Sean Chen

Email: sean.chen3@mail.mcgill.ca

Education:

McGill University, M.Sc in Physics (2026)
University of British Columbia, B.Sc in Honours Physics (2023)

Technical Skills:

- Proficient with Python; used for condensed matter simulations, ray tracing simulations, a puzzle solving program, and data analysis in coursework
- Proficient with atomic force microscopy; used for characterizing thickness and surface potential of 2D materials
- Familiar with fabrication of van der Waals (vdW) heterostructures and thermal scanning probe lithography
- Familiar with MATLAB; used for data analysis in math and physics courses
- Familiar with Wolfram Mathematica; used for condensed matter simulations
- Familiar with electronics
- Basic CAD experience; designed electrostatic lenses and vdW heterostructure stacking setup components

Research Experience:

- Characterizing persistent photoconductivity in monolayer WS_2 on SiO_2 substrate using Kelvin probe force microscopy & construction of a vdW heterostructure stacking setup in a glovebox, supervised by Dr. Peter Grutter at McGill University. Presented at an undergraduate symposium (May 2023 - present).
- Fabricated 3R-MoS_2 photodetectors to measure temperature dependence of photocurrent and electrical resistance, and to create an electrically-switchable photodetector; theoretically analyzed temperature dependence of zero-bias resistance. Supervised by Dr. Ziliang Ye at UBC (Oct 2022 - Apr 2023).
- Theoretically investigated boundary effects on pairing symmetries in unconventional superconductors by solving the Bogoliubov-De Gennes equations on a finite square lattice with on-site and nearest neighbour interaction; presented in an undergraduate poster symposium. Supervised by Dr. Frank Marsiglio at the University of Alberta (May - Aug 2022).
- Theoretically modeled charge doping from substrate to 3R-MoS_2 nanoflakes using a Thomas-Fermi model. This project was led by Dr. Jing Liang and supervised by Dr. Ziliang Ye at UBC (Nov - Dec 2021).
- Designed electrostatic lenses for NanoMi open source electron microscope using CAD, wrote ray tracing simulations in python to simulate the lens's optical properties, assembled and disassembled a UHV chamber, performed experimental measurements of lens's optical properties. This project was supervised by Dr. Marek Malac at the National Institute of Nanotechnology in Edmonton (Jan - Aug, 2019 & Sep - Dec, 2020).

Awards:

- NSERC USRA at University of Alberta (May - Aug 2022)
- NSERC USRA at Simon Fraser University (May - Aug 2020)
- 12th place in CAP Physics Exam nationwide; qualified for Canadian Physics Olympiad (national finals May 2016)
- 3rd place in CAP Physics Exam in British Columbia (2017)
- Dean's Honour List (2019W and 2022W)

Publications:

- S. Fauzia, S. Chen (equal contribution), R.-J. Hsu, R. Chen, CM. Chen, **Solving puzzles using knowledge-based automation: biomimicry of human solvers**, https://doi.org/10.1007/s40747-024-01440-0
- J. Liang, D. Yang, Y. Xiao, S. Chen, J. I. Dadap, J. Rottler, Z. Ye **Shear Strain-Induced Two-Dimensional Slip Avalanches in Rhombohedral MoS2**, **Nano Letters, 23, 15, 7228–7235 (2023)**
- M. Malac, et al., **NanoMi: An open source electron microscope hardware and software platform**, **https://doi.org/10.1016/j.micron.2022.103362**

Conferences:

- P. Senarath Yapa Arachchige, S. Chen, J. Maciejko, F. Marsiglio, **Inhomogeneous Superconductivity due to Surfaces**, Bulletin of the American Physical Society (2023)
- J. Liang, D. Yang, Y. Xiao, S. Chen, J. Dadap, J. Rottler, Z. Ye, **Imaging the polarization state in few-layer 3R-MoS_2 with Kelvin Probe Force Microscopy**, Bulletin of the American Physical Society (2023)
- M. Malac, et al, **NanoMi: An Open Source (Scanning) Transmission Electron Microscope**, Microscopy and Microanalysis 26 (S2), 1810-1811
- M. Malac, et al, **NanoMi Open Source (S) TEM Platform: Initial SEM Implementation**, Microscopy and Microanalysis 27 (S1), 1062-1063

Volunteering & Outreach:

- Volunteered for UBC Physics Circle (Problem-solving outreach for high school students) (Sept 2019 – Apr 2021)
- Event organizer for Vancouver High School Science Olympics non-profit science organization (Sep 2015 - Jun 2017)
- Co-president and co-founder, Burnaby North Secondary's STEM Club (Sep 2015 - Jun 2017)
- Ambassador for STEM Fellowship non-profit science organization (Aug 2016 - Jun 2017)
- Volunteered at Seton Villa Retirement Home (Aug 2015 - Jul 2016)
- Volunteered as a physics tutor for Burnaby North Secondary "The Noble Tutors" Chemistry and Physics tutoring club (Sep 2016 - Jun 2017)