

Ryan Plumadore

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Fully bilingual: French, English

SKILLS

Materials Characterization

- Scanning Tunneling Microscopy & Spectroscopy
- Tapping Mode and Non-Contact Atomic Force Microscopy
- Scanning Electron Microscopy
- X-Ray Photoelectron Spectroscopy
- Optical Microscopy
- Raman Spectroscopy
- Ultra-High Vacuum (UHV) Systems
- Cryogenic Systems
- Nitrogen-Vacancy Magnetometry

Materials Synthesis

- Metal-Organic Chemical Vapour Deposition (MOCVD)
- 2D materials fabrication
- 2D heterostructure fabrication

Nanofabrication and Design

- Hardware design
- Process development
- Electron beam lithography
- Metal deposition
- Spin coating
- Reactive Ion Etching

Other

- Secret Security Clearance (Level II)
- Software: Gwyddion, CasaXPS, Labview, WSxM, Excel, Word, Origin, LaTeX, Rhinoceros 3D, GIMP, Vesta, Python, C+, HTML
- Crucial Conversations for Mastering Dialogue
- Interests: gardening, baking, woodworking, sewing, blacksmithing, reading, hiking, bouldering, running

WORK EXPERIENCE

JUNE 2025 – TO-DATE	Senior Technician, MOCVD Core Facility – <i>Department of Physics, University of Ottawa</i> • Establishing a new Core Facility centered around MOCVD of 2D materials. • Design and execution of experiments, performing MOCVD film growth and characterization of samples. • Act as a consultant to internal and external researchers, providing technical advice and complex analysis of research data.
JAN 2024 – MAY 2025	Lab Manager – <i>Department of Physics, University of Ottawa (Adina Luican-Mayer Laboratory)</i> • Daily lab management and logistics: maintenance and operation of advanced scientific instruments, manage procurement and inventory, organize outreach events, and provide hands-on training and supervision of 5 graduate students. • Spearheaded a collaborative research project with external stakeholders, systematically developing and optimizing the fabrication of nanomaterial devices for gas sensor arrays.
JAN 2023 – JAN 2024	Associate Scientist – <i>Canadian Bank Note Company, Limited, for “CBN Nano Technologies”</i> • Operation of scanning tunneling microscopes, qPlus atomic force microscopes, and X-ray photoelectron spectroscopy for complimentary characterization of organic molecules on semiconducting substrates • Responsible for the design, construction, and maintenance of ultrahigh vacuum chambers and custom laboratory hardware • Leveraged in-depth expertise to guide the planning and execution of advanced nanofabrication projects • Worked collaboratively with multidisciplinary teams to address complex scientific challenges
SEP 2016 – DEC 2022	Research Assistant – <i>Department of Physics, University of Ottawa (Adina Luican-Mayer Laboratory)</i> • Fabricated 2D van der Waals heterostructures tailored for scanning probe experiments, utilizing cleanroom facilities for e-beam lithography, metal deposition, and atomic force microscopy work. • Maintained and operated a commercial, closed-cycle cryogenic and ultrahigh vacuum scanning tunneling microscope for device characterization, including scanning tunneling spectroscopy. • Mentored students in experimental techniques and procedures.

EDUCATION

2018 – 2024	Doctor of Philosophy in Physics – <i>University of Ottawa</i> THESIS: “INVESTIGATING BAND STRUCTURE MODIFICATIONS IN 2D MATERIALS AND HETEROSTRUCTURES VIA STM/S” AWARDS: ONTARIO GRADUATE SCHOLARSHIP (2021-2022), UNIVERSITY OF OTTAWA PH.D. ADMISSION SCHOLARSHIP (2018-2022)
2016 – 2018	Master of Science in Physics – <i>University of Ottawa</i> THESIS: “STUDY OF TWO-DIMENSIONAL MATERIALS BY SCANNING TUNNELING MICROSCOPY”
2012 – 2016	Honours Bachelor of Science in Physics-Mathematics – <i>University of Ottawa</i>

TEACHING EXPERIENCE

Teaching Assistant, University of Ottawa, Ottawa, Canada

- 2022 **PHY3902/4 Laboratoire de physique et de physique appliquée II**
- Guided 5 groups of 2-3 students in advanced laboratory experiments.
 - Connected theoretical principles to experimental observations during the experimental process.
- 2020 – 2021 **PHY3370 Introduction à la mécanique quantique**
- Planned and presented walkthroughs of complex problems in online sessions, to enhance student understanding and proficiency with the advanced subject matter.
- WINTER 2019 **PHY1721/2 Principes de physique I/II**
- Graded assignments for a class of approximately 75 students.
 - Planned and conducted discussion group sessions to facilitate collaborative learning, address queries, and enhance comprehension of course materials.
- 2016 – 2019 **PHY1521/2 Principes fondamentaux de physique I/II**
- Planned and presented concise introductory lectures demonstrating procedures for specific experiments.
 - Supervised and guided 3 sections of 20 students during the experiment execution, fostering independent learning.
 - Graded students' lab reports and provided feedback, ensuring understanding and application of course concepts.

OUTREACH

- 2016 – 2025 Luican-Mayer Group and Advanced Research Complex (ARC) – *Lab Tours*
- Coordinated and lead lab tours and in english and french
 - Showcased state-of-the-art instrumentation and scientific research
 - Adapted content to effectively communicate subject matter to diverse audiences (general public, high school physics teachers, students, professors)
- 2016 – 2025 uOttawa STEM – *Lab Tours and Open House Events*
- Collaborated with faculty members to develop and provide lab tours and experimental demonstrations.
 - Communicated with prospective students, fostering interest in the program and research material.
 - Addressed inquiries about the curriculum, research opportunities, and career paths.

PUBLICATIONS

1. **Ryan Plumadore**, Leena Aggarwal, Yanglin Zhu, Yingdong Guan, Zhiqiang Mao, Adina Luican-Mayer. *Visualizing the heterogeneity of the surface and edge states in $MnBi_2Te_4$* . **In preparation.**
2. Laurent Molino, Leena Aggarwal, Indrajit Maity, **Ryan Plumadore**, Johannes Lischner, Adina Luican-Mayer. (2023). *Influence of atomic relaxations on the moiré flat band wave functions in antiparallel twisted bilayer WS_2* . **Nano Lett.** **23(24)** 11778–11784
3. Sergio Ramos, Bruno Carvalho, Raphael Longuinhos Monteiro Lobato, Jenaina Ribeiro-Soares, Cristiano Fantini, Henrique Ribeiro, Laurent Molino, **Ryan Plumadore**, Tony Heinz, Adina Luican-Mayer, Marcos Pimenta. (2023). *Selective electron-phonon coupling in dimerized 1T-TaS₂ revealed by resonance Raman spectroscopy*. **ACS Nano.** **17, 16, 15883–15892**
4. Laurent Molino, Leena Aggarwal, Vladimir Enaldiev, **Ryan Plumadore**, Vladimir Falko, Adina Luican-Mayer. (2023). *Ferroelectric switching at symmetry-broken interfaces by local control of dislocation networks*. **Adv. Mater.** **2207816**
5. **Ryan Plumadore**, Mehmet Baskurt, Justin Boddison-Chouinard, Gregory Lopinski, Mohsen Modarresi, Pawel Potasz, Pawel Hawrylak, Hasan Sahin, Francois M. Peeters, and Adina Luican-Mayer. (2020). *Prevalence of oxygen defects in an in-plane anisotropic transition metal dichalcogenide*. **Phys. Rev. B.** **102, 205408**
6. **Ryan Plumadore**, Mohammed M. Al Ezzi, Shaffique Adam and Adina Luican-Mayer. (2020). *Moiré patterns in graphene-rhenium disulfide vertical heterostructures*. **Journal of Applied Physics** **128, 044303**
7. Ranjana Rautela, Samantha Scarfe, Jean-Michel Guay, Petr Lazar, Martin Pykal, Saied Azimi, Cedric Grenapin, Justin Boddison-Chouinard, Alexei Halpin, Weixiang Wang, Lukasz Andrzejewski, **Ryan Plumadore**, Jeongwon Park, Jean-Michel Ménard, Michal Otyepka, and Adina Luican-Mayer (2020). *Mechanistic Insight into the Limiting Factors of Graphene-Based Environmental Sensors*. **ACS Appl. Mater. Interfaces**, **12, 35, 39764–39771**
8. Sergio L.L.M. Ramos, **Ryan Plumadore**, Justin Boddison-Chouinard, Saw Wai Hla, Jeffrey R. Guest, Dave Gosztola, Marcos A. Pimenta, Adina Luican-Mayer. (2019). *Suppression of the commensurate charge density wave phase in ultrathin 1T-TaS₂ evidenced by Raman hyperspectral analysis*. **Phys. Rev. B** **100, 165414**
9. Justin Boddison-Chouinard, **Ryan Plumadore**, Adina Luican-Mayer. (2019). *Fabricating van der Waals Heterostructures with Precise Rotational Alignment*. **J. Vis. Exp.** **(149), e59727**

CONFERENCE AND POSTER PRESENTATIONS

Conferences

- JUNE 2022 Canadian Association of Physics (CAP) Conference
- *Scanning Tunneling Microscopy and Spectroscopy of a Graphene-Rhenium Disulfide Heterostructure at Low Temperature*
 - *Stacking Order Domains in Twisted Transition Metal Dichalcogenides*
- MAY 2022 Ottawa-Carleton Institute for Physics Graduate Symposium (OCIP) – Virtual
- *Scanning Tunneling Microscopy of 2D van der Waals Heterostructures*
- JUNE 2021 Canadian Association of Physics (CAP) Conference – Virtual
- *Scanning Tunneling Microscopy and Spectroscopy of $MnBi_2Te_4$*
- MARCH 2021 American Physical Society (APS) March Meeting – Virtual
- *Scanning Tunneling Microscopy and Spectroscopy of $MnBi_2Te_4$*
- JULY 2020 Institute of Electrical and Electronics Engineers (IEEE) Nano Conference – Virtual
- *Prevalence of Oxygen Defects in an In-Plane Anisotropic Transition Metal Dichalcogenide*
- JUNE 2019 Canadian Association of Physics (CAP) Conference
- *Imaging the In-Plane Anisotropy and Lattice Defects of ReS_2 Using Scanning Tunneling Microscopy*
- APRIL 2018 Ottawa-Carleton Institute for Physics Graduate Symposium (OCIP)
- *Novel 2D Materials Studied with Scanning Probe Microscopy*
- MARCH 2018 American Physical Society (APS) March Meeting
- *Imaging the In-Plane Anisotropy of ReS_2 Using Scanning Tunneling Microscopy*

Posters

- MAY 2022 Quantum Circuits in 2D Materials (QC2DM) Workshop
- *Visualizing the Heterogeneity of the Surface and Edge States in Magnetic Topological Insulator $MnBi_2Te_4$*
- JUNE 2019 Hybrid Quantum Systems Workshop
- *2D Materials Quantum Structure and Their Electronic Properties*
- JUNE 2019 Centre for Research in Photonics - University of Ottawa (CRPuO) Industry Day
- *2D Materials Quantum Structure and Their Electronic Properties*
- OCTOBER 2018 University of Ottawa PhysicsFest
- *Scanning Tunneling Microscopy and Spectroscopy of 2D van der Waals Materials*
- MAY 2018 Centre for Research in Photonics - University of Ottawa (CRPuO) Industry Day
- *Fabricating van der Waals Heterostructures*
- MAY 2017 Centre for Advanced Materials Research (CAMaR) Opening Workshop
- *Fabricating van der Waals Heterostructures*
- OCTOBER 2016 Schawlow-Townes Symposium
- *Custom-built Layered Materials Explored from Atom to Bulk*
- OCTOBER 2016 University of Ottawa PhysicsFest
- *Custom-built Layered Materials Explored from Atom to Bulk*