

# Nathan Valadez

## Curriculum Vitae

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### EDUCATION

University of Central Florida

*Ph.D in Physics*

Orlando, Florida

*Fall 2022 - Present*

Texas A&M University

*Bachelor of Science in Physics with minor in Mathematics*

College Station, Texas

*Graduated May 2022*

**Awards:** Above & Beyond Award (2024), outReach for the Stars Award (2023), Dr. Joseph Newton Undergraduate Service Award (2022)

### RESEARCH

Neupane Lab: Quantum Material Research Group

*Advisor: Dr. Madhab Neupane*

University of Central Florida

*August 2022-Present*

- Performing the experimental technique known as Angle-Resolved Photoemission Spectroscopy (ARPES) in order to directly visualize electronic band dispersions and characterizing topological materials.
- Continued the investigation on highly-correlated topological materials within the  $LnSbTe$  system by using APRES and presented results made by the group at national and local conferences.
- Presented knowledge gained on topics such as photoelectric spectroscopy, topological quantum materials, magnetic topological materials, and rare Earth based materials.

Analysis of online resources on student learning outcomes (PER)

*Advisor: Dr. Tatiana Erukhimova*

Texas A&M University

*May 2020 – May 2022*

- Performed an investigation on the relation between use of supplemental materials and student performance in a calculus-based introductory electromagnetism course through the use of exam scores and normalized gain on pre and post BEMA examination.
- Analyzed the significance of the data that was collected and considered possible factors that contributed to the data (first generation status, gender, and scores on SAT Math section and TAMU's Math Placement Exam) and ran a paired t-test on the pre and post BEMA examination using SPSS.

Cryogenic Dark Matter Search (CDMS) Group

*Advisor: Dr. Rupak Mahapatra*

Texas A&M University

*May 2019 – May 2020*

- Designed a housing for Cs-I crystals using Solidworks and soldered circuit components on photomultiplier tubes that were used for our Positron Emission Tomography (PET) detector.
- Maintained and serviced the usage of Bluefors SD Dilution Refrigerator and disassembled parts of 2 different dilution refrigerators in order to test components for detectors in cryogenic temperatures.

### PUBLICATIONS

Milo X. Sprague, Anup Pradhan Sakhya, Barun Ghosh, Sabin Regmi, Mazharul Islam Mondal, Iftakhar Bin Elius, **Nathan Valadez**, Dariusz Kaczorowski, Arun Bansil, Madhab Neupane, *Observation of Paramagnetic Spin-Degeneracy Lifting in  $EuZn_2Sb_2$*  (2024), Published: Phys. Rev. B 110, 045130 (2024)

Milo Sprague, Anup Pradhan Sakhya, Sabin Regmi, Mazharul Islam Mondal, Iftakhar Bin Elius, **Nathan Valadez**, Kali Booth, Tetiana Romanova, Andrzej Ptok, Dariusz Kaczorowski, and Madhab Neupane, *Complex Fermiology and Electronic Structure of Antiferromagnet  $EuSnP$* , Published: Phys. Rev. Materials 8, 054411 (2024)

Sabin Regmi, Iftakhar Bin Elius, Anup Pradhan Sakhya, Milo Sprague, Mazharul Islam Mondal, **Nathan Valadez**, Volodymyr Buturlim, Kali Booth, Tetiana Romanova, Krzysztof Gofryk, Andrzej Ptok, Dariusz Kaczorowski, and

Madhab Neupane, *Electronic structure in a rare-earth based nodal-line semimetal candidate PrSbTe*, Published: Phys. Rev. Materials 8, L041201 (2024)

Sabin Regmi, Iftakhar Bin Elius, Anup Pradhan Sakhya, Dylan Jeff, Milo Sprague, Mazharul Islam Mondal, Damani Jarrett, **Nathan Valadez**, Alexis Agosto, Tetiana Romanova, Jiun-Haw Chu, Saiful I. Khondaker, Andrzej Ptok, Dariusz Kaczorowski, Madhab Neupane, *Observation of momentum-dependent charge density wave gap in a layered antiferromagnet GdTe<sub>3</sub>*, Published: Scientific Reports 13, 18618 (2023)

Sabin Regmi, Anup Pradhan Sakhya, Tharindu Fernando, Yuzhou Zhao, Dylan Jeff, Milo Sprague, Favian Gonzalez, Iftakhar Bin Elius, Mazharul Islam Mondal, **Nathan Valadez**, Damani Jarrett, Alexis Agosto, Jihui Yang, Jiun-Haw Chu, Saiful I. Khondaker, Xiaodong Xu, Ting Cao, and Madhab Neupane, *Observation of flat and weakly dispersing bands in a van der Waals semiconductor Nb<sub>3</sub>Br<sub>8</sub> with breathing Kagome lattice*, Published: Phys. Rev. B 108, L121404 (2023)

Sabin Regmi, Robert Smith, Anup Pradhan Sakhya, Milo Sprague, Mazharul Islam Mondal, Iftakhar Bin Elius, **Nathan Valadez**, Andrzej Ptok, Dariusz Kaczorowski, Madhab Neupane, *Observation of gapless nodal-line states in NdSbTe*, Published: Phys. Rev. Materials 7, 044202 (2023)

Anup Pradhan Sakhya, Brenden R. Ortiz, Barun Ghosh, Milo Sprague, Mazharul Islam Mondal, Matthew Matzelle, Iftakhar Bin Elius, **Nathan Valadez**, David G. Mandrus, Arun Bansil and Madhab Neupane, *Observation of multiple flat bands and topological Dirac states in a new titanium based slightly distorted Kagome metal YbTi<sub>3</sub>Bi<sub>4</sub>*, Preprint: <https://arxiv.org/pdf/2309.01176.pdf>

Anup Pradhan Sakhya, Sabin Regmi, Milo Sprague, Mazharul Islam Mondal, Iftakhar Bin Elius, **Nathan Valadez**, Andrzej Ptok, Dariusz Kaczorowski, and Madhab Neupane, *Observation of flat bands and Dirac-like bands in a weakly correlated semimetal YRu<sub>2</sub>Si<sub>2</sub>*, Preprint: <https://arxiv.org/pdf/2304.07871.pdf> (2023)

## PRESENTATION/CONFERENCES

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- Oral Presentation, “Momentum Dependent Charge Density Wave Gap in Antiferromagnetic Metal,” *Princeton Summer School on Condensed Matter Physics (PSSCMP) 2024 Flash Talk* July 26, 2024  
Link: <https://pccm.princeton.edu/education/psscmp>
- Poster, “Momentum Dependent Charge Density Wave Gap in Antiferromagnetic Metal,” *Princeton Summer School on Condensed Matter Physics (PSSCMP) 2024 Poster Session* July 25, 2024  
Link: <https://pccm.princeton.edu/education/psscmp>
- Oral Presentation, “Momentum Dependent Charge Density Wave Gap in Antiferromagnetic Metal,” *Association of Nepali Physicist in America (ANPA) Conference 2024* July 19-21, 2024  
Link: <https://anpaglobal.org/conferences-and-events/conference-2024/>
- Presenter, “Introduction to Topological Quantum Materials,” UCF STEM Camp Connect II July 11, 2024  
Link: <https://stem.ucf.edu/camp-connect/>
- Poster, “Gapless nodal lines in a rare-earth-based semimetal,” *UCF Department of Physics Prospective Student Open House 2024* March 29, 2024
- Poster, “Momentum Dependent Charge Density Wave Gap in Antiferromagnetic Metal,” *APS March Meeting 2024* March 4-8, 2024  
Link: <https://march.aps.org/>
- Panel Speaker, “Graduate Student Q&A,” *UCF Department of Physics Fall 2023 Orientation* August 16, 2023
- Oral Presentation, “Gapless nodal lines in a rare-earth based semimetal,” *Association of Nepali Physicist in America (ANPA) Conference 2023* July 14-16, 2023  
Link: <https://anpaglobal.org/conferences-and-events/anpa-conference-2023/>
- Poster, “Gapless nodal lines in a rare-earth-based semimetal,” *Science & Technology of Emerging Materials Symposium (STEMS)- 2023* March 16, 2023  
Link: <https://prem.cecs.ucf.edu/2023-stems/>
- Poster, “Gapless nodal lines in a rare-earth-based semimetal,” *APS March Meeting 2023* March 5-10, 2023  
Link: <https://march.aps.org/>
- Poster, “Gapless nodal lines in a rare-earth-based semimetal,” *2023 NanoFlorida conference* March 4, 2023  
Link: <http://nanoscience.ucf.edu/nanoflorida/>
- Poster, “Impact of supplemental resources on student outcomes in introductory E&M,” *Texas A&M University Student Research Week* March 2022
- Poster, “Impact of supplemental resources on student outcomes in introductory E&M,” *American*

<i>Association of Physics Teachers Virtual Winter Meeting</i>	January 2022
Panel Moderator, "Graduated Student Panel," <i>SPS at Texas A&amp;M University General Meeting</i>	November 2021
Presentation, "From CDMS to Physics Education," <i>SPS at Texas A&amp;M University General Meeting</i>	October 2021
Attendee, <i>American Association of Physics Teachers Virtual Summer Meeting</i>	August 2021
Poster, "Michelson Interferometer," <i>Texas A&amp;M University Physics 327/328 Poster Presentation</i>	April 2021
Panel Speaker, "How to be a Physics Major," <i>Texas A&amp;M University's Physics and Engineering Festival</i>	April 2021
Volunteer, <i>Conference for Undergraduate Women in Physics (CUWiP) 2020 at Texas A&amp;M</i>	January 2020

## RELEVANT COURSES

Graduate-Level Core Courses	Addition Courses	University of Central Florida
Classical Mechanics	Condensed Matter Physics I & II	
Electrodynamics I & II	Data Science for Materials Scientists (Python)	
Quantum Mechanics I & II	Nuclear Physics (Audit)	
Statistical Mechanics	Elementary Japanese Language and Civilization I (Audit)	
	Computational Physics (Fortran)	
Core Courses	Additional Courses	Texas A&M University
Advanced Mechanics I & II	Experiences in Secondary Math and Science Classrooms	
Advanced Electricity and Magnetism I & II	Linear Algebra for Differential Equations	
Quantum Mechanics	Nuclear Physics	
Mathematical Methods I & II	Superconductivity and Superfluidity (Graduate Level)	
Thermodynamics and Statistical Mechanics	Complex Analysis	

## TEACHING

Graduate Teaching Assistant (GTA)	University of Central Florida
<i>GTA for the Department of Physics</i>	<i>January 2023 - August 2023</i>
<ul style="list-style-type: none"> <li>Lead discussion and lab sessions for both calculus-based introductory Mechanics and Electricity &amp; Magnetism</li> <li>Gave a weekly lecture to 300+ undergraduate students across eight different 50 minute sections and helped students with weekly discussion problems.</li> <li>Took attendance of students that were in the session that would impact their final grade in the course.</li> <li>Created a Discord for students in both Mechanics and Electricity &amp; Magnetism to provide another resource in case they had questions related to the course.</li> </ul>	
Undergraduate Teaching Fellows	Texas A&M University
<i>Peer Teacher for the Department of Physics and Astronomy</i>	<i>August 2021 - January 2022</i>
<ul style="list-style-type: none"> <li>Gave a series of 5 weekly 50 minute lectures to 15+ freshman physics students on topics of linear algebra (systems of equations, matrix algebra, determinants, eigenvalues, and eigenvectors) as a part of an advanced math module within Physics Freshman Orientation (PHYS 101) course.</li> <li>Created my own weekly homework assignments based off of my lecture material, assisted students that needed guidance during and outside of office hours, and graded assignments.</li> <li>Assisted students in using LaTeX</li> </ul>	
New Student Conference Mentor	Texas A&M University
<i>Peer Mentor for the Department of Physics and Astronomy</i>	<i>May 2019 - July 2022</i>
<ul style="list-style-type: none"> <li>Welcomed over 200 newly enrolled physics students to the department during Texas A&amp;M's New Student Conference (NSC) that occurred multiple times during the summer for the past 3 years (never missed a single NSC).</li> <li>Assisted as a peer mentor to incoming physics freshman and transfer students by helping make schedules, share valuable experience as a college student, and give advice/opinions on classes.</li> </ul>	
Classroom Field Observer	Texas A&M University
<i>Student of TAMU's SCEN 201</i>	<i>August 2018 - December 2018</i>
<ul style="list-style-type: none"> <li>Gained field experience and observed teaching strategies and pedagogy employed by experienced teachers in both a high school and middle school algebra classroom as part of Experiences In Secondary Math and Science Classrooms (SCEN 201) course.</li> </ul>	

- Assisted/tutored students during in-class assignments.

## POSITIONS OF RESPONSIBILITY

<b>Graduate Society of Physics Students:</b> <i>President</i>	2024 - Present
Organized multiple social events for members and welcomed new and potential graduate students to the department. Advertised student participation in the 7-year Academic Program Review of our graduate program and held general meetings to provide members with departmental updates. I continue to serve as a student representative on the graduate recruitment and outreach committee. Additionally, I ran six recitation sessions for students preparing for the Written Qualification Exams.	
<b>Graduate Society of Physics Students:</b> <i>Co-president</i>	2023 - 2024
Collaborated with my fellow Co-president and Vice President to revitalize the organization following disruptions caused by COVID-19. Leveraged social media platforms to unite members across different cohort years and developed strategic plans for meetings and organizational activities. Additionally, I partnered with the departmental outreach coordinator to implement effective volunteer recruitment strategies and secured a budget in collaboration with the department to support organizational initiatives and member activities.	
<b>Society of Physics Students (Chapter 7149):</b> <i>President</i>	2021-2022
Tasked with being the voice and to represent the entire undergraduate students in the physics department when participating in events on and off campus. Interviewed and created a director team of enthusiastic undergraduate students that demonstrated great communication, reliability, and a genuine love of physics during meetings and outreach events. In charge of gathering guest speakers and planning general meetings. In charge of a ~\$2000 budget and finalized every social and outreach event that members are able to participate in.	
<b>Discover, Explore, and Enjoy Physics (DEEP):</b> <i>DEEP Leader</i>	2020-2021
Organized projects and acted as a point of contact for DEEP mentors. Maintained ~\$100 budgets for demos and researched necessary parts necessary for demonstrations. Encouraged cooperation and communication amongst all members to ensure projects are completed on time and informed DEEP mentors on progress on projects.	
<b>Society of Physics Students (Chapter 7149):</b> <i>Vice President</i>	2020-2021
Supported and worked closely with the President of our organization to plan out every general and director meetings, finalize any social or outreach events, and keep track of a \$1500+ budget. Maintained a relationship with many professors and directors by constantly helping around and networking in the department in order to generate new ideas for events that our members can participate in.	
<b>Society of Physics Students (Chapter 7149):</b> <i>Social Events Officer</i>	2019-2020
Worked closely with the SPS president in order to create a safe and fun environment for all SPS members during social events and meetings and meet with prospective TAMU students during Aggieland Saturday. Coordinated with other SPS directors in order to finalize logistics and \$100+ budgets for specific events. Planned and coordinated the set up and trivia night for the second annual end of the year SPS Banquet.	

## INVOLVEMENT & OUTREACH

<b>Graduate Society of Physics Students-</b> <i>President</i>	Spring 2023 - Present
The voice of the graduate students within the Department of Physics at UCF. Similar to that of SPS, GSPS provides an opportunity for graduate students to come together in order to better the work/student environment within the department and connect graduate students to local volunteering events that promote science.	
<b>APS March Meeting Recruiter-</b> <i>Volunteer</i>	Spring 2023 - Present
Step-up and led the graduate school fair table during the APS March meeting and represented UCF by answering questions and giving advice to prospective undergraduate students looking at graduate schools.	
<b>Physics Career Exploration Day-</b> <i>Volunteer</i>	Spring 2023 - Present
Reached out to prospective physics undergraduate students (many of which were still in high school) and families of the different career opportunities within the field of physics by giving lab tours and answering questions on what it's like majoring in physics.	
<b>Spark STEM Fest-</b> <i>Volunteer</i>	Spring 2023- Present
Presented physics demonstrations to the general public during the annual Spark STEM Fest event at the Orlando Science Center.	
<b>STEM Day-</b> <i>Volunteer</i>	Fall 2022 - Present
Presented physics demonstrations to K-12 students during UCF's biannual STEM Day event.	

<b>Just Add Science- Volunteer</b>	Fall 2019- Spring 2022
Helped in the performances of the TAMU Physics Show and met people at existing events and venues throughout the Bryan/College Station area and engage people in an exciting science experiences.	
<b>Discover, Explore, and Experience Physics (DEEP)- DEEP Leader</b>	Spring 2019 – Fall 2021
Researched, designed, and fabricated science demonstrations that can be used during the annual Physics Festival and during physics lectures (current project: ping pong cannon).	
<b>Society of Physics Students (SPS)- President</b>	Fall 2018 – Spring 2022
Provide opportunities for physics majors and enthusiasts to come together to promote physics on and of campus through local outreach, volunteering events that promote science, and general meetings.	
<b>First Friday's Downtown Bryan, TX</b>	Spring 2020 – Spring 2022
Presented demonstrations to the general public during monthly First Friday event in downtown Bryan	
<b>Texas A&amp;M Physics Shows,</b>	Fall 2019 – Spring 2022
Assisted Dr. Tatiana in the performance of Texas A&M's physics shows for students K-12. Also organized and presented a series of hands on demonstrations for students after the show.	
<b>Game Day Physics Program</b>	Fall 2019 – Fall 2022
Organized and presented physics demonstrations to the general public before a select number of home football games.	
<b>Texas A&amp;M Physics and Engineering Festival</b>	Spring 2019 – Spring 2022
Annual event in which Texas A&M invites the general public to experience over 100 different hands-on science demonstrations and public lecture/presentation from guest speakers. Annually, over 4,000 people would attend the event from all across the U.S. and world.	
<b>Texas A&amp;M Chemistry Open House</b>	Fall 2018 – Fall 2022
Annual event hosted by the Chemistry Department at Texas A&M that invited the general public to promote the public awareness and importance of chemistry in everyday life. During the event, the physics department would host a set of hands-on physics demonstrations for the public to interact with.	

## PROFESSIONAL SOCIETIES

<b>American Physical Society (APS)</b>	<i>2022-Present</i>
<b>American Association of Physics Teachers (AAPT)</b>	<i>2019 – 2022</i>
<b>Society of Physics Students (SPS)</b>	<i>2018 – 2022</i>
<b>American Institute of Physics (AIP)</b>	<i>2018 – 2022</i>

## SKILLS

<b>Experienced in:</b>	<b>Some experienced in:</b>
Woodworking	Python
Machine Tools	Java
Adobe Photoshop	SolidWorks
Microsoft Office	C++
LaTeX	Gnuplot
Soldering	
PIRA Demonstration Catalog	
SPSS	