



ITZEL RUIZ BARRERA

itzelruiz10@gmail.com
(513)-386-4656

Student

Currently a fourth year CAMRAS student in Applied physics and undergraduate at Illinois Institute of Technology. Through my background of electrical engineering and physics my goal is to pursue my PhD in the field of Quantum Science.

Education

Illinois Institute of Technology| August 2022-Present

Bachelors Student In Applied Physics (Electrical Engineering concentration)| Expected Graduation: 2026|

GPA up to 6th Semester; 3.58/4.0

Professional Experiences

Chicago Quantum Exchange Fellow, [Goldsmith Group](#), Chemistry Department, University of Wisconsin Madison| May - July 2025

- Investigated and developed modifications to fiber-based Fabry–Perot cavity designs to advance fundamental understanding and enable more efficient photonic interfacing with qubits.
- Developed and optimized a neodymium-doped silica sol–gel for fiber coating experiments and enabling controlled optical absorption conditions.
- Applied UV–Vis spectroscopy to characterize absorption spectra and evaluate structural optical properties of neodymium-doped silica sol–gel materials.
- Employed Scanning Electron Microscopy (SEM) to analyze surface morphology and microstructural features of fiber coating materials.
- Utilized Zygo surface profilometry to assess surface quality, roughness, and uniformity of cleaved and coated optical fibers.
- Presented project findings at the annual Chicago Quantum Exchange Symposium, University of Chicago, highlighting advances in photonic–qubit interfacing research.

Quantum Computing and Informatics Undergraduate Intern, Fermi National Accelerator Laboratory| June 2024

- Learned and applied the fundamentals of quantum computing, including quantum gates and superposition with guidance from the members of theory group at Fermi National laboratory who focus on lattice field theory.
- Gained hands-on experience programming in Python and Qiskit to design quantum algorithms by translating traditional computer science methods into Quantum systems.
- Collaborated with scientists and mentors to deepen understanding of quantum mechanics and computational models by peer-reviewing technical models.
- Developed and simulated basic quantum field theory models using Quantum Gate operations to explore applications in practical problem-solving.
- Conducted simulations and experiments to analyze quantum states and operations in a simulated environment to build quantum field theory models.

Undergraduate Researcher, [Segre Group](#), Physics Department, Illinois institute of Technology| May 2023 - May 2025

- Joined Professor Carlo Segre’s research group and partnered with a PhD student to analyze results and integrated learning to propose new projects for further optimization lithium ion battery charge and discharge cycles.
- Designed experiments to develop and test novel anode materials for lithium- and sodium-ion batteries by investigating molecular structures of transition-metal–containing compounds.
- Received comprehensive training in XRD instrument operation, crystallographic analysis with GSAS-II, battery cell fabrication, and electrochemical cycling tests to evaluate performance under varied conditions.
- Developed technical expertise in different synthesis techniques including sol-gel, annealing, and ball-milling to produce novel materials and prepare samples for XAFS analysis at Argonne National Laboratory.
- Presented research findings at the [2024 SACNAS conference](#) and the Illinois Institute of Technology Spring 2025 Undergraduate Poster competition.

Electrical Engineering Co-op Cincinnati Incorporated| May 2024 - August 2024

- Developed a mathematical model for laser cutting, applying engineering principles to optimize precision and efficiency.
- Designed an experiment to apply mathematical equations in real-world laser cutting of metal, improving project outcomes.
- Utilized Solid Edge software to design and develop electrical schematics and systems to enable upgrades and troubleshooting.
- Collaborated with senior electrical engineers, assisting in developing schematic drawings and electrical design processes.
- Conducted UL safety inspections to ensure compliance with key industry safety standards for electrical products.

Case Western Reserve Origin Science Pre College program| August 2021

- Awarded a high school scholarship to attend an advance summer college course on complex topics in Astrophysics and Evolutionary Biology and selected among several hundred applicants to receive the opportunity
- Implemented technical concepts to design a research project to map origin of life by applying evolutionary science

Presentations & Papers

Dana M. Alramahi, **Itzel R. Barrera**, Otavio J. Marques, Karen A. Marin, Bernard Patawah, Carlo U. Segre | *Wadsley-Roth materials for fast charging anode for Li-ion and Na-ion batteries* | paper manuscript submitted for publication

Dana M. Alramahi, **Itzel R. Barrera**, Otavio J. Marques, Carlo U. Segre | *HEO (ZnCoCuNiMg) Made by Sol-Gel Synthesis for Li-Anodes* | paper manuscript submitted for publication

Dana M. Alramahi, Otavio J. Marques, **Itzel R. Barrera**, Karen A. Marin, Benard Patawah, Carlo U. Segre | *Novel design of high-entropy bronze oxide for fast charging anode for Li-ion batteries* | paper manuscript submitted for publication

Dana M. Alramahi, Otavio J. Marques, **Itzel R. Barrera**, Carlo U. Segre | *Removal of Titanium from High-Entropy Tungsten-Bronze anode for Li-ion Batteries* | paper manuscript submitted for publication

Itzel Ruiz Barrera | *Sol-Gel Coating Fibers for Multiple Optically Tunable Fabry-Pérot Cavities* | Oral Presentation at Chicago Quantum Exchange Symposium July 29, 2025 & Poster Presentation at Chicago Quantum Summit Nov 3, 2025

Itzel Ruiz Barrera | *High Entropy Oxide Tungsten Bronzes as Anodes for Lithium-Ion Batteries* | Poster Presentation at SACNAS conference October 2024

Involvements

- **President of the Society of Physics** student school chapter where I lead an executive board dedicated to advancing the appreciation of physics and fostering research opportunities. My mission is to significantly increase student engagement and ensure that members have access to the resources and support necessary to enhance their academic and professional careers.

-**1st Vice President of Recruitment for Kappa Phi Delta Sorority** where I lead the planning of recruitment week and actively contribute to the executive board, addressing conflicts and implementing strategies to enhance our chapter's impact. Previously, I was the Scholarship Chair, where I promoted academic excellence by guiding my sisters to improve their performance and raise their GPAs. Additionally, I held the role of Philanthropy Chair, where I organized and facilitated 15 hours of meaningful volunteer opportunities, fostering a strong spirit of service within our sisterhood.

- **Created a Robotics club** for a local hispanic church where I provided introductory STEM opportunities for middle school through early high school kids.

Skills

- VHDL programming language
- Solid Edge
- KiCad
- XRD analyzing (GSAS-II)
- C programming language
- SolidWorks
- UV-Vis Spectroscopy
- Bilingual in Spanish and English
- Mathematica
- Java
- Matlab and Octave
- Qiskit
- Python
- SEM
- Zygo Microscope

Achievements

- **Camras Scholarship:** Awarded a full tuition scholarship at the Illinois Institute of Technology, recognizing select students who demonstrate exceptional leadership and academic excellence through a competitive roundtable interview process.
- **Dean's List:** Achieved Dean's List honors for Fall 2023, Spring 2024, Fall 2024, and Spring 2025, reflecting consistent academic excellence.
- **2024 Purdue Quantum Summer School:** Selected to attend the prestigious Purdue Quantum Summer School, with all travel and lodging expenses covered.
- **SACNAS 2024 Travel Scholar:** Chosen as a Travel Scholar for the SACNAS conference, where I presented my research conducted with the Segre group, fully funded by the organization.
- **Illinois Institute of Technology Spring 2025 Poster Competition:** Awarded first place for best poster presentation for my research with the Segre group, showcasing my ability to communicate complex scientific concepts effectively.