# Guilherme H. Caumo

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## Education

**Master of Science, Physics** 2024 - present

*McGill University | Montreal, QC, Canada*

- Completing a thesis on quantum fluctuations in a vacuum under the supervision of Prof. Peter Grutter.
- Engaging in coursework in quantum physics, advanced statistical mechanics, condensed matter physics, nanoscience, and experimental methods.

**Bachelor of Science, Physics** 2020 - 2024

*McGill University | Montreal, QC, Canada*

- Completed a minor in mathematics
- Completed an honours research thesis in high-energy nuclear theory
- Maintained a Hugh Brock Scholarship
- Received a Canadian Space Agency research grant through Prof. David Hanna
- Awarded a 2023 McGill Summer Undergraduate Research Fellowship

**High School Diploma** 2016 - 2020

*Pan American School of Porto Alegre | Porto Alegre, RS, Brasil*

- High Honors with Distinction
- Senior Class Representative
- National Hispanic Recognition Program

## Research Experience

**Measuring quantum fluctuations in a nanovacuum (thesis)** May, 2024 - present

- Pursuing a master's thesis supervised by Prof. Peter Grutter in condensed matter physics with the aim of measuring quantum fluctuations in a nanovacuum.
- Characterizing light-matter interactions in an ultra-high vacuum enviroment.
- **Co-Organized:** No-Contact Atomic Force Microscopy 2024 Montreal (an international conference specializing in AFM techniques relevant to the project).

**Numerical stability of relativistic heavy-ion collisions simulation (thesis)** May, 2023 - May, 2024

- Completing an honours research thesis for Prof. Sangyong Jeon in theoretical nuclear physics to analyze instabilities in MUSIC, a (3+1)D hydrodynamics simulation for heavy-ion collisions to study the quark gluon plasma.
- Developed skills in high energy theory, quantum chromodynamics, phenomenology, numerical methods, and physics simulations.
- **Presented work at:** Undergraduate Honours Thesis Oral Presentation.

**Development of an Electrochemical Sensor** Jul. - Aug., 2023

- Hired as a research assistant by Prof. Peter Grutter to build an electrochemical sensor and was responsible for designing the electronic components, calibrating the position sensing detectors and microcantilevers, and setting up a functional optical setup for the sensor.
- Learned how to assemble electronic components, perform optical experiments, and experimental techniques in electrochemistry.

**Operating a Scanning Tunneling Microscope** May - Jul., 2023

– Hired as a research assistant by Prof. Peter Grutter to characterize, design, and repair instrumentation to operate a scanning tunneling microscope.
– Attended weekly lab meetings from May to August and became familiar with experimental methods in condensed matter physics, specifically atomic imaging, as well as research and development techniques.

**Development of a Low-cost Compton Gamma-ray Imager** May - Aug., 2022

– Hired as a research assistant by Prof. David Hanna to characterize instrumentation, participate in design studies, develop analysis code, and calibrate devices for the development of a radiation imager.
– Calculated the muon lifetime using scintillation detectors. Measured the lateral distribution of muons in cosmic-ray air showers. Designed and built a model cyclotron using 3D printing.
– **Presented work at:** the Canadian Astro-Particle Physics Summer Student Talk Competition and McGill Space Institute Summer Undergraduate Research Showcase.

**Game addiction and Brain-Derived Neurotrophic Factor** 2018-2020

– Idealized and organized this project with the Federal University of Rio Grande do Sul.
– As leading author, I was responsible for performing the background research, organizing data collection, meeting ethics criteria, following biochemical and statistical analyses, and drafting the manuscript.
– **Presented work at:** the 34th MOSTRATEC International Science Fair as a finalist, 39th Scientific Week of the Clinical Hospital of Porto Alegre, the 2018 Pan American Science Fair, and the XIV Youth Hall Science Fair at the Federal University of Rio Grande do Sul (awarded Young Researcher Award).

**Electronic devices and sleep quality** 2017-2020

– Idealized and organized this project with the Federal University of Rio Grande do Sul, publishing it in 2020.
– As leading author and founder of the Scientific Initiation Junior program, I established a working relationship with university research labs in the field of neuroscience, psychiatry and physics, performed background research, translated necessary surveys and instruments for the methodology, organized the data collection ethically, performed statistical analyses, drafted the manuscript, and published the work.
– **Presented work at:** the 2017 Pan American Science Fair, a TEDx talk, the V Colloquium of the Chronobiology and Sleep Lab, 39th Scientific Week of the Clinical Hospital of Porto Alegre, XIV Youth Hall Science Fair at the Federal University of Rio Grande do Sul, and the 2017 Pan American Science Fair.

## Teaching Experience

**PHYS 257 - Experimental Methods 1** Fall 2024

– Hired as a teaching assistant for Prof. Brigitte Vachon. Coordinated laboratory sessions, helped students design experiments and analyze data using Python, evaluated lab reports and assignments submitted by students by providing constructive feedback.

## Achievements

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| Awards | 2023 McGill Summer Undergraduate Research Fellowship. Gold Medal International Math Olympiad. 2019 MOSTRATEC International Science Fair Finalist. 2018 Pan American Science Fair First Place. 2017 Pan American Science Fair First Place. AP Capstone Diploma. AP Scholar with Distinction. |
| Scholarships | NS Nanotech Canada Inc. grant, Hugh Brock Scholarship. 2024 NSERC summer research stipend. 2022 Canadian Space Agency grant. |

## Publications

Caumo, G. H. et al. (2020). "Exposure to electronic devices and sleep quality in adolescents: A matter of type, duration, and timing". In: *Sleep Health* 6(2), pp. 172–178. DOI: 10.1016/j.sleh.2019.12.004.

Tonon, A. C. et al. (2020). "The Brazilian-Portuguese version of the Sleep Hygiene Index (SHI): validity, reliability and association with depressive symptoms and sleep-related outcomes". In: *Sleep Science* 3(1), pp. 37–48. DOI: 10.5935/1984-0063.20190130.

## Skills

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| Research | Experienced researcher, programming, statistical analysis software (primarily Python, R, SPSS Statistics), scientific communication and writing, and LaTeX. Trained in nuclear instrumentation modules, scanning probe microscopy, hydrodynamic simulations, WHMIS training, and handling radioactive sources at McGill University. |
| Coding | Numerical methods, Python, Arduino programming, command line, C++, R, and ROOT (primarily pyROOT). Also capable of learning new coding languages and programs as needed for research projects. |
| Engineering | Ultra-high vacuum techniques, electronics, CADs (Fusion 360, SolidWorks, Tinkercad), 3D printing, and instrumentation design. |
| Languages | Spanish (fluent), Portuguese (fluent), English (fluent), Russian (intermediary). |

## References

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| Prof. Peter Grutter | Distinguished James McGill Professor, Department of Physics, McGill University, peter.grutter@mcgill.ca |
| Prof. Sangyong Jeon | Professor, Department of Physics, McGill University, sangyong.jeon@mcgill.ca |
| Prof. David Hanna | Rutherford Professor of Physics, Department of Physics, McGill University, hanna@physics.mcgill.ca |
| Prof. Maria Elisa Calcagnotto | Associate Professor of Biochemistry, Department of Biochemistry, Federal University of Rio Grande do Sul, elisa.calcagnotto@ufrgs.br |