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Education

- **Max Planck Institute for the Physics of Complex Systems** — Dresden, Germany
  Doctoral Student — *Aug. 2021 - present*
  - PhD. Supervised by Prof. Roderich Moessner
- **Universidad Nacional Autonoma de Mexico, UNAM** — Mexico City, Mexico
  Bachelor of Science in Physics, summa cum laude — *Aug. 2016 - January 2021*
- **University of California, Berkeley** — Berkeley, CA
  Exchange semester abroad — *2019 Fall*

Research Experience

- **Non-linear Transport in Weyl Semimetals** — Mexico City, Mexico
  Research Assistant — *Spring 2019 - Fall 2020*
  - Associate student at the Institute of Nuclear Sciences, UNAM under the supervision of PhD. José Alberto Martín Ruiz from the department "Structure of Matter". We researched transport properties of topological materials, specifically non-linear electrochemical conductivity in Weyl (WSM), and nodal-line (NLSM) semimetals. For a WSM we discovered a novel quantized phenomena under the semi-classical Boltzmann formalism.
- **Soliton dynamics in Bose-Einstein condensates** — Mexico City, Mexico
  Research Assistant — *Summer 2020*
  - I studied the soliton dynamics of a high density Bose-Einstein condensate subject to a time varying anharmonic trap, under the guidance of PhD. Jorge Fujioka (Institute of Physics, UNAM). Using a variational approximation (VA) we investigated the behaviour of a condensate where three body losses, quantum feeding and second order quantum fluctuations were present. The VA solutions were compared with direct numerical solutions of a modified Gross-Pitaevskii equation, resulting in a novel fragmentation and regeneration process.
- **Non-linear optical phenomena in Weyl Semimetal** — Berkeley, CA
  Research Assistant — *Fall 2019*
  - Assisted Dr. Daniel Parker, within PhD. Joel's Moore group, on theoretical calculations of the self-focusing conductivity for a Weyl Semimetal within a novel Feynman diagrammatic approach.

Academic Recognitions

- **Gabino Barreda Award** — Mexico City, Mexico
  Medal and certificate — *Fall 2021*
  - Awarded the Gabino Barreda Medal for the highest grade point average as a bachelor of science in Physics, UNAM
- **Graduated with honours** — Mexico City, Mexico
  Valedictorian — *2013 to 2016*
  - Finished high school at Educational Centre Jean Piaget with a final average of 99%. Awarded the best high school grade average by the Directorate General for Incorporation and Revalidation of Studies (DGIRE), UNAM.
- **Metropolitan Chemistry Competition** — Mexico City, Mexico
  First place — *Nov. 2015 to Jan. 2016*
  - First place at the XXVI Metropolitan Chemistry Competition, with an additional National Chemistry Competition curse of Physical, Organic, Inorganic and Analytical Chemistry by the Centre for Advanced Research and Studies of the National Polytechnic and the School of Chemistry, UNAM.

Schools and Workshops

- **Frontiers of Condensed Matter** — Les Houches, France
  International Doctoral Training Session — *October 2022*
  - Two week school with high-level training in the general area of condensed matter physics, organized jointly by the Physics Graduate School of Grenoble, by the Casimir Research School of Delft-Leiden (Netherlands), the Donostia International Physics Center in San Sebastian (Spain), the Graduate School of Quantum Matter at the Karlsruhe Institute of Technology, the Transregional Collaborative Research Center Elasto-Q-Mat (Germany), and the Swiss Nanoscience Institute in Basel (Switzerland)

- **DPG Spring Meeting of the Condensed Matter Section** — Germany
  Talk — *September 2021 and March 2022*
  - Participated on both Condensed Matter meetings of the German Physical Society (DPG) in Regensburg and Dresden and gave a talk on *Time Reversal invariant finite-size topology* .

- **Topological Phases in Condensed Matter and Ultracold Atom Systems** — Corsica, France
  School/Workshop — *June 28 to July 8 2022*
  - Participated a the two week school/worshop on topological phases at the Institute d'Etudes Scientifiques de Cargèse

- **Cluster of excellence ct.qmat retreat** — Merseburg, Germany
  Speaker at Retreat — *March 2022*
  - Presented *Quantized nonlinear transport phenomena in Weyl semimetals* at the *Complexity and Topology in Quantum Matter (ct.qmat)* 2022 retreat, part of the Würzburg-Dresden cluster of excellence

- **CMD2020GEFES** — Madrid, Spain (online)
  Speaker at Colloquium — *Sep 2020*
  - Presented *Quantized nonlinear transport phenomena in Weyl semimetals* at the *Emergent Transport in Functional Quantum Materials* colloquium, part of a international conference combining the biennial meeting of the Condensed Matter Divisions of the Spanish Royal Physics Society (RSEF-GEFES) and of the European Physical Society (EPS-CMD).

Skills

Languages: Spanish, English, Intermediate German, Beginner Italian; **Computational**: Python (including N.N. with Keras and Pytorch), C++, Fortran, Julia, Unix Shell

Operating Systems: Linux, MacOS X, Windows 95/98/NT/2000/XP

Applications: Mathematica, MatLab, LaTeX, OpenOffice, MS Office XP

Publications

- Flores-Calderón, R. ,Fujioka J. , and A. Espinosa-Cerón. "**Soliton Dynamics of a High-Density Bose-Einstein Condensate Subject to a Time Varying Anharmonic Trap.**" Chaos, Solitons &; Fractals, vol. 143, Jan. 2021, p. 110580., doi:10.1016/j.chaos.2020.110580. url: https://www.sciencedirect.com/science/article/pii/S0960077920309711?via%3Dihub

- Flores-Calderón, R., and A. Martín-Ruiz. "**Quantized Electrochemical Transport in Weyl Semimetals.**" Physical Review B, vol. 103, no. 3, 2021. Crossref, doi:10.1103/physrevb.103.035102. https://journals.aps.org/prb/abstract/10.1103/PhysRevB.103.035102