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# Vanessa Carling Kwong

## Research Interests

Two-dimensional (2D) semiconducting materials have been of prominence in electronics development due to their excellent features for creating tunable devices from an easily isolable bulk state, mechanically cleaved at the interlayer van der Waals (vdW) forces. I am interested in leveraging these materials, specifically transition metal dichalcogenides (TMDCs) and their unique properties to explore cutting-edge optical (e.g.,correlated states) and magnetotransport (e.g.,Quantum Hall Effect) phenomena for their implementation in advancing optoelectronics development.

## Professional Interests

Interdisciplinary research combined with involvement in undergraduate research advocacy has deepened my commitment to teaching and effectively communicating science across all audiences. My interest lies in the continuing engagement in research advocacy at the undergraduate level, to the extension of protecting these vital research works.

## Education

**University of California, Riverside** — Riverside, CA

*Doctor of Philosophy, Physics* — 2025 - 2031 *(expected)*

- Advisor: Prof. Andrew Joe

*Bachelor of Science, Physics* — 2020 - 2025

- Senior Thesis Advisor: Prof. Andrew Joe

## Experience

**The Joe Lab at UC Riverside** — Dept. of Physics & Astronomy, UCR

*External Researcher* — 2025.04 - 2025.08

- Engineer Ohmic contacts to p-type monolayer $WSe_2$ and $MoSe_2$, measuring quantum transport
- Fabricate devices and study electrical tuning of triplet exciton emission through optical characterisation
- Enhance technical nanofabrication skills through training and assisting students; increase familiarity with cross-campus facilities at UCI IMRI

*Undergraduate Researcher* — 2023.10 - 2025.04

- Develop expertise in fabricating reliable vdW devices through precise patterning and dry transfer of mechanically exfoliated 2D materials
- Perform and analyze optical and transport measurements through MATLAB programming
- Set up new laboratory space and improve lab efficiency by building equipment and training incoming lab members on technical methods

*Research in Science & Engineering (RISE) Student Researcher* — 2024.06 - 2024.08

- Advisor: Prof. Andrew Joe
- Develop low-temperature Pt contacts to monolayer TMDs and test contact resistance
- Assist in fabrication of graphene devices for magnetotransport in search of the Quantum anomalous Hall Effect

## Projects

**Triplet exciton light emission in $MoSe_2$/$WSe_2$ Heterobilayer Devices**
*The Joe Lab, UC Riverside Dept. of Physics and Astronomy* 2025.07 - Present

**Magnetotransport in Monolayer TMD Heterostructure Devices**
*The Joe Lab, UC Riverside Dept. of Physics and Astronomy* 2024.06 - Present

**Pulsed Nuclear Magnetic Resonance**
*PHYS 142W, UC Riverside* 2024.11 - 2024.12

**Gamma Ray Emission of Radioactive Isobars**
*PHYS 142W, UC Riverside* 2024.11

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**Noise Fundamentals**
*PHYS 142W, UC Riverside* 2024.10

**MATLAB Laser Dispersion Program**
*The Joe Lab, UC Riverside Dept. of Physics and Astronomy* 2024.03 - 2024.04

**Mutagenesis of KOIN and WFL in *A. thaliana***
*Dynamic Genome, UC Riverside* 2021.02 - 2021.03

## Presentations

1. "Transport in Monolayer $WSe_2$ Devices,"
   *UC Riverside Dept. of Physics and Astronomy Senior Research Symposium*, Riverside CA (2025.06)
2. Invited Undergraduate Presentation,
   *UC Riverside CNAS for Rep. Mark Takano*, Riverside CA (2025. 04)
3. Undergraduate Research Panelist,
   *California State University, San Bernardino, calSWIFT'25 (California Semiconductor Workforce Development & Innovation for Future Technologies) Symposium*, San Bernardino CA (2025.04)
4. Undergraduate Advocate,
   *Students Transforming Through Research (Council on Undergraduate Research's Advocacy Program)*, Washington DC (2025.03)
5. "Advances in Monolayer TMD Heterostructure Devices,"
   *UC RIverside PHYS 142W Capstone Presentation*, virtual presentation (2025.03)
6. "Quantum Transport in Monolayer TMD Heterostructure Devices,"
   *UC Riverside Research in Science and Engineering (RISE) Symposium*, Riverside CA (2024.08)
7. "Optical Characterization of Two-Dimensional Semiconductor Heterostructures,"
   *UC Riverside Undergraduate Research & Creative Activities Symposium*, virtual presentation (2024.05)
8. "Mutating AT3G08680 to Determine Functional Redundancy in *Arapdidopsis*,"
   *UC Riverside Dynamic Genome*, virtual presentation (2021.03)
9. "Love Gloves?"
   *Los Angeles County Science and Engineering Fair*, Pasadena CA (2018.04)

## Awards

- **R. Stephen White Scholarship**, UC Riverside Dept. of Physics & Astro. 2025.05
- **Dean's List** (multiple), UC Riverside CNAS 2020 - 2025
- **Third Award in Microbiology Senior**, LACSEF 2018.04

## Skills

**Laboratory**: Device fabrication (mechanical exfoliation, dry transfer), scanning electron microscopy (SEM), electron-beam evaporation (EBE) & lithography (EBL), atomic force microscopy (AFM), sputtering, atomic layer etching (ALE), optical spectroscopy, soldering.

**Programming**: MATLAB, Python, C++, HTML, CSS, JavaScript.

**Other**: LaTeX, CAD (KLayout, AutoCAD), Microsoft Office Suite

**Languages**: English (native), Cantonese (native), Mandarin.

## References

Available upon request