

Sebastián Urrutia-Quiroga

Physics & Teaching

1700 Northside Dr NW, Apt 4305
Atlanta, GA 30318, USA
☎ +1 (619) 627 7184
✉ surrutiaquir@gmail.com
🌐 www.surrutiaquir.com
Last update: October 22, 2021

Educational background

- Expected Summer 2022 **Ph.D. in Physics**, *University of Massachusetts (UMass)*, Amherst, USA.
Advisor: Prof. Michael Ramsey-Musolf.
- December 2015 **M.Sc. in Physics**, *Pontificia Universidad Católica de Chile (PUC)*, Santiago, Chile.
Advisors: Prof. Marco Aurelio Díaz and Prof. Ángel Abusleme.
Conferred with Maximum Distinction.
- December 2015 **Electrical Engineer**, *Pontificia Universidad Católica de Chile*, Santiago, Chile.
Professional degree.
Conferred with Maximum Distinction.
- December 2013 **Bachelor of Engineering**, *Pontificia Universidad Católica de Chile*, Santiago, Chile.
Conferred with Distinction

Research interests

Physics beyond the Standard Model. Leptogenesis. Low-energy observables (e.g., $0\nu\beta\beta$ -decay, CLFV, CP -violation). Collider phenomenology, including Machine Learning algorithms. Effective field theories, fundamental symmetries, and Electroweak symmetry breaking. Dark matter.

Scholarships and Awards

- 2020 “Arthur Quinton” TA award, Physics Department, UMass, Amherst.
Awarded to an outstanding Teaching Assistant.
- 2018 Most inspiring TA award, School of Engineering, PUC, Chile.
Award conferred by the Engineering Student Association.
- 2018 Becas Chile grantee, CONICYT, Chile.
Scholarship to support Ph.D. students out of the country.
- 2016 Fulbright grantee, Fulbright Foreign Student Program, USA.
Enables graduate students from abroad to study and conduct research in the United States.
- 2016 “Marcos Orrego Puelma” award, Chilean Institute of Engineers, Chile.
Award conferred to the best student among the graduates of the associated universities.
- 2015 “Escuela de Ingeniería” award, School of Engineering, PUC, Chile.
Best student of the 2015 class.
- 2014 Beca Nacional de Magister grantee, CONICYT, Chile.
Scholarship to support M.Sc. students in Chile.

2011, 2014, 2015 A-class Teaching Assistant, Math Department, PUC, Chile.

Highest TA category in the Department.

2009 “Padre Hurtado” award, PUC, Chile.

Full funding to carry out undergraduate studies.

Teaching experience

Inclusive and engaging instructor with extensive experience as a mentor, teaching assistant, and instructor of record.

INSTRUCTOR OF RECORD

Spring 2021 **Introductory Physics I (P131)**, *University of Massachusetts*, Amherst.

Undergraduate level.

Algebra-based course on introductory physics.

- Taught online, asynchronously using the flipped environment approach.
- Facilitated weekly live problem-solving sessions.
- Five sections of 100 students (co-instructor: Prof. Heath Hatch).

Spring 2020 **Introductory Physics I (P131)**, *University of Massachusetts*, Amherst.

Undergraduate level.

Algebra-based course on introductory physics.

- Taught in Team-Based-Learning (TBL) format using the flipped environment approach.
- Developed course material and coordinated the instructional team.
- One section of 100 students.
- Half of the semester was held in person and the second half was held online.

2017–2018, 2020 **Pre-academic physics training for engineering freshmen**, *Pontificia Universidad Católica de Chile*, Santiago, Chile.

Undergraduate level.

School of Engineering.

- One-week long mini-course.
- Developed solved-problem sets and video lessons to reinforce students' learning.
- Facilitated daily live problem-solving sessions, using technology to increase students' engagement in the class.
- General coordinator of the three sections; teaching one section of 150 students.

2014 **PENTA UC**, *Pontificia Universidad Católica de Chile*, Santiago, Chile.

High-school level.

Educational Program for Academically Talented Children (Penta UC).

- One-semester long mini-course. Algebra-based introduction to special relativity.
- Prepared and delivered student-centered lectures, putting emphasis on students' participation and engagement.
- One section of 30 students.

TEACHING ASSISTANT

Role: Supported students' learning process with weekly help sessions (or daily attendance to class for TBL format) and interactive review sessions before exams. Provided developmental feedback as part of grading responsibilities.

- 2017–to date **Physics Department, University of Massachusetts, Amherst.**
Undergraduate level.
 Introductory physics for life sciences majors: Introductory Physics I (P131) and Introductory Physics II (P132). Taught in TBL format.
- Graduate level.**
 Core courses of the graduate introductory program of studies: Classical Mechanics (P601), Methods of Mathematical Physics (P605), and Classical Electrodynamics (P606).
- 2010–2017 **Physics Department, Math Department, School of Engineering, Pontificia Universidad Católica de Chile, Santiago, Chile.**
 Undergraduate-level courses for science-related majors.
- Physics: Statics and Dynamics (FIS1513), Thermodynamics (FIS523), Electricity and Magnetism (FIS1533), and Methods of Mathematical Physics II (FIZ0313).
 - Math: Single and multivariable calculus series (MAT1610, MAT1620, MAT1630), and ordinary differential equations (MAT1640).
 - Engineering: Electronics (IEE2413), Electric Materials (IEE1100), and Electric Circuits (IEE2123).
- 2009–2014 **PENTA UC, Pontificia Universidad Católica de Chile, Santiago, Chile.**
 High-school level.
 Classical mechanics, fluid physics, and special relativity courses for high school students at the Educational Program for Academically Talented Children (Penta UC).

MENTOR

- 2018–to date **Informal research mentoring of Ph.D. students, University of Massachusetts, Amherst.**
 High-Energy Ph.D. students in the Physics Department at UMass Amherst (Samyukta Krishnamurthy, Jesse Underland)
- 2010–2017 **CARA UC, Pontificia Universidad Católica de Chile, Santiago.**
 Academic support and realization of math/physics help sessions for science-related majors at the Support Center for Academic Performance and Vocational Exploration (CARA UC). More information about the program is available [here](#) (in Spanish).

Schools, seminars, and conferences

As speaker:

- 2021 DPF21 – 2021 Meeting of the Division of Particles and Fields of the American Physical Society, Florida State University, Florida (virtual event).
- 2021 Phenomenology 2021 Symposium, University of Pittsburgh, Pennsylvania (virtual event).
- 2021 Graviticulas Seminar, Pontificia Universidad Católica de Chile, Santiago, Chile (virtual event).
- 2021 Theory Seminar, Universidad Adolfo Ibañez, Santiago, Chile (virtual event).
- 2021 Frontiers of Particle and Nuclear Physics Seminar, Shanghai Jiao Tong University/Tsung-Dao Lee Institute, Shanghai (virtual event).
- 2020 Virtual Colloquium, Los Alamos National Laboratory, New Mexico (virtual event).
- 2020 Phenomenology 2020 Symposium, University of Pittsburgh, Pennsylvania (virtual event).

As attendee:

- 2021 SACNAS National Diversity in STEM (NDiSTEM) Digital Conference.
- 2020 Mini-workshop: Particle theory of neutrinoless double-beta decay, Snowmass Topical Group on Neutrino Properties (virtual event).
- 2019 National Nuclear Physics Summer School, University of Tennessee, Knoxville.
- 2016 4th Chilean School of High Energy Physics, Universidad Técnica Federico Santa María, Valparaiso, Chile.

Service activities

Teaching and mentoring

- First-year students mentoring program, Physics Department, UMass, Amherst. Peer mentor, 2018–2020.
- Talent + Inclusion program, School of Engineering, PUC, Chile. Peer mentor, 2014–2015. More information about the program is available [here](#) (in Spanish)
- Elaboration of problem set volumes for math and physics courses, 2010–to date. Available free of charge in my [personal website](#).

Professional

- MJRM Group, Physics Department, UMass, Amherst. Cluster manager and IT liaison. 2020–to date.
- Climate Committee, Physics Department, UMass, Amherst. Graduate student representative, 2020–2021.
- Graduate Employee Organization, UMass, Amherst. Physics steward, 2020–2021.
- Graduate Student Seminar, Physics Department, UMass, Amherst. Organizing committee member, Spring 2020.
- International Masterclass-Chile, Physics Institute, PUC, Chile. Organizing committee member, 2015–2016.
- High Energy Festival, Physics Institute, PUC, Chile. Organizing committee member, 2015–2016.
- Student Association, School of Engineering, PUC, Chile. Undergraduate electrical engineering representative, 2014.

Languages

- Spanish Native proficiency.
- English Full professional proficiency.

Computer skills

- Programming languages Python, C++
- Technical computing Mathematica, Matlab
- Operating system Linux, MacOS, Microsoft Windows

Publications

PUBLISHED IN JOURNALS

- [1] M. A. Díaz, N. Rojas, S. Urrutia-Quiroga and J. W. F. Valle, *Heavy Higgs Boson Production at Colliders in the Singlet-Triplet Scotogenic Dark Matter Model*, JHEP **08**, 017 (2017), [1612.06569].
- [2] M. A. Díaz, B. Koch and S. Urrutia-Quiroga, *Constraints to Dark Matter from Inert Higgs Doublet Model*, Adv. High Energy Phys. **2016**, 8278375 (2016), [1511.04429].

UNDER REVIEW

- [1] J. Harz, M. J. Ramsey-Musolf, T. Shen and S. Urrutia-Quiroga, *TeV-scale Lepton Number Violation: Connecting Leptogenesis, Neutrinoless Double Beta Decay, and Colliders*, 2106.10838.

IN PREPARATION

- [1] M. L. Graesser, G. Li, M. J. Ramsey-Musolf, T. Shen and S. Urrutia-Quiroga, *Lepton Number Violating Leptoquark Interactions: $0\nu\beta\beta$ Decay and Collider Probes*.
- [2] G. Cottin, J. Harz, G. Li, M. J. Ramsey-Musolf, J. Underland and S. Urrutia-Quiroga, *Lepton Number and Flavor Violation in the High-Energy and Intensity Frontiers*.

CONFERENCE PAPERS

- [1] I. Maturana-Ávila, M. A. Díaz, N. Rojas and S. Urrutia-Quiroga, *Towards a way to distinguish between IHDM and the Scotogenic at CLIC*, in *Prospects in Neutrino Physics (NuPhys2018) London, United Kingdom, December 19-21, 2018*, 1903.11181.