Curriculum Vitae: [1] Martin Mendez

PhD Candidate in Physics | Mechanical Engineer
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Academic Background

PhD in Physics 2021 – present
Faculty of Mathematics, Astronomy, Physics and Computer Science (FAMAF), UNC Córdoba, ARG

- **Thesis:** Correlations and entanglement in few-body quantum systems: scattering processes and cavity quantum electrodynamics.
- **Supervisor:** Dr. Federico Manuel Pont. **Co-supervisor:** Dr. Pablo Serra.

Bachelor's Degree in Physics (equivalent to Master's Degree in Physics) 2018 – 2020
FAMAF, UNC Córdoba, ARG

- Coursework oriented towards foundational training for the PhD in Physics.

Mechanical Engineering (equivalent to Master's Degree in Engineering) 2015 – 2019
Faculty of Exact, Physical and Natural Sciences (FCEFyN), UNC Córdoba, ARG

- **GPA:** 8.02/10.00. Honor Mention for highest GPA of the graduating class of 2019.
- **Final Project:** Characterization of an epoxy-matrix composite reinforced with granite particles for use as the main structural element (bed) of a CNC lathe.

Technical Degree in Automation and Control Systems 2009 – 2014
Escuela Cooperativa Técnica Los Andes (ECTLA) Bariloche, ARG

Awards and Fellowships

- **Simons–Balseiro Exchange Fellowship 2025–2026** | Instituto Balseiro. Research stay (Apr. 2026 – May. 2026).
- **CONICET Doctoral Fellowship** | National Scientific and Technical Research Council. (Mar. 2021 – Mar. 2027).
- **University Award, Class of 2019** | FCEFyN, UNC. Honor diploma for highest GPA in Mechanical Engineering.

Research Grants and Contracts

- **FONDECYT 1230897** | Amazing Quantum Group, Universidad de Chile 2026
  PI: Dr. Hermann-Avigliano Carla A. | Role: Technical Staff (International Collaboration)
  Intense Quantum Light: Engineering and Characterization of Non-Classical Radiation.
- **SECYT, UNC – FORMAR Grant** | FAMAF-UNC 2026–2027
  PI: Dr. Pont Federico M. | Role: Member (Doctoral Fellow)
  Research on field-matter interaction effects in molecules and double quantum dots in microcavities and superconducting circuits.
- **PIP, CONICET – N° 11220150100327CO** | FAMAF-UNC 2022–2024
  PI: Dr. Osenda Omar | Role: Member (Doctoral Fellow)
  Control, Dynamics and Spectral Properties of Few-Body Quantum Systems: Applications to Quantum Information and Physical Chemistry.
- **SECYT, UNC – Consolidar Project** | FAMAF-UNC 2020–2023
  PI: Dr. Serra Pablo | Role: Member (Doctoral Fellow)
  Research on Critical Phenomena Theory with Applications in Atomic, Molecular and Condensed Matter Physics.

Publications

1. Mendez, M., & Pont, F. M. (2025). *Dynamics of correlations and entanglement generation in electron-molecule inelastic scattering*. Physical Review A, 111(5), 052411.
2. Mendez, M. (2024). *Julia package to resolve the time-independent Schrödinger (TISE) equation by the finite element method (FEM)*. https://github.com/mendzmartin/FEMTISE.jl.
3. Mendez, M., Tommasini, F. C., Ferreyra, S. P., Guido, R. M., Bordón, J. C. & Scaliti, F. (2021). *Optimization of a platform with controllable horizontal rotational motion for a head-related transfer function measurement system*. Revista Tecnología Y Ciencia, (42), 12–26.
4. Mendez, M., Bordón, J.C., Guido, R.M., Cravero, G.A. & Tommasini, F.C. (2020). *Mechanical design of a loudspeaker support for a head-related transfer function measurement system*. Jornadas de Ciencia y Tecnología 2020, Universidad Tecnológica Nacional (UTN), Córdoba, Argentina.
5. Méndez, M., Albanesi, L. F., & Grasso, M. L. (2020). *Fabrication and characterization of granite epoxy for use in machine tools*. Revista de la Facultad de Ciencias Exactas, Físicas y Naturales, 7(2), 51–61.

In preparation

1. Mendez, M., & Pont, F. M. *Quenching of dissociation in molecular excited states through critical phenomena in cavity quantum electrodynamics*. To be submitted (2026).
2. Naranjo, N., Mendez, M., Gondret, V. & Hermann-Avigliano, C. *Characterizing Non-Classicality and Entanglement in Generalized Coherent States*. To be submitted (2026).

[1] Last updated April 3, 2026

Research Experience

Research Stay – Instituto Balseiro Apr. 2026 – May. 2026
Atomic, Molecular and Optical Physics Group (FAMO), Centro Atómico Bariloche (CAB, CNEA) Bariloche, ARG

- Pauli-Fierz model beyond the dipole approximation: characterization of a molecule confined in spherical and cylindrical QED cavities.
- References: Dr. Juan M. Randazzo and Dr. Renata Della Picca.

Summer Research Internship – Department of Physics Jan. 2026
Amazing Quantum Group, Universidad de Chile Santiago, CHL

- Generation and detection of intense non-Gaussian quantum light. Active participation in daily and weekly group meetings, theoretical (and experimental when needed) work under specialized supervision, and elaboration of a scientific poster.
- References: Dr. Carla Hermann-Avigliano and Dr. Victor Gondret.

Short Research Stay Nov. 2024
Atomic Collisions Group, Centro Atómico Bariloche (CAB, CNEA) Bariloche, ARG

- Seminar delivered: "Entanglement in inelastic collision processes".
- Study of atomic and molecular physics techniques and exploration of applications to specific systems.
- Reference: Dr. Juan M. Randazzo.

Research Residency Aug. 2019 – Jun. 2020
Center for Research and Transfer in Acoustics (CINTRA) Córdoba, ARG

- Mechanical design of a head-related transfer function measurement system.
- Projects involved: PICT 2016-0738, PID 4498 and PID 6565.
- Reference: Dr. Fabián C. Tommasini.

Professional Practice Jan. 2020 – Feb. 2020
National Atomic Energy Commission (CNEA), CAB Bariloche, ARG

- Characterization of granite-epoxy composite for implementation as the main structural element (bed) of precision machine tools. (190 h).
- Reference: Dr. Luisa F. Fernández Albanesi.

Teaching Experience

- **Teaching Assistant, Grade A** | FAMAF, UNC
  Numerical Methods Mar. 2026 – Feb. 2027
  Mathematical Analysis II Mar. 2025 – Feb. 2026
  General Physics II Mar. 2025 – Feb. 2026
- **Lecturer, University Entrance Course** | FAMAF, UNC Feb. 2025
- **Teaching Assistant, Grade B**
  Introduction to Physics | FAMAF, UNC Mar. 2024 – Feb. 2025
  Mathematics I | FCQ, UNC Mar. 2024 – Feb. 2025
- **Teaching Trainee (Ad-Honorem). Rational Mechanics** | FCEFyN, UNC Mar. 2019 – Mar. 2020

Evaluation Activities

- Thesis committee member for Mr. Fernandez, Leandro E., Bachelor's degree in Physics, FAMAF, UNC. *Markovian decoherence induced by a Caldeira-Leggett thermal bath in a two-qubit superconducting system and cavity in the dispersive regime.* Mar. 2026.

Conference Contributions

Contributed Talks

- M. Mendez, V. Gondret and C. Hermann-Avigliano, Experimental entanglement criteria, presented at the Eighth Argentine School and Workshop on Quantum Science (CUANTOS 8), Bariloche, Argentina, 2026.
- M. Mendez and F. M. Pont, Polaritonic dynamics of a molecule confined in a cavity (Cavity-QED): exploring superradiance, presented at the 110th Meeting of the Argentine Physics Association and XIX Uruguayan Physics Society Meeting, La Plata, Argentina, 2025.
- M. Mendez and F. M. Pont, Electron-nucleus correlations from a quantum information perspective applied to a one-dimensional model of electron-molecule scattering, presented at the 109th Meeting of the Argentine Physics Association, San Luis, Argentina, 2024.
- M. Mendez and F. M. Pont, Electron-nucleus correlations from a quantum information perspective applied to a one-dimensional model of electron-ion scattering, presented at the Sixth Argentine School and Workshop on Quantum Science (CUANTOS 6), San Luis, Argentina, 2024.
- M. Mendez, Solving the Schrödinger equation with FEM: Introduction to the `FEMTISE.jl` package, presented at the Workshop Juliero 2024, Córdoba, Argentina, 2024.
- M. Mendez, J. Duarte, A. Bande and F. M. Pont, ICD Electron emission lifetimes in paired vertically stacked QWs from quantum dynamics, presented at The 12th International Conference on Quantum Dots (QD 2024), Munich, Germany, 2024.

Departmental Seminars and Invited Talks

- M. Mendez, From ab-initio QED models to standard quantum optics models, presented at the Amazing Quantum Group, Department of Physics (DFI), Faculty of Physical and Mathematical Sciences, Santiago, Chile, 2026.
- M. Mendez, Polaritonic Quantum Chemistry: From Ab Initio QED to Light-Mediated Control of Matter, presented at the PhD Physics Seminar, Instituto de Física Enrique Gaviola (IFEG, CONICET, UNC), Córdoba, Argentina, 2025.
- M. Mendez and F. M. Pont, Entanglement generation and quantum correlation dynamics in electron-molecule inelastic scattering, presented at the Department of Surface Physics and Atomic, Molecular and Optical Physics, Atomic Collisions Division, CAB-CNEA, San Carlos de Bariloche, Argentina, 2024.
- M. Mendez, Exploring Superradiance: Theory, Experiments and Applications, presented at the PhD Physics Seminar, Instituto de Física Enrique Gaviola (IFEG, CONICET, UNC), Córdoba, Argentina, 2024.

Poster Presentations

- M. Mendez, V. Gondret and C. Hermann-Avigliano, Characterizing Non-Classicality and Entanglement in Generalized Coherent States: Bridging Theoretical Foundations and Experimental Criteria, presented at the Summer Internship of Physics, Department of Physics (DFI), Faculty of Physical and Mathematical Sciences, Santiago, Chile, 2026.
- M. Mendez and F. M. Pont, Laser-driven electronic quantum dynamics in semiconductor heterostructure quantum dots, presented at the X National Meeting on Solids (SÓLIDOS 2025), San Carlos de Bariloche, Argentina, 2025.
- M. Mendez and F. M. Pont, Coupled quantum dynamics of a molecule-field system in a cavity (Cavity-QED): exploring superradiance, presented at the Annual Regional Meeting on Physics, Technology and Applications (RRAFTA 2025), Córdoba, Argentina, 2025.
- M. Mendez and F. M. Pont, Entanglement generation in electron-molecule scattering processes, presented at RRAFTA 2025, Córdoba, Argentina, 2025.
- M. Mendez and F. M. Pont, Electron-nucleus correlations from a quantum information perspective applied to a one-dimensional model of electron-ion scattering, presented at the Annual Poster Exhibition of FAMAF, Córdoba, Argentina, 2024.
- M. Mendez and F. M. Pont, Entanglement generation in electron-molecule scattering processes, presented at the XIII Conference on Quantum Foundations (CQF XIII), Córdoba, Argentina, 2024.
- M. Mendez and F. M. Pont, Mutual information and von Neumann entropy in the quantum dynamics of an electron-nucleus coupling model, presented at the Fifth Argentine School and Workshop on Quantum Science (CUANTOS 5), Córdoba, Argentina, 2023.

Courses

Graduate Courses

1. ***Computational Atomic Physics*** by Dr. Mitnik, D. (UBA-IAFE). FAMAF, UNC. Feb. 2026. [2]
2. ***Elements of the Theory of Critical Phenomena*** by Dr. Cannas, S. A.. FAMAF, UNC. Aug. 2025 – Nov. 2025. [2]
3. ***Introduction to University Teaching: Practical Track*** by Dr. Echeveste, E. M. and Dr. Baudino Quiroga, N.. FAMAF, UNC. Aug. 2024 – Nov. 2024.
4. ***Quantum Electrodynamics*** by Dr. Depaola, G.. FAMAF, UNC. Mar. 2024 – Jun. 2024. [2]
5. ***Introduction to University Teaching: Theoretical Track*** by Dr. Echeveste, E. M. and Dr. Baudino Quiroga, N.. FAMAF, UNC. Aug. 2022 – Nov. 2022.
6. ***Introduction to Quantum Optics: Manipulation of Ultracold Atoms with Electromagnetic Fields*** by Dr. Cormick, C.. FAMAF, UNC. Aug. 2022 – Nov. 2022.
7. ***Partial Differential Equations: Analytical and Numerical Methods*** by Dr. Reula, O.. FAMAF, UNC. Aug. 2022 – Nov. 2022.
8. ***Computational Physics*** by Dr. Marconi, V. I. and Dr. Banchio, A. J.. FAMAF, UNC. Mar. 2022 – Jun. 2022.
9. ***Parallel Computing*** by Dr. Wolovick, N.. FAMAF, UNC. Mar. 2021 – Jun. 2021.

Undergraduate Courses (PhD Specialization)

1. ***Solid State Physics*** by Dr. Castellano, G. E., Dr. Zuriaga, M., Dr. Sanchez, C. and Dr. Pont, F. M.. FAMAF, UNC. Mar. 2022 – Jun. 2022.
2. ***Quantum Mechanics II*** by Dr. Osenda, O., Dr. Monti, G. and Dr. Pont, F. M.. FAMAF, UNC. Aug. 2021 – Nov. 2021.
3. ***Thermodynamics and Statistical Mechanics II*** by Dr. Castellano, G. E., Dr. Zamar, R. and Dr. Billoni, O.. FAMAF, UNC. Aug. 2021 – Nov. 2021.
4. ***Quantum Mechanics I*** by Dr. Osenda, O., Dr. Monti, G. and Dr. Zangara, P. R.. FAMAF, UNC. Mar. 2021 – Jun. 2021.
5. ***Mechanics*** by Dr. Revelli, J., Dr. Gallo, E., Dr. Racker, J. D. and Dr. Paz, D. J.. FAMAF, UNC. Aug. 2020 – Nov. 2020.
6. ***Mathematical Methods in Physics I*** by Dr. Ortiz, O., Dr. Vaca Chavez, F., Dr. Menchon, S. and Dr. Kahan, A.. FAMAF, UNC. Aug. 2020 – Nov. 2020.

Technical Skills

- **Operating Systems:** Linux, Windows.
- **Programming Languages:** Julia, Fortran, C, Mathematica, LaTeX, Bash, Git.
- **Software / HPC:** MCTDH (Heidelberg Package), Slurm, SGE, CATIA, Gnuplot, VS Code.
  Scientific software development in Julia: FEMTISE.jl (FEM-based solver for the time-independent Schrödinger equation, openly available on GitHub).

[2] Course completed but not yet formally graded.

Languages

- **Spanish:** Native.
- **English:** Intermediate (B2).
- *Private English lessons: B2 level* (2022 – 2024).
- *Intensive English course: Levels 2, 3 and 4 (B1)*, Faculty of Languages, UNC (2019 – 2020).

Other Activities

- **BAUM Fábrica de Árboles**: Volunteer in native species forestation and reforestation 2025
- **Hearing Health Campaign, CINTRA**: Technical support in audiometry for vulnerable populations 2019
- **Hobbies:** Mountaineering, Kayaking, Snowboarding, Football, Swimming, Reading.