# GIRARD MARIN

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## EDUCATION

**Swiss Federal Institute of Technology Lausanne (EPFL), Switzerland** *2021 - Present*
Master's degree in Physics from the condensed matter theory lab of Professor Frédéric, with thesis to be done in Professor Zoë Holmes's quantum information and computation lab.

**Swiss Federal Institute of Technology Lausanne (EPFL), Switzerland** *2017 - 2021*
Bachelor's degree in Physics.

## RESEARCH PROJECTS

**Ongoing research on contextuality and quantum advantage** *2023 - Present*
Master thesis work in EPFL's QIC lab, supervised by Professor Zoë Holmes.
*Exploratory work, with the goal to identify research questions relating to the importance of contextuality for quantum advantage.*

**Review on emergent gravity from fractons and Mach's principle** *2022 - 2023*
Semester literature project in condensed matter physics, supervised by Professor Christopher Mudry.
*Exploratory work, with the goal to developed know-how in the domain of emergent space and identify research question for fracton physics.*

**Anderson Localization in a Poincare disk** *2022 - 2023*
Semester research project in conformal field theory supervised by Dr Matthijs Hogervorst.
*Using simulation and theory to understand the phenomena of Anderson localization, unique to disordered medium, in a special geometry.*

**Probabilities and the arrow of time in the Many-worlds** *2022 - 2023*
One year literature project supervised by Professor Dustin Lazarovici.
*Exploratory work in between philosophy and physics, resulting in an ongoing reseach project with Andreas Albercht on the arrow of time in the Many-Worlds.*

**Supersymmetry in interacting Majorana model on the Shastry-Sutherland lattice** *2022*
Semester research project in Professor Frédéric Mila's CTMC lab, supervised by Dr Loic Herviou.
*Using simulation and theory to study the ground state and properties of an interacting Majorana model, in the Shastry-Sutherland lattice.*

**(Paper) Relativistic thermodynamics of perfect fluids** *2021-2022*
Paper written in collaboration with Dr Sylvain Brechet.
*Research centered around understanding the thermodynamics of a perfect fluid in a relativistic setting.*
*Preprint:* arXiv:2210.04282

## RESEARCH INTERESTS

**Foundations of quantum mechanics:** I am interested in studying the foundations of quantum mechanics and the related problem of emergence from quantum mechanics. Of particular interest are approaches via quantum cosmology, quantum information theory, as well as the quantum mereology program.
**Quantum information theory:** Understanding the source of quantum advantage, and the differences between classical and quantum theory. Theory and potential for useful contributions to quantum technologies make it fascinating.
**Condensed matter physics:** Condensed matter also holds keys to making quantum computers useful and is rich in interesting open questions. Using techniques developed for condensed matter to study gravity and emerging space from entanglement also drives me.

## SELECTION OF IMPORTANT COURSES

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|---|---|
| **High energy physics** | Quantum field theory I/ II, Conformal field theory and gravity (doctoral course) |
| **Statistical physics** | Statistical physics of random and disordered systems (doctoral course) |
| **Quantum physics** | Quantum information theory, Quantum physics I/II/III/IV |
| **General relativity** | General relativity I and II, observational cosmology |
| **Condensed matter** | Field theory in condensed matter physics (doctoral course), solid state physics I,I,III |

## RELEVANT SKILLS

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|---|---|
| **Modeling and Analysis** | Matlab, Mathematica, Labview |
| **Programming** | C++, Python, Latex |
| **Languages** | English (Native), French (Native) |

## WORK EXPERIENCE AND ACHIEVEMENTS

**Teaching assistant** *2021 - Present*
TA for multiple bachelor courses in physics: special relativity, thermodynamics, electrodynamics, quantum mechanics, statistical physics, mechanics.

**First aid responder at EPFL** *2021 - Present*
Present at events and generally responsive to urgent care needs on the EPFL campus. Includes BLS-2 Swiss certification

**Terahertz radiation demonstrative experiment** *June - Jully 2018*
Summer Lab work in a terahertz wave laboratory. I learned to work with electromagnetic wave sources and designed an experiment to demonstrate the proprieties of terahertz waves in the LPMN EPFL laboratory.

## OTHER

**A passion for climbing and the game of Go**
**International Earth Science Olympiad (IESO 2016)**
$2^{nd}$ place in the French national selection.
**Maintaining an outreach blog where topics of physics and philosophy are discussed**
workinprogresschair.blogspot.com/
**Volunteering as a summer camp counselor.**
At a camp for children who otherwise would not have vacations (at *Solidaire* 1 week per year 2016-2021).
**Committee member**
At the EPFL Mountaineering club and Ishigo club