

# Zehao Dong

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## Profile

I am a PhD candidate in Physics at Tsinghua University, focusing on strongly correlated quantum materials and advanced electron microscopy. I develop GPU-accelerated multislice electron ptychography (MEP) to visualize atomic-scale defects and dopants in three dimensions.

## Research Interests

- High-temperature superconductivity in cuprates and nickelates;
- Scanning transmission electron microscopy at atomic resolution
- Multislice electron ptychography; GPU-accelerated computational imaging and phase retrieval

## Education

**Tsinghua University**, PhD in Physics 2022 – present

- Research: Electron ptychography (MEP), 4D-STEM, strongly correlated materials (nickelates/cuprates)
- Advisors: Prof. Yayu Wang; Prof. Zhen Chen

**Peking University**, BSc in Physics 2018 – 2022

## Selected Publications

- **Interstitial oxygen order and its competition with superconductivity in  $\text{La}_2\text{PrNi}_2\text{O}_{7+\delta}$**  2025  
**Zehao Dong**<sup>†</sup>, Gang Wang<sup>†</sup>, Ningning Wang<sup>†</sup>, Wen-Han Dong<sup>†</sup>, Lin Gu, Yong Xu, Jinguang Cheng\*, Zhen Chen\* & Yayu Wang\*  
 Nature Materials (2025), 10.1038/s41563-025-02351-2
- **Sub-nanometer depth resolution and single dopant visualization achieved by tilt-coupled multislice electron ptychography** 2025  
**Zehao Dong**, Yang Zhang, Chun-Chien Chiu, Sicheng Lu, Jianbing Zhang, Yu-Chen Liu, Suyu Liu, Jan-Chi Yang, Pu Yu, Yayu Wang & Zhen Chen\*  
 Nature Communications, 16, 1219 (2025)
- **Visualization of oxygen vacancies and self-doped ligand holes in  $\text{La}_3\text{Ni}_2\text{O}_{7-\delta}$**  2024  
**Zehao Dong**<sup>†</sup>, Mengwu Huo<sup>†</sup>, Jie Li<sup>†</sup>, Jingyuan Li, Pengcheng Li, Hualei Sun, Lin Gu, Yi Lu\*, Meng Wang\*, Yayu Wang\* & Zhen Chen\*  
 Nature, 641, 70-75 (2024)
- **The emergence of global phase coherence from local pairing in underdoped cuprates** 2023  
 Shusen Ye, Changwei Zou, Hongtao Yan, Yu Ji, Miao Xu, **Zehao Dong**, Yiwen Chen, Xingjiang Zhou & Yayu Wang\*  
 Nature Physics, 19, 1301-1307 (2023)
- **Planar tunneling spectroscopy on van der Waals superconductors with  $\text{AlO}_x$  junction grown by ALD** 2023  
 Yu Ji, Hao Wang, **Zehao Dong**, Shusen Ye, Qingyang Li, Zhiting Gao, G. D. Gu, Zhenqi Hao, Yayu Wang\*  
 J. Appl. Phys., 133, 013903 (2023)

(For a complete and up-to-date list, please see my Google Scholar)

## Research Experience

<b>PhD Research</b> , Tsinghua University, Department of Physics	2022 – present
<ul style="list-style-type: none"><li>• Developed GPU-accelerated multislice electron ptychography (MEP) pipelines.</li><li>• Introduced tilt-coupled MEP for sub-nanometer depth resolution and single-dopant 3D visualization.</li><li>• Applied 4D-STEM/MEP to nickelate superconductors to quantify oxygen vacancies, ligand holes, and interstitial oxygen ordering.</li><li>• Tools: MATLAB, Python; NVIDIA A100/RTX 4090 clusters; STEM and EELS.</li></ul>	
<b>Undergraduate Research</b> , Peking University, School of Physics	2019 – 2022
<ul style="list-style-type: none"><li>• Fabricated ALD-grown <math>\text{AlO}_x</math> planar tunnel junctions for vdW superconductors.</li><li>• Low-<math>T</math> spectroscopy and angular magnetotransport.</li><li>• STM/tunneling spectroscopy on cuprates and conventional superconductors.</li></ul>	

## Fundings & Awards

• <b>NSFC's Young Scientists Fund for Graduate Students</b> (Grant No. 124B2068)	2025 – 2026
• <b>National Scholarship for Graduate Students</b> , Ministry of Education, China	2024 & 2025
• <b>Best Oral Presentation Award</b> , 20th International Microscopy Congress, Busan	2023
• <b>Gold Medalist</b> , 49th International Physics Olympiad (IPhO)	2018

## Conference Presentations

• <b>CPS Fall Meeting, Harbin, China</b> <i>Interstitial oxygen order and its competition with superconductivity in <math>\text{La}_2\text{PrNi}_2\text{O}_{7+\delta}</math></i>	2025 (Poster)
• <b>CPS Fall Meeting, Haikou, China</b> <i>Visualization of oxygen vacancies and self-doped ligand holes in <math>\text{La}_3\text{Ni}_2\text{O}_{7-\delta}</math></i>	2024 (Oral)
• <b>Advanced Transmission Electron Microscopy Conference, Hong Kong, China</b> <i>Visualization of oxygen vacancies and self-doped ligand holes in <math>\text{La}_3\text{Ni}_2\text{O}_{7-\delta}</math></i>	2024 (Poster)
• <b>20th International Microscopy Congress, Busan, South Korea</b> <i>Improving depth resolution using tilt-series coupled multislice electron ptychography</i>	2023 (Oral)

## Technical Skills

- **Experimental:** STEM/4D-STEM, electron ptychography, EELS;
- **Programming:** MATLAB, Python; GPU computing
- **Languages:** Chinese (Native), English (Fluent)