

# Arman Duha

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🔗 Google Scholar

## Professional Summary

Computational condensed matter and AMO physicist, specializing in quantum many-body dynamics, quantum simulation, metrologically useful entanglement generation, and topological materials. Experienced in designing and simulating complex quantum systems, including 2D materials and Floquet-engineered spin models, to advance applications in quantum sensing, computing, and topologically protected states. Proficient in leveraging high-performance computing (HPC) clusters for scientific computing tools (Python, Mathematica).

## Education

<b>Ph.D. in Physics</b> , Oklahoma State University, Stillwater, OK	Expected May 2025
<b>Master of Science in Physics</b> , Oklahoma State University, Stillwater, OK	May 2022
<b>Bachelor of Science in Physics</b> , University of Dhaka, Dhaka, Bangladesh	September 2018

## Relevant Experience

<b>Graduate Research Assistant (Atomic, Molecular, and Optical Physics)</b> <i>Co-advisor: Dr. Thomas Bilitewski, Oklahoma State University</i>	May 2023 – Present
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- Numerically investigated non-equilibrium spin dynamics using Python for quantum simulation and quantum-enhanced sensing (1st project published in PRA, 2nd project ongoing)

<b>Graduate Research Assistant (Solid-state Physics)</b> <i>Co-advisor: Dr. Mario Borunda, Oklahoma State University</i>	June 2020 – Present
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- Performed symbolic regression-based machine learning predictions of threshold displacement energy in materials (preparing manuscript)
- Utilized Mathematica and HPC clusters to simulate quantum transport in two-dimensional Dirac fermions for van der Waals material (published in PRB)
- Simulated efficient perovskite solar cell, funded by NASA Oklahoma EPSCoR (published in Optical Materials)
- Performed molecular dynamics of catalysts for Fischer-Tropsch synthesis using density functional theory (preparing manuscript)

<b>Graduate Teaching Assistant (College Physics 1)</b> <i>Oklahoma State University, Stillwater, OK</i>	August 2019 – May 2020
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- Served as physics lab instructor and organized review sessions before exams, supervising groups of over 40 students.

<b>Undergraduate Research (Quantum Mechanics)</b> <i>Advisor: Dr. S. Hasibul Hassan Chowdhury, University of Dhaka, Bangladesh</i>	June 2018 – June 2019
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- Calculated gauge-invariant energy spectra in 2-dimensional noncommutative quantum mechanics (published in Annals of Physics)

## Publications

- **Arman Duha**, and Mario F. Borunda. "Effect of uncorrelated on-site scalar potential and mass disorder on transport of two-dimensional Dirac fermions." *Physical Review B* 110.9 (2024): 094205.
- **Arman Duha**, and Thomas Bilitewski. "Two-Mode Squeezing in Floquet-Engineered Power-Law Interacting Spin Models." *Physical Review A* 109, no. 6 (June 26, 2024): L061304.
- **Arman Duha**, Borunda M. *Optimization of a Pb-free all-perovskite tandem solar cell with 30.85% efficiency*. *Optical Materials*. 2022 Jan 1.
- Chowdhury SH, Chowdhury TA, **Arman Duha** *Gauge invariant energy spectra in 2-dimensional noncommutative quantum mechanics*. *Annals of Physics* 430 (2021): 168505.

## Presentations

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- Two-mode squeezing and entanglement dynamics for power-law interactions in two-dimensional bi-layer spin system, 2024 APS DAMOP meeting, Fort Worth, TX.
- Two-mode squeezing and entanglement dynamics for power-law interactions in two-dimensional bi-layer spin system, 2024 APS March meeting, Minneapolis, MN.
- Investigating transport properties of Graphene on Boron Nitride, 2023 APS March meeting, Las Vegas, NV.
- Lead-free All-perovskite Tandem Solar Cell, Joint Fall 2022 Meeting of the Texas Section of APS, Houston, TX.
- Lead-free All-perovskite Tandem Solar Cell, 2022 APS March meeting, Chicago.
- EPR Paradox and Bell's Inequality, 2017 Blackboard Lunch Seminar, University of Dhaka, Bangladesh.

## Technical Skills

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- **Programming Languages:** Python, Mathematica, C++
- **Quantum Simulation:** Quantum spin systems, 2D Dirac fermions, van der Waals materials
- **Machine Learning:** Symbolic regression
- **Tools:** DFT (SIESTA) molecular dynamics, Unix shell scripting, UCSF ChimeraX

## Certifications

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| ○ <i>Atomic Astrophysics with Computational Workshop</i> , University of Dhaka | November 2017 |
| ○ <i>Trained mentor</i> , Mentor Collective                                    | August 2021   |

## Honors and Awards

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| ○ 2024 APS DAMOP Student Travel Award                           | June 2024     |
| ○ 4th i-CoMSE DFT Workshop Travel Award                         | June 2023     |
| ○ 2023 APS GERA Energy Workshop Travel Award                    | March 2023    |
| ○ 2022 TSAPS Student Travel Award                               | October 2022  |
| ○ 2nd position: Atomic Astrophysics with Computational Workshop | November 2017 |

## Volunteering Experience

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| ○ Organizer, AMO journal club for undergraduate and graduate students | 2024      |
| ○ Physics demonstrator, OSU outreach program for middle school        | 2024      |
| ○ Mentor, OSU Sophomore Mentor Collective                             | 2021-2022 |
| ○ Examiner, Bangladesh Physics Olympiad                               | 2017-2019 |

## Professional Associations

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| ○ Member, American Physical Society | 2021-Present |
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