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

Professor	Department of Physics, The University of Hong Kong	2023.09 -
Associate Professor	Department of Physics, The University of Hong Kong	2019.03–2023.08

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, quantum entanglement and 2D quantum moiré materials, Rydberg atom arrays, Fractional Chern insulators.

Computational quantum many-body physics: large-scale quantum Monte Carlo simulations, machine-learning methods in physics, self-learning quantum Monte Carlo algorithms, Explainable-AI with Monte Carlo, tensor and neural networks

Honours and Awards

1). 2024 IOP Publishing Top Cited Paper Award for China.

2). Editorial Board Member of Reports on Progress in Physics in IOPSCIENCE.

3). 2020/21 Tianhe Star Award for "outstanding accomplishments and promotion of computational oriented research on the Tianhe supercomputers of China".

4). 2018 Highly Cited Research Article Award by Chinese Physics Society.

5). 2016 Mercator Fellow of the DFG research unit FOR1807 "*Advanced Computational*

Methods for Strongly Correlated Quantum Systems".

6). Citation ~ 8000 (google scholar), h-index 47, ~150 publications.

7). Referee for grants applications of Dutch Research Council, National Research Foundation of Singapore; Referee for promotion at Nanyang Technological University, Singapore; Supervisor of 10 PhD thesis, 5 Postdoctoral fellows.

Representative publications in recent five years

1). *From Fractional Quantum Anomalous Hall Smectics to Polar Smectic Metals: Nontrivial Interplay Between Electronic Liquid Crystal Order and Topological Order in Correlated Topological Flat Bands,*
Hongyu Lu, Han-Qing Wu, Bin-Bin Chen*, Kai Sun*, **Zi Yang Meng*(Corresponding author)**,
Rep. Prog. Phys. 87 108003 (2024).

2). *Thermodynamic Response and Neutral Excitations in Integer and Fractional Quantum Anomalous Hall States Emerging from Correlated Flat Bands*,
Hongyu Lu, Bin-Bin Chen, Han-Qing Wu, Kai Sun*, **Zi Yang Meng*,**
Phys. Rev. Lett. 132, 236502 (2024).

3). *Dimensionality crossover to a two-dimensional vestigial nematic state from a three-dimensional antiferromagnet in a honeycomb van der Waals magnet*,
Zeliang Sun, Gaihua Ye, Mengqi Huang, Chengkang Zhou, Nan Huang, Qiuyang Li, Zhipeng Ye, Cynthia Nnokwe, Hui Deng, David Mandrus, **Zi Yang Meng**, Kai Sun, Chunhui Du, Rui He, Liuyan Zhao,
Nat. Phys. (2024).

4). *Spectral evidence for Dirac spinons in a kagome lattice antiferromagnet*,
Zhenyuan Zeng, Chengkang Zhou, Honglin Zhou, Lankun Han, Runze Chi, Kuo Li, Maiko Kofu, Kenji Nakajima, Yuan Wei, Wenliang Zhang, D. G. Mazzone, **Zi Yang Meng*,** Shiliang Li*,
Nat. Phys. 20, 1097(2024).

5). *Thermodynamic characteristic for correlated flat-band system with quantum anomalous Hall ground state,*
Gaopei Pan, Xu Zhang, Hongyu Lu, Heqiu Li, Bin-Bin Chen, Kai Sun*, **Zi Yang Meng*,**
Phys. Rev. Lett. 130, 016401 (2023).

6). *Emergent glassy behavior in a kagome Rydberg atom array,*
Zheng Yan, Yan-Cheng Wang, Rhine Samajdar, Subir Sachdev*, **Zi Yang Meng*,**
Phys. Rev. Lett. 130, 206501 (2023).

7). *Intrinsic nonlinear Hall effect and gate-switchable Berry curvature sliding in twisted bilayer graphene,*
Meizhen Huang, Zefei Wu, Xu Zhang, Xuemeng Feng, Zishu Zhou, Shi Wang, Yong Chen, Chun Cheng, Kai Sun, **Zi Yang Meng*,** Ning Wang*,
Phys. Rev. Lett. 131, 066301 (2023) Editors' Suggestion.

8). *Triangular lattice quantum dimer model with variable dimer density,*
Zheng Yan, Rhine Samajdar, Yan-Cheng Wang, Subir Sachdev*, **Zi Yang Meng*,**
Nature Communications 13, 5799 (2022).

9). *Monte Carlo study of the pseudogap and superconductivity emerging from quantum magnetic fluctuations,*
Weilun Jiang, Yuzhi Liu, Avraham Klein, Yuxuan Wang, Kai Sun, Andrey V. Chubukov*,

Zi Yang Meng*,
Nature Communications 13, 2655 (2022)
10). *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)

Representative publications beyond recent five-year period

1*). 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).
2). *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).
3). *Itinerant Quantum Critical Point with Fermion Pockets and Hot Spots*,
Zi Hong Liu, Gaopei Pan, Xiao Yan Xu, Kai Sun, **Zi Yang Meng***,
Proc. Natl. Acad. Sci. U.S.A. 116 (34), 16760-16767 (2019).
4). *Monte Carlo Study of 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).
5). *Role of Noether's Theorem at the Deconfined Quantum Critical Point*,
Nvsen Ma, Yi-Zhuang You, **Zi Yang Meng*,**
Phys. Rev. Lett. 122, 175701 (2019).
6). *Nearly deconfined spinon excitationns 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).
7). 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*,**
Phys. Rev. X 7, 031052 (2017).
8). *Self-Learning Monte Carlo Method,*
Junwei Liu, Yang Qi, **Zi Yang Meng,** Liang Fu,
Phys. Rev. B. 95. 041101(R) (2017).
9). *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)
10). *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).

Recent Research Grants

1). PI of Research Grant Council (RGC) of Hong Kong General Research Fund Scheme
Project No.: 17301924
Project title: Precise computation of quantum entanglement in many-body systems,
Funding year: 2025 - 2028 (on-going)
Amount: 910,742 HKD
2). Project Coordinator (PC) of RGC Collaborative Research Fund (CRF) Scheme
Project No.: C7037-22GF
Project title: Many-body paradigm in quantum moiré material research
Funding year: 2023 – 2026 (on-going)
Amount: 5,964,800 HKD
3). Principle Investigator (PI) of French National Research Agency (Agence Nationale de la Recherche) and RGC of Hong Kong Joint Research Scheme
Project No.: A_HKU703/22
Project title: Automate: Advanced Numerical Methods for Highly Entangled Quantum Matter
Funding year: 2023 – 2027 (on-going)
Amount: 3,000,000 HKD
4). PI of RGC of Hong Kong General Research Fund Scheme
Project No.: 17302223
Project title: The novel phases and numerical simulation of Rydberg arrays,
Funding year: 2024 - 2025 (on-going)
Amount: 428,794 HKD
5). PI of RGC of Hong Kong General Research Fund Scheme
Project No.: 17309822
Project title: Quantum moiré materials and non-local measurements for quantum matter,
Funding year: 2023 - 2025 (on-going)
Amount: 783,000 HKD
6). PI of RGC of Hong Kong General Research Fund Scheme
Project No.: 17301721
Project title: Computational investigations on correlated quantum materials
Funding year: 2022 - 2024 (completed)
Amount: 598,015 HKD
7). Co-Investigator of RGC of Hong Kong Areas of Excellence (AoE) Scheme
Project No.: AoE/P-701/20
Project title: 2D materials research: fundamentals towards emerging technologies
Funding year: 2021 - 2029 (on-going)
Amount: 92,021,000 HKD
8). PI of RGC of Hong Kong General Research Fund Scheme
Project No.: 17301420
Project title: Computational artificial intelligence on quantum many-body systems
Funding year: 2021 - 2023 (completed)
Amount: 899,792 HKD
9). PI of RGC of Hong Kong General Research Fund Scheme
Project No.: 17303019,
Project title: Large-scale quantum simulations of criticality and dynamics of correlated electron systems
Funding year: 2019 - 2022 (completed)
Amount: 753,667 HKD

Others

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

Graduated 10 PhD students, 5 Postdoctoral fellows as supervisor.

Currently supervising of 6 PhD students and 3 Postdoctoral fellows.

Teaching at all university levels, create new undergraduate course "PHYS3151: Machine Learning in Physics" and undergraduate/graduate course "PHYS4150/8150: Computational Physics" in HKU. Both courses are with the highest student rating in the department.

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

Members of The HKU Musketeers Foundation Institute of Data Science, Panel member of the HKU-TCL Joint Research Center for AI.