# DACEN WATERS, PH.D.

**Assistant Professor - University of Denver**
**Department of Physics and Astronomy**

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## OVERVIEW

I am an experimental condensed matter physicist interested in novel correlated and topological physics in two-dimensional (2D) materials. Owing to their 2D nature, these materials can be assembled into complex heterostructures that are highly tunable, such as with electronic doping, displacement field, magnetic field, and relative twist angles between neighboring layers. These capabilities make 2D materials an exciting candidate for future quantum information devices.

## EMPOLYMENT

### Assistant Professor
**Department of Physics and Astronomy, University of Denver**
September 2024 – Present  Denver, CO

### Postdoctoral Research Fellow
**Department of Physics, University of Washington**
August 2020 – August 2024  Seattle, WA

### Graduate Research Associate
**Department of Physics, Carnegie Mellon University**
August 2016 – August 2020  Pittsbugh, PA

## EDUCATION

### Ph.D. in Physics
**Carnegie Mellon University**
May 2016 – August 2020

### M.S. in Physics
**Carnegie Mellon University**
August 2014 – May 2016

### B.S. in Physics and Mechanical Engineering
**Arkansas Tech University**
August 2009 – December 2013

## SELECT HONORS AND AWARDS

### Intelligence Community Postdoctoral Fellowship
**Oak Ridge Institute for Science and Education**
October 2022 – August 2024

### George E., S 1945, and Marjorie S. Pake Presidential Fellowship in Physics
**Carnegie Mellon University**
August 2017 – May 2018

### Outstanding Teaching Assistant
**Physics Department - Carnegie Mellon University**
June 2015

## PUBLICATIONS

### Preprints

- **D. Waters**, D. Waleffe, E. Thompson, E. Arreguin-Martinez, J. Fonseca, T. Poirier, J. H. Edgar, X. Xu, C. Cobden, and M. Yankowitz. "On the origin of anomalous hysteresis in graphite/boron nitride transistors", arXiv:2410.02699 (*under review*), (2024)
- **D. Waters**, A. Okounkova, R. Su, B. Zhou, J. Yao, K. Watanabe, T. Taniguchi, X. Xu, Y.-H. Zhang, J. Folk, and M. Yankowitz. "Interplay of electronic crystals with integer and fractional Chern insulators in moiré pentalayer graphene", arXiv:2408.10133 (*under review*), (2024)
- R. Su, **D. Waters**, B. Zhou, K. Watanabe, T. Taniguchi, Y.-H. Zhang, M. Yankowitz, and J. Folk. "Topological electronic crystals in twisted bilayer-trilayer graphene", arXiv:2406.17766 (*accepted in Nature*), (2024)

- **D. Waters**, R. Su, E. Thompson, A. Okounkova, E. Arreguin-Martinez, M. He, K. Hinds, K. Watanabe, T. Taniguchi, X. Xu, Y.-H. Zhang, J. Folk, and M. Yankowitz. "Topological flat bands in a family of multilayer graphene moiré lattices", arXiv:2405.05913 (*accepted in Nature Communications*), (2024)

### Refereed Journal Articles

- **D. Waters**, E. Thompson, E. Arreguin-Martinez, M. Fujimoto, Y. Ren, K. Watanabe, T. Taniguchi, T. Cao, D. Xiao, and M. Yankowitz. "Mixed-dimensional moiré systems of twisted graphitic thin-films", *Nature* (2023)
- D. Saha, **D. Waters**, C.-C. Yeh, S. M. Mhatre, N. T. M. Tran, H. M. Hill, K. Watanabe, T. Taniguchi, D. B. Newell, M. Yankowitz, and A. F. Rigosi, "Graphene-based analog of single-slit electron diffraction", *Physical Review B* (2023)
- F. Lüpke, **D. Waters**, A. D. Pham, J. Yan, D. G. Mandrus, P. Ganesh, and B. M. Hunt. "Quantum spin hall edge states and interlayer coupling in twisted bilayer $WTe_2$", *ACS Nano Letters* (2022)
- J. Wright, C. Chang, **D. Waters**, F. Lüpke, R. M. Feenstra, L. Raymond, R. Koscica, G. Khalsa, D. Muller, H. G. Xing, and D. Jena, "Unexplored MBE growth mode reveals new properties of superconducting NbN", *Physical Review Materials* (2021)
- S. Subramanian, Q. T. Campbell, S. K. Moser, J. Kiemle, P. Zimmermann, P. Seifert, F. Sigger, D. Sharma, H. Al-Sadeg, M. Labella, **D. Waters**, R. M. Feenstra, R. J. Koch, C. Jozwiak, A. Bostwick, E. Rotenberg, I. Dabo, A. W. Holleitner, T. E. Beechem, U. Wurstbauer, J. A. Robinson, "Photophysics and electronic structure of lateral graphene/$MoS_2$ and Metal/$MoS_2$ junctions", *ACS Nano* (2020)
- **D. Waters**, Y. Nie, F. Lüpke, Y. Pan, S. Fölsch, Y.-C. Lin, B. Jariwala, K. Zhang, C. Wang, H. Lv, K. Cho, D. Xiao, J. A. Robinson, and R. M. Feenstra. "Flat bands and mechanical deformation effects in the moiré superlattice of $MoS_2$-$WSe_2$ heterobilayers", *ACS Nano* (2020)
- F. Lüpke, **D. Waters**, S. C. de la Barrera, M. Widom, D. G. Mandrus, J. Yan, R. M. Feenstra, and B. M. Hunt. "Proximity-induced superconducting gap in the quantum spin Hall edge state of monolayer $WTe_2$", *Nature Physics* (2020)
- Y. Pan, S. Fölsch, Y. Nie, **D. Waters**, Y.-C. Lin, B. Jariwala, K. Zhang, K. Cho, J. A. Robinson, and R. M. Feenstra. "Quantum-confined electronic states arising from the moiré pattern of $MoS_2$-$WSe_2$ heterobilayers", *ACS Nano Letters* (2019)

## PRESENTATIONS

### Invited colloquiua/seminars

- "A new twist on topological moiré materials". Pittsburgh Quantum Institute. Pittsburgh, PA. November 2024.
- "A new twist on graphite". Colorado State University - Fort Collins, CO. October 2024
- "A new twist on graphite". University of Kansas - Lawrence, KA. October 2024
- "A new twist on graphite". University of Denver - Denver, CO. February 2024
- "A new twist on graphite". University of Maryland Baltimore County - Baltimore, MD. February 2024
- "A new twist on graphite". Reed College - Portland, OR. October 2023.
- "Moiré tuning of transport properties in multilayer graphite". Columbia University - Programmable Quantum Materials Seminar. New York, NY. October, 2023.

### Contributed presentations

- "Massive hysteresis and out-of-equilibrium behavior in graphitic thin-film devices". American Physical Society March Meeting. Minneapolis, MN. March 2024.
- "Moiré effects in twisted graphene/graphite heterostructures" - Part 2 of 2. American Physical Society March Meeting. Las Vegas, NV. March 2023.
- "Mixed-dimensional moiré tuning of transport properties in graphite thin films". Graphene Conference 2023 - Plenary Session. Manchester, UK. July 2023.
- "Moiré tuning of transport properties in multilayer graphite". Gordon Research Conference on Topological and Correlated Matter - Poster. Ventura, CA. June 2023.
- "Strongly correlated states in twisted graphene multilayers". American Physical Society March Meeting. Chicago, IL. March 2022.
- "Quantum spin Hall edge states in twisted bilayer 1T'-$WTe_2$". American Physical Society March Meeting. Virtual Meeting. March 2021.
- "Flat bands and mechanical deformation effects in the moiré superlattice of $MoS_2$-$WSe_2$ heterobilayers". ICFO School on the Frontiers of Ligh Emergent Phenomena in Moiré Materials - Virtual Poster. July 2020.
- "Coexistence of quantum spin Hall edge state and proximity-induced superconducting gap in monolayer 1T'-$WTe_2$". Pittsburgh Quantum Institute - Poster. Pittsburgh, PA. April 2019.
- "Role of strain in quantum-confined states of 2D material heterobilayers". American Physical Society March Meeting. Boston, MA. March 2019.
- "Quantum-confined states and band shifts arising from moiré patterns in $MoS_2$-$WSe_2$ heterojunctions". American Physical Society March Meeting. Los Angeles, CA. March 2018.

## TEACHING

- 2022 (Winter): Physics 116: Waves, Optics, Atoms and Nuclei - University of Washington, substitute course instructor
- August 2014 – August 2019: Future Faculty Program Participant - Eberly Center for Teaching Excellence & Educational Innovation, Carnegie Mellon University
- August 2014 – December 2017: Teaching assistant - Carnegie Mellon University

# SERVICE ROLES

## Journal Referee

Physical Review Letters, Physical Review X, Physical Review B, Nature Physics

## University Committees

- October 2024 – Present: Undergraduate Student Committee - Department of Physics and Astronomy, University of Denver
- October 2024 – Present: Graduate Student Committee - Department of Physics and Astronomy, University of Denver

## Other

- June 2019 – May 2020: President - Carnegie Mellon University Graduate Student Assembly
- June 2017 – May 2018: Vice President of Communications - Carnegie Mellon University Graduate Student Assembly

# OUTREACH

- Public seminar at the American Physical Society Conference for Undergraduate Women in Physics. Seattle, WA. January, 2023.