,*
Junwei Liu, Yang Qi, **Zi Yang Meng,** Liang Fu,
Phys. Rev. B. 95. 041101(R) (2017)

5). *Self-Learning Quantum Monte Carlo Method in Interacting Fermion Systems,*
Xiao Yan Xu, Yang Qi, Junwei Liu, Liang Fu, **Zi Yang Meng*,**
Phys. Rev. B 96, 041119(R) (2017)

6). *Odd-Parity Triplet Superconducting Phase in Multiorbital Materials with a Strong Spin-Orbit Coupling: Application to Doped* Sr_2IrO_4*,*
Zi Yang Meng, Yong Baek Kim, Hae-Young Kee*,
Phys. Rev. Lett. 113, 177003 (2014)

7). *Dimerized Solids and Resonating Plaquette Order in SU(N)-Dirac Fermions*,
Thomas C. Lang, **Zi Yang Meng**, Alejandro Muramatsu, Stefan Wessel, Fakher F. Assaad,
Phys. Rev. Lett. 111, 066401 (2013)

8).*Dynamical signatures of edge-state magnetism on Graphene nanoribbons*,
H. Feldner, Z. Y. Meng, T. C. Lang, F. F. Assaad, S. Wessel and A. Honecker,
Phys. Rev. Lett. 106, 226401 (2011)

9). *Quantum spin liquid emerging in two-dimensional correlated Dirac fermions*,
Zi Yang Meng, T. C. Lang, S. Wessel, F. F. Assaad and A. Muramatsu,
Nature 464, 847 (2010)

Grant records in the recent five years

1). PI of General Research Fund 17301721,
Project title: Computational investigations on correlated quantum materials,
Funding year: 2022 – 2024 (in progress)

2). PI of General Research Fund 17301420,
Project title: Computational artificial intelligence on quantum many-body systems,
Funding year: 2021 – 2023 (in progress)

3). PI of General Research Fund 17303019,
Project title: Large-scale quantum simulations of criticality and dynamics of correlated electron systems, Funding year: 2019 – 2022 (in progress)

4). PI of HKU-TCL Joint research center for artificial intelligence
Project title: Quantum-Inspired explainable-AI
Funding year: 2021 - 2023 (in progress)

5). PI of HKU Seed Fund for Basic Research for New Staff 201904185013,
Project title: Next-Generation of Scientific Computation via Neuromorphic-AI Accelerators,
Funding year: 2019-2021 (completed)

6). PC of Ministry of Science and Technology of China through the National Key Research and Development Program, Project title: Ground state phase diagram and low-energy excitations in the quantum frustrated magnets,
Funding year: 2016 – 2021 (completed)

7). Co-I of Areas of Excellence AoE/P-701/20,
Project title: 2D materials research: fundamentals towards emerging technologies,
Funding year: 2021-2029 (in progress)

8). Co-I of HKU Small Equipment Grant,
Project title: High performance scientific computing platform for developing interdisciplinary numerical packages in physics, astronomy and other scientific areas,
Funding year: 2021-2024 (in progress)

Previous Ph.D. Students

1. Xiao Yan Xu, Ph.D. (2017)
   Tenure-track Associate Professor, School of Physics and Astronomy Shanghai Jiao Tong University

2. Zi Hong Liu, Ph.D. (2019)
   Postdoctoral fellow at University of Wuerzburg

3. Guang-Yu Sun, Ph.D. (2020)
   Postdoctoral fellow at Institute of Advanced Studies, Tsinghua University

4. Yuan Da Liao, Ph.D. (2021)
   Postdoctoral Fellows at Fudan University

5. Chuang Chen, Ph.D. (2021)
   Postdoctoral Fellows at Fudan University

Previous Postdoctoral Fellows

1. Yan-Cheng Wang (2016-2019)
   Tenure-track Associate Professor, China University of Mining and Technology

2. Nvsen Ma (2017-2020)
   Associate Professor, School of Physics, Beihang University

Others

Full publication list: https://quantummc.xyz/publication/

Editorial Board of " Reports on Progress in Physics" of IOPscience."

Panel member of the HKU-TCL Joint Research Center for AI.

Citation ~ 4600 (google scholar), h-index 36.

Teaching at all university levels, create new course "Machine Learning in Physics".

Referee for several peer-reviewed journals (PNAS, Physical Review B, Physical Review Letters and Physical Review X, Nature Communications, etc.).