



**Marlon Josue Rivera Valladares**  
Montréal, Québec, Canada

✉ marlon.riveravalladares@mail.mcgill.ca

## EDUCATION

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- **McGill University, Montréal** Fall 2024 - Present  
*Master of Science in Physics* CGPA: N/A
- **McGill University, Montréal** Fall 2021 - Winter 2024  
*Bachelor of Science: Honours Physics* CGPA: 4.0
- **Vanier College, Montréal** Fall 2019 - Winter 2021  
*Diploma of College Studies: Pure & Applied Science Honours* R-score: 38.042
- **École d'éducation internationale de Laval (É.É.I.L.), Laval** Fall 2014 - Winter 2019  
*International Baccalaureate: Middle Years Programme* General mean: 93.51%

## RESEARCH EXPERIENCE

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- **Honours Research Thesis, McGill University** Fall 2023 - Winter 2024  
*Student* Montréal  
Supervisors: Prof. Katelin Schutz & Dr. Saniya Heeba  
From a theoretical standpoint, there are many different candidates for what dark matter (DM) could be. Among these, one specific model allows for a 3-body decay process of DM of the form  $\chi_2 \rightarrow \chi_1 e^+ e^-$  with the  $\chi$ 's being DM particles and  $e^+ e^-$  an electron-positron pair. The creation of the  $\chi_1$  particles could impact the evolution of large scale structures in the universe, such as galaxies or galaxy clusters. As such, in the exploration of these effects, I:
  - Developed the Boltzmann and continuity equations for the matter perturbation of particles involved in a decay
  - Modified the Cosmic Linear Anisotropy Solving System coding package to accommodate for such a DM case
- **DMcGill Group, McGill University** Summer 2023  
*Summer Research Student* Montréal  
Supervisors: Prof. Katelin Schutz & Dr. Saniya Heeba  
Exploring the same model as in my Honours Research Thesis project, instead of looking at the produced  $\chi_1$  particles, I investigated the effects of the  $e^+ e^-$  pair on the evolution of the universe's baryonic matter temperature and ionization fraction. In particular, I:
  - Ascertained if the 3-body decay could be approximated via a 2-body decay process
  - Computed 3-body & 2-body decay kinematics and the associated product spectra
  - Wrote a Python script that made use of a code package called DarkHistory to obtain distinct universe evolutions
- **ATLAS Group, McGill University** Summer 2022  
*Summer Research Student* Montréal  
Supervisors: Prof. Brigitte Vachon & Dr. Steffan Stärz  
In the context of the Liquid Argon Electronics upgrade of the ATLAS detector, firmware is being developed for a new off-detector readout electronics card. In order to aid with this, I:
  - Created a new monitoring tool to be used for software development
  - Wrote a Python script that queries repositories in GitLab, a DevOps software, and automatically creates a website overview of their continuous integration status
- **Science Program Comprehensive Assessment, Vanier College** Fall 2021  
*Student* Montréal  
Supervisors: Sandi Wing May Mak & Christian Stahn  
The Science Program Comprehensive Assessment formed part of the college curriculum, and aimed to demonstrate a mastery of all the competencies and skills set out in the college Science Program. Specifically, I:
  - Investigated the applications of advanced linear algebra & ordinary differential equations techniques, such as eigenfunctions and Fourier series, in collaboration with another student
  - Wrote a term paper focusing on the mathematical techniques required to solve the bounded wave equation
  - Wrote a Python code to create an animation of solutions to the bounded wave equation
- **IB: MYP Personal Project, É.É.I.L.** 2018-2019  
*Student* Laval  
Supervisor: Louise Turgeon  
As part of the International Baccalaureate: Middle Years Programme, each graduating student completed a personal project to formally assess our approaches to learning skills for self-management, research, communication, critical and creative thinking, and collaboration. Particularly, I :
  - Created a student magazine discussing the advent of genetic engineering
  - Submitted a detailed report and student journal specifying all the steps of my research and creation process over the course of a year

## TECHNICAL SKILLS & INTERESTS

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**Coding Languages:** Python (advanced), Mathematica (intermediate), C (beginner)

**Developer Tools:** Git (intermediate), Doxygen (beginner)

**Spoken Languages:** English (fluent), French (fluent), Spanish (fluent)

**Areas of Interest:** Physics, Mathematics, Technology, Electronics, History, Cinematography, Soccer

## LEADERSHIP & VOLUNTEERING

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- Sound Engineer & Music Group Member, Misión Internacional El-Shaddai Laval *2021 - Present*
- Project Organizer, Vanier Key Society at Vanier College *Fall 2020 - Winter 2021*
- Peer Tutor, Tutoring & Academic Success Centre at Vanier College *Winter 2020 - Winter 2021*
- Event Organizer, Environmentalist Club at É.É.I.L. *2019*
- Event Organizer, Amnesty International at É.É.I.L. *2018*
- Volunteer, Centre communautaire Petit Espoir *2017, 2019*
- Volunteer, Héma-Québec *2016*
- Day Camp Monitor, Park-Extension Youth Organization *2015 - 2018*
- Volunteer, CHSLD de La Rive *2015 - 2016*

## AWARDS & SCHOLARSHIPS

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- Master's training scholarship, FRQNT *Fall 2024 - Winter 2026*
- NSERC Undergraduate Student Research Award, McGill University *Summer 2023*
- James F. Mathison Scholarship, McGill University *Fall 2023*
- NSERC Undergraduate Student Research Award, McGill University *Summer 2023*
- McGill Science Scholarship, McGill University *Fall 2021 - Winter 2024*
- Dean's Honour List, McGill University *Fall 2022, Fall 2023*
- E. P. Aikman Prize in Physics, McGill University *Fall 2022*
- BIPOC Summer Undergraduate Research Fellowship, McGill University *Summer 2022*
- Gustav Levinschi Foundation Graduation Scholarship, Vanier College *Winter 2021*
- Dean's Honour Roll, Vanier College *Fall 2019 - Winter 2021*
- Entrance Scholarship, Vanier College *Fall 2019*
- Certificate of excellence in physics, É.É.I.L. *2019*
- Certificate of excellence in chemistry, É.É.I.L. *2019*
- Certificate of excellence in history, É.É.I.L. *2018*
- Certificate of excellence in general science, É.É.I.L. *2017, 2018*
- Certificate of excellence in mathematics, É.É.I.L. *2016, 2018, 2019*