DAN, JIADONG

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Research Interests
Machine Learning
Electron Microscopy
Computational Imaging

EDUCATION

National University of Singapore — Singapore
Ph.D. in Integrative Sciences and Engineering (Advisor: Prof. Stephen J. Pennycook) — *2015 – 2020*
Areas of concentration: electron microscopy, machine learning

Shandong University — Shandong
B.Eng. in Materials Sciences & Engineering — *2011 – 2015*
Graduated in the top 5% of the class

National Cheng Kung University — Tainan
Exchange Student in Department of Materials Sciences & Engineering — *2013*
Overall Grade: 92.9/100

RESEARCH EXPERIENCE

Eric and Wendy Schmidt AI in Science Fellow — 2023 – Present
Center for Bioimaging Sciences, National University of Singapore — *Singapore*

- Designing software for quantitative electron microscopy data analysis.
- Developing AI copilot systems for next-generation electron microscope.

Research Fellow — 2020 – 2023
Department of Biological Sciences, National University of Singapore — *Singapore*

- Pioneered structural motifs and their hierarchies in disordered materials.
- Developed algorithms to represent and classify structural motifs
- Developed machine learning frameworks to learn motif compositional rules.

FELLOWSHIPS & AWARDS

(2024) Project Proposal Selected for Oxford RSE Workshop (VIDAR) — 2024
Oxford Research Software Engineering Workshop, University of Oxford — *UK*

(2024) Kavli IPMU Travel Award (AI-driven discovery in physics and astrophysics) — 2024
The CD3 x Simons Foundation workshop, Kavli IPMU — *Japan*

(2023) IFSM Young Scientist (*sole recipient from Singapore*) — 2023
International Federation of Societies for Microscopy (IFSM) — *USA*

(2023) The Eric and Wendy Schmidt AI in Science Fellowship — 2023
Schmidt Sciences — *USA*
Amount: S$202,000 for independent research and professional development

(2022) Postdoctoral Scholar Award (*sole recipient from Singapore*) — 2022
Microscopy Society of America — *USA*

(2015) NUS-NGS Scholarship (one of 44 international recipients) — 2015
National University of Singapore — *Singapore*
Amount: S$168,000 awarded as a Ph.D. research scholarship

(2012) First-Class Academic Excellence Scholarship (top 2%) — 2012
Shandong University — *China*

Academic Service

Mentorship

Master Student(s): *Cheng Zhang (NUS, 2021 – 2023)*

Peer Review

Contributed reviews to *Microscopy & Microanalysis*, *Scientific Reports*, *Molecules*, *Electronics*, *Entropy*, *Nanomaterials*, and *Algorithms*

Professional Leadership

Post-doc subcommittee officer at Microscopy Society of America (2023 – present), and co-organized the *Postdoc and Early Career Professional Development Event* at M&M 2024

Public Engagement and Science Communication

Press interviews for *NUS Faculty of Science Research News*

Conference & Seminar Presentations

Poster presentation at *Microscopy & Microanalysis 2022*, Portland, USA	*Aug. 2022*
Invited talk at Institute of Engineering Innovation, The University of Tokyo, Japan (hosted by Prof. Ryo Ishikawa)	*Apr. 2023*
Invited talk at School of Materials Science and Engineering, Peking University, China (hosted by Prof. Xiaoxu Zhao)	*May 2023*
Invited talk at School of Physics, University of Chinese Academy of Sciences, China (hosted by Prof. Wu Zhou)	*May 2023*
Poster presentation at *Microscopy & Microanalysis 2023*, Minneapolis, USA	*Jul. 2023*
Oral presentation at 20th International Microscopy Congress, Busan, Korea	*Sep. 2023*
Oral presentation at Institute of Physics Singapore Meeting, Singapore	*Sep. 2023*
Invited talk at 2023 Chinese Electron Microscopy Society (CEMS) Meeting, China	*Oct. 2023*
Oral presentation at AI for Science Summit, University of Cambridge, UK	*Dec. 2023*
Fireslide oral at the CD3 $\times$ Simons Foundation workshop, Kavli IPMU, Japan	*Jan. 2024*
Invited talk at Anhui University, China (hosted by Prof. Dongsheng Song)	*Apr. 2024*
Poster presentation at *Microscopy & Microanalysis* 2024, Cleveland, USA	*Aug. 2024*
Poster presentation at the Faculty of Science 95th Anniversary Symposium, NUS, Singapore	*Sep. 2024*
Oral presentation at Materials Research Society (MRS) Fall Meeting, Boston, USA	*Dec. 2024*
Poster presentation at Meet the New Faculty Candidate Session at MRS Fall Meeting, Boston, USA	*Dec. 2024*

Softwares

motif-learn — *Primary Developer*
https://github.com/jiadongdan/motif-learn

defect-learn — *Primary Developer*
https://github.com/jiadongdan/defect-learn

stemplot — *Primary Developer*
https://github.com/jiadongdan/stemplot

VIDAR — *Primary Developer*
https://github.com/jiadongdan/VIDAR

Teaching Experience

Experiments in Chemistry III (CM2192)

2015 – 2016
Graduate Teaching Assistant — *NUS*

- Grading lab reports, supervising lab sessions, and leading discussions on experimental techniques.

Engineering Principles & Practices II (EG1112)

2016 – 2017
Graduate Teaching Assistant — *NUS*

- Grading exams and assignments, and facilitating group discussions on engineering concepts.

Engineering Principles & Practices I (EG1111)

2017 – 2018
Graduate Teaching Assistant — *NUS*

- Grading exams and assignments, and facilitating group discussions on engineering concepts.

Publications (h-index: 18 with 1,819 citations)

29. Physics through the microscope
    Stephen J. Pennycook, Ryo Ishikawa, Haijun Wu, Xiaoxu Zhao, Changjian Li, N. Duane Loh, **Jiadong Dan**, Wu Zhou
    Chinese Physics B, 2024
28. Can conventional classifiers outperform neural networks in identifying structural defects from atomic resolution micrographs?
    Jiadong Dan*, Cheng Zhang, N. Duane Loh
    Microscopy and Microanalysis, 2024
27. Symmetry quantification and segmentation in STEM imaging through Zernike moments
    Jiadong Dan*, Cheng Zhang, Xiaoxu Zhao, N. Duane Loh*
    Chinese Physics B, 2024 (editor's suggestion)
26. Atomically engineering metal vacancies in monolayer transition metal dichalcogenides
    Xiaocang Han, Mengmeng Niu, Yan Luo, Runlai Li, **Jiadong Dan**, Yanhui Hong, Xu Wu, Alex V. Trukhanov, Wei Ji, Yeliang Wang, Jiahuan Zhou, Jingsi Qiao, Jin Zhang, Xiaoxu Zhao
    Nature Synthesis, 2024 (featured with a News and Views by Marijn A. van Huis)
25. A multiscale generative model to understand disorder in domain boundaries
    Jiadong Dan*, Moaz Waqar, Ivan Erofeev, Kui Yao, John Wang, Stephen J. Pennycook, and N. Duane Loh*
    Science Advances, 2023 (featured by NUS Faculty of Science Research News)
24. Exploring the emergence of complex grain boundary structures via hybrid probabilistic generative model
    Jiadong Dan*, Moaz Waqar, Stephen J. Pennycook, and N. Duane Loh
    Microscopy and Microanalysis, 2023
23. Exploring motifs and their hierarchies in crystals via unsupervised learning
    Jiadong Dan, Xiaoxu Zhao, Qian He, N. Duane Loh and Stephen J. Pennycook
    Microscopy and Microanalysis, 2022
22. Navigating the nanoworld: automatic feature recognition
    Stephen J. Pennycook, **Jiadong Dan**, Xiaoxu Zhao, Shoucong Ning, Wu Zhou, Qian He, N Duane Loh
    Microscopy and Microanalysis, 2022
21. Learning motifs and their hierarchies in atomic resolution microscopy
    Jiadong Dan, Xiaoxu Zhao, Shoucong Ning, Jiong Lu, Kian Ping Loh, Qian He, N. Duane Loh*, and Stephen J. Pennycook*
    Science Advances, 2022 (featured by NUS Faculty of Science Research News)
20. Strong moiré excitons in high-angle twisted transition metal dichalcogenide homobilayers with robust commensuration
    Xiaoxu Zhao, Jingsi Qiao, Xin Zhou, Hao Chen, Jun You Tan, Hongyi Yu, Si Min Chan, Jing Li, Henshui Zhang, Jiadong Zhou, **Jiadong Dan**, Zhen Liu, Wu Zhou, Zheng Liu, Bo Peng, Longjiang Deng, Stephen J. Pennycook, Su Ying Quek, Kian Ping Loh
    Nano Letters, 2022
19. Improving photoelectrochemical activity of ZnO/TiO_2 core–shell nanostructure through Ag nanoparticle integration
    Wang, Zeli, Zhen Chen, **Jiadong Dan**, Weiqiang Chen, Chenghang Zhou, Zexiang Shen, Tze Chien Sum, and Xue-Sen Wang
    Catalysts, 2021
18. Unveiling atomic-scale moiré features and atomic reconstructions in high-angle commensurately twisted transition metal dichalcogenide homobilayers
    Xiaoxu Zhao, Jingsi Qiao, Si Min Chan, Jing Li, **Jiadong Dan**, Shoucong Ning, Wu Zhou, Su Ying Quek, Stephen J. Pennycook, Kian Ping Loh
    Nano Letters, 2021
17. Engineering covalently bonded 2D layered materials by self-intercalation
    Xiaoxu Zhao, Peng Song, Chengcai Wang, Anders C Riis-Jensen, Wei Fu, Ya Deng, Dongyang Wan, Lixing Kang, Shoucong Ning, **Jiadong Dan**, T Venkatesan, Zheng Liu, Wu Zhou, Kristian S Thygesen, Xin Luo, Stephen J. Pennycook, Kian Ping Loh
    Nature, 2020 (featured by NUS Faculty of Science Research News)
16. Chemically exfoliated VSe_2 monolayers with room-temperature ferromagnetism
    Wei Yu, Jing Li, Tun Seng Herng, Zishen Wang, Xiaoxu Zhao, Xiao Chi, Wei Fu, Ibrahim Abdelwahab, Jun Zhou, **Jiadong Dan**, Zhongxin Chen, Zhi Chen, Zejun Li, Jiong Lu, Stephen J. Pennycook, Yuan Ping Feng, Jun Ding, Kian Ping Loh
    Advanced Materials, 2019
15. Growth of Nb-doped monolayer WS_2 by liquid-phase precursor mixing
    Ziyu Qin, Leyi Loh, Junyong Wang, Xiaomin Xu, Qi Zhang, Benedikt Haas, Carlos Alvarez, Hanako Okuno, Justin Zhou Yong, Thorsten Schultz, Norbert Koch, **Jiadong Dan**, Stephen J. Pennycook, Dawen Zeng, Michel Bosman, Goki Eda
    ACS Nano, 2019
14. A machine perspective of atomic defects in scanning transmission electron microscopy
    Jiadong Dan, Xiaoxu Zhao, and Stephen J. Pennycook*
    InfoMat, 2019
13. Defect heterogeneity in monolayer WS_2 unveiled by work function variance
    Xinyun Wang, **Jiadong Dan**, Zhenliang Hu, Jin Feng Leong, Qi Zhang, Ziyu Qin, Shisheng Li, Junpeng Lu, Stephen J. Pennycook, Wanxin Sun, Chorng Haur Sow
    Chemistry of Materials, 2019
12. Engineering and modifying two-dimensional materials via electron beams
    Xiaoxu Zhao, **Jiadong Dan**, Wu Zhou, Kian Ping Loh, Stephen J. Pennycook
    Microscopy and Microanalysis, 2019

11. High-energy gain upconversion in monolayer tungsten disulfide photodetectors
    Qixing Wang, Qi Zhang, Xiaoxu Zhao, Yu Jie Zheng, Junyong Wang, Xin Luo, **Jiadong Dan**, Rui Zhu, Qijie Liang, Lei Zhang, PK Johnny Wong, Xiaoyue He, Yu Li Huang, Xinyun Wang, Stephen J. Pennycook, Goki Eda, Andrew TS Wee
    Nano Letters, 2019
10. Phase-controlled synthesis of monolayer ternary telluride with a random local displacement of tellurium atoms
    Bijun Tang, Jiadong Zhou, Pingping Sun, Xiaowei Wang, Lichun Bai, **Jiadong Dan**, Jiefu Yang, Kun Zhou, Xiaoxu Zhao, Stephen J. Pennycook, Zheng Liu
    Advanced Materials, 2019
9. Edge segregated polymorphism in 2D molybdenum carbide
    Xiaoxu Zhao, Weiwei Sun, Dechao Geng, Wei Fu, **Jiadong Dan**, Yu Xie, Paul RC Kent, Wu Zhou, Stephen J. Pennycook, Kian Ping Loh
    Advanced Materials, 2019
8. Healing of planar defects in 2D materials via grain boundary sliding
    Xiaoxu Zhao, Yujin Ji, Jianyi Chen, Wei Fu, **Jiadong Dan**, Yuanyue Liu, Stephen J. Pennycook, Wu Zhou, Kian Ping Loh
    Advanced Materials, 2019
7. Effects of precursor pre-treatment on the vapor deposition of WS_2 monolayers
    Mei Er Pam, Yumeng Shi, Junping Hu, Xiaoxu Zhao, **Jiadong Dan**, Xue Gong, Shaozhuan Huang, Dechao Geng, Stephen J. Pennycook, Lay Kee Ang, Hui Ying Yang
    Nanoscale Advances, 2019
6. Molecular-beam epitaxy of two-dimensional In_2Se_3 and its giant electroresistance switching in ferroresistive memory junction
    Sock Mui Poh, Sherman Jun Rong Tan, Han Wang, Peng Song, Irfan H Abidi, Xiaoxu Zhao, **Jiadong Dan**, Jingsheng Chen, Zhengtang Luo, Stephen J. Pennycook, Antonio H Castro Neto, Kian Ping Loh
    Nano Letters, 2018
5. Molecular beam epitaxy of highly crystalline $MoSe_2$ on hexagonal boron nitride
    Sock Mui Poh, Xiaoxu Zhao, Sherman Jun Rong Tan, Deyi Fu, Wenwen Fei, Leiqiang Chu, **Jiadong Dan**, Wu Zhou, Stephen J. Pennycook, Antonio H Castro Neto, Kian Ping Loh
    ACS Nano, 2018
4. Atom-by-atom fabrication of monolayer molybdenum membranes
    Xiaoxu Zhao#, **Jiadong Dan#**, Jianyi Chen, Zijing Ding, Wu Zhou, Kian Ping Loh, Stephen J. Pennycook
    Advanced Materials, 2018
3. Strain modulation by van der Waals coupling in bilayer transition metal dichalcogenide
    Xiaoxu Zhao, Zijing Ding, Jianyi Chen, **Jiadong Dan**, Sock Mui Poh, Wei Fu, Stephen J. Pennycook, Wu Zhou, Kian Ping Loh
    ACS Nano, 2018
2. Mo-terminated edge reconstructions in nanoporous molybdenum disulfide film
    Xiaoxu Zhao, Deyi Fu, Zijing Ding, Yu-Yang Zhang, Dongyang Wan, Sherman JR Tan, Zhongxin Chen, Kai Leng, **Jiadong Dan**, Wei Fu, Dechao Geng, Peng Song, Yonghua Du, T Venkatesan, Sokrates T Pantelides, Stephen J. Pennycook, Wu Zhou, Kian Ping Loh
    Nano Letters, 2018
1. Ultrathin nickel boron oxide nanosheets assembled vertically on graphene: a new hybrid 2D material for enhanced photo/electro-catalysis
    Min-Quan Yang, **Jiadong Dan**, Stephen J. Pennycook, Xin Lu, Hai Zhu, Qing-Hua Xu, Hong Jin Fan, Ghim Wei Ho
    Materials Horizons, 2017