

# Alberto Ruiz-Biestro

*Engineering Physics*

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## EDUCATION

- Present **Ph.D. Physics & Astronomy**, *Rice University*
- 2020 – 2024 **B.Sc. Engineering Physics**, *Monterrey Institute of Technology*. GPA: 3.6  
TOEFL iBT Score: 108.

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## PUBLICATIONS

1. **Alberto Ruiz-Biestro** and Julio C. Gutierrez-Vega.  
“Solutions of the Lippmann-Schwinger equation for confocal parabolic billiards”.  
*Phys. Rev. E.*, Mar 2024. doi:10.1103/PhysRevE.109.034203.

## CONFERENCE PRESENTATIONS

2. **Mexican Optics and Photonics Meeting**. Poster presentation.  
“Lippmann-Schwinger equation in parabolic geometries”. Nov 2023.
1. **National Space Activity Congress** (CONACES). “Raman spectrometer design for biosignature detection” (virtual). Nov 2021.

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## AWARDS

- Apr 2023 **Best Team Project**. *International Centre for Theoretical Physics & Quantum Trieste*, Italy. 2nd place in the quantum hackathon.
- Aug 2020 **Academic Merit Scholarship**, *Monterrey Institute of Technology*.

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## SKILLS

- Numerical* Proficient in **Julia**, **MATLAB**, **Python**, and **Linux**. Proven skills in Mathematica, Bash and **Git**.
- Experimental* Experimental optics. Bruker X-ray diffractometer D2 Phaser and related software, FTIR, UV-VIS.
- Soft skills* Analytical thinking, problem solving, collaboration, scientific communication.

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## TEACHING EXPERIENCE

- Aug 2023 – Dec 2023 **Course assistant for Mathematical Methods for Physics**.  
Graded homework and exams; held weekly advisory sessions.
- Aug 2022 – Jun 2023 **Course assistant for Modern Electrodynamics**.  
Graded homework and exams; held weekly advisory sessions.

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## LEADERSHIP

- 2022 – 2023 **Quantum Computing Club** co-founder and VP.

- Organization of seminars, including one with Dr. Benjamín Perez-García on the implementation of Deutsch's algorithm with linear optics.
- Organization and construction of a variety of courses that gave undergraduate students tools to program and analyze quantum algorithms.
- Active participation in the organization of my institution's first **quantum hackathon**. Helped with dissemination and spreading the invitation to external faculty and students.
- Coordinated and teaching of workshops in collaboration with the *Physics Student Society* (AEF in Spanish) from Nuevo-Leon's Autonomous University (UANL).
- Organization, planning, and direction of quantum computing bootcamps, offering intensive courses to students from ITESM as well as from other universities.
- Our outreach has grown beyond the state of Nuevo León.

2023 SPIE Student Chapter President  
 2022 – 2023 Given talks and short courses on Julia, Python, and  $\text{\LaTeX}$ .

## RESEARCH EXPERIENCE

- Sep 2023 – Present **Photonics and Mathematical Optics Group, Monterrey, Mexico**  
*Advisors:* Julio C. Gutierrez-Vega   
 Implemented a Boundary Integral Method for solving the Lippmann-Schwinger (scattering) Equation.  
 Development of meshes for discretization and parallel computation.  
 Advanced theoretical methods and mathematical formulations for analytic results.
- Apr 2023 **International Centre for Theoretical Physics & Quantum. Trieste, Italy**  
*Advisor:* Nathan Fitzpatrick  (*Quantinum*)
- Generated ground and excited state curves using a Quantum Krylov-subspace method along a reaction coordinate for an  $\text{H}_2$  molecular Hamiltonian.
  - Development of hybrid quantum-classical algorithms with TKET and the InQuanto quantum chemistry platform; aided team in setting up and using **Git** for version control.
  - Collaborated with graduate students from diverse backgrounds. Our team received the *Best Team Project* award, along with second place.
- Aug 2021 – Jun 2022 **Photonics and Mathematical Optics Group, Monterrey, Mexico**  
*Advisors:* Dr. Antonio Ortiz-Ambriz  Dr. Gerardo Fox  Dr. Servando López 
- Numerical simulation of the *Nonlinear Schrodinger Equation* through *pseudo-spectral method* (split-step Fourier) and numerical solutions of Boundary Value Problems (shooting method, finite differences, etc.).
  - Developed audio-identification algorithm in order to identify an audio recording from a microphone (FFT and signal-processing methods).
  - Analyzed the travelling-salesman-problem through simulated annealing; simulated the dynamics and critical points of the Lenz-Ising model.
  - Developed **Genetic algorithms** and **Neural Networks**; Experience with **Agent Based Modeling**.