

# Toni Bertólez Martínez

PHD STUDENT · PHYSICS PROGRAM

*Institut de Ciències del Cosmos, Universitat de Barcelona*

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## EDUCATION

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### Universitat de Barcelona

*Barcelona, Spain*

PHD IN PHYSICS

*2021 - present*

- PhD thesis: “Massive neutrinos as a window to New Physics in Particle Physics, Astrophysics and Cosmology”.
- Advisor: Dr. Jordi Salvadó Serra

### Institut de Ciències del Cosmos, Universitat de Barcelona

*Barcelona, Spain*

MS ASTROPHYSICS, PARTICLE PHYSICS AND COSMOLOGY

*2019 - 2020*

- Specialization in Particle Physics and Gravitation. Average grade 9.4/10.
- Master’s thesis: “Dark matter from inflaton - Higgs coupling”, supervised by Dr. Alessio Notari.

### Universitat de Barcelona

*Barcelona, Spain*

BS UNDERGRADUATE DEGREE

*2015 - 2019*

- Specialization in Fundamental Physics. Average grade 8.7/10.
- Bachelor’s thesis: “Coleman-Weinberg Symmetry Breaking and Higgs Physics”, supervised by Dr. Federico Mescia.

## PROFESSIONAL EXPERIENCE

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2021-2025 **Predoctoral researcher**, Universitat de Barcelona

2019-2020 **Graduate researcher**, Institut de Ciències del Cosmos, Universitat de Barcelona

2018-2019 **Universitat de Barcelona**, Spanish Ministry of Education

2018 **Undergraduate Research Assistant**, Deutsches Elektronen-Synchrotron (DESY)

## PUBLICATIONS

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### PUBLISHED

Carlos A. Argüelles, **Toni Bertólez-Martínez**, Jordi Salvadó. Impact of wave packet separation in low-energy sterile neutrino searches. *Phys.Rev.D* 107 (2023) 3, 036004. arXiv: 2201.05108.

**Toni Bertólez-Martínez**, Carlos A. Argüelles, Iván Esteban, Jacobo López-Pavón, Iván Martínez-Soler, Jordi Salvadó. IceCube and the origin of ANITA-IV events. *JHEP* 07 (2023), 005. arXiv: 2305.03746.

Virgile Dandoy, **Toni Bertólez-Martínez**, Francesco Costa. High Frequency Gravitational Wave Bounds from Galactic Neutron Stars. arXiv: 2402.14092.

### CONTRIBUTED

M. A. Acero et al. White Paper on Light Sterile Neutrino Searches and Related Phenomenology. arXiv: 2203.07323.

## AWARDS, FELLOWSHIPS & GRANTS

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2021-2025 **Predoctoral Research Fellowship**, Spanish Ministry of Science and Innovation

2019-2020 **Postgraduate Research Fellowship**, Institut de Ciències del Cosmos

2018-2019 **Undergraduate Research Fellowship**, Spanish Ministry of Education

2018 **Undergraduate Research Fellowship**, Deutsches Elektronen-Synchrotron (DESY)

## SECONDMENTS

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- July 2023 **Fermi National Acceleratory Laboratory (FNAL)**, Batavia, USA. One month stay working on neutrino cosmology with Dr. Olga Mena and Rasmi Hajjar.
- Mar 2024 **Fermi National Acceleratory Laboratory (FNAL)**, Batavia, USA. Two months stay working on ultra-high-energy neutrinos with Dr. Pedro Machado.

## PRESENTATIONS

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### INVITED TALKS

- July 2024. *Going beyond cosmological bounds on neutrino masses*. Invited talk: Invisibles24 Workshop, Bologna.
- August 2023. *IceCube and the origin of the ANITA-IV events*. Invited talk: Invisibles23 Workshop, Göttingen.
- May 2023. *The origin of the ANITA-IV events from the synergies with IceCube*. Invited talk: Third Annual EuCAPT symposium 2023, CERN. Received an EuCAPT lightning talk prize in recognition of this talk. [Link here](#).
- July 2022. *Impact of Wave Packet Separation in Low-Energy Sterile Neutrino Searches*. Invited talk: Here, There and Everywhere Neutrino School 2022, Niels Bohr Institute, Copenhagen, Denmark.
- June 2022. *Impact of Wave Packet Separation in Low-Energy Sterile Neutrino Searches*. Invited talk: Invisibles22 Workshop, Paris-Saclay University (IJCLab), Orsay, France.
- February 2022. *Ghostbusters! A perspective on neutrino oscillations*. Invited talk: ICCUB Winter Meeting 2022, Barcelona, Spain.

### POSTERS

- July 2024. *Going beyond cosmological bounds on neutrino masses*. Invisibles24 Workshop, Bologna. Received the best poster of the session award.
- August 2023. *What is the origin of the ANITA-IV events?* Invisibles23 School & Workshop, Germany. Received the prize for the 3rd best poster of the session.
- May 2023. *What is the origin of the ANITA-IV events?* Third Annual EuCAPT symposium 2023, CERN.
- June 2022. *Impact of Wave Packet Separation in Low-Energy Sterile Neutrino Searches*. Invisibles22 School & Workshop, Paris-Saclay University (IJCLab), Orsay, France. Received the prize for the best poster of the session.

### SEMINARS

- April 2024. *What do we measure when we measure the neutrino mass in cosmology?* Invited chalk talk: Fermilab, USA.
- April 2024. *What do we measure when we measure the neutrino mass in cosmology?* Invited talk: Laboratory for Particle Physics and Cosmology (LPPC), Harvard University, USA.
- March 2024. *IceCube and the origin of the ANITA-IV events*. Invited talk: Centre For Neutrino Physics (CNP), VirginiaTech.
- October 2023. *IceCube and the origin of the ANITA-IV events*. Invited talk: IFIC, UV.
- July 2023. *IceCube and the origin of the ANITA-IV events*. Invited talk: Laboratory for Particle Physics and Cosmology (LPPC), Harvard University, USA.
- May 2023. *IceCube and the origin of the ANITA-IV events*. Invited talk: Center for Cosmology and AstroParticle Physics (CCAPP) Journal Club, Ohio, USA.
- December 2021. *Sterile neutrinos: oscillations and decoherence*. Cosmology Journal Club, ICCUB, Barcelona, Spain.

## ATTENDED CONFERENCES

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- 2023 **Invisibles23 School & Workshop**, Universität Heidelberg and Georg-August-Universität Göttingen  
**International Neutrino Summer School**, Fermilab  
**Physics and Gender school**, Càtedra UB de Perspectiva de Gènere i Feminismes Ciutat de Cornellà  
**Third Annual EuCAPT Symposium**, CERN, Geneva, Switzerland
- 2022 **Invisibles22 School & Workshop**, Paris-Saclay University (IJCLAB), Paris, France  
**Here, There & Everywhere Neutrino School 2022**, Niels Bohr Institute, Copenhagen, Denmark
- 2021 **Invisibles21 School**, Online

## TEACHING EXPERIENCE

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- 2022-2023 **Mètodes Matemàtics per a la Física I**, Teaching Assistant, 15h *UB*
- 2021-2022 **Mètodes Matemàtica per a la Física II**, Teaching Assistant, 15h *UB*

## SERVICES

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### COMISSIONS

- 2024- **PhD Students representative**, at the ICCUB Council. *ICCUB*
- 2022-2023 **PhD Meeting comission**, Co-organizer of the weekly meetings between PhDs, where we build a support network and train ourselves. *ICCUB*
- 2022-2025 **Encontres amb el Tercer Cicle (E3C)**, Member of E3C, an association that organizes outreach talks from PhD students to undergrads. Co-organized 4 series of talks. *UB*
- 2021-2024 **Diversity, Equity and Inclusion Comission (DEIC)**, PhD students representative *ICCUB*
- 2021 - **Equality Comission of the Physics Department**, PhD students representative *UB*

### MENTORING

- 2022-2023 **MS Astrophysics, Particle Physics and Cosmology**, Mentor *ICCUB*
- 2021-2022 **MS Astrophysics, Particle Physics and Cosmology**, Mentor *ICCUB*

## OUTREACH

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### PRESS AND MEDIA

- 2024 **Scientific writer for “Núvol”**, Núvol is a Catalan digital newspaper for which I will be occasionally writing some articles on different scientific topics.  
**“Cau la nit al Castell de Pladurs” podcast**, Two podcast episodes on cosmic rays and neutrino astronomy.
- 2023 **La Tarda de Catalunya Ràdio**, Radio section on scientific outreach and the book “Per què els elefants no tenen càncer?”  
**Radio Nacional Espanyola, El Pla B**, Radio section on science interdisciplinarity and the book “Per què els elefants no tenen càncer?”  
**Radio OndaCero Catalunya**, Radio section on science interdisciplinarity and the book “Per què els elefants no tenen càncer?”  
**Per què els elefants no tenen càncer?**, Co-published a book section on general scientific questions from an interdisciplinary point of view. Wrote a chapter on complex systems and the Ising model.  
**Radio OndaCero Catalunya**, Radio section on astronomy, JWST and Euclid  
**Quan vinguin els marcians (TV3)**, 1 television interview on scientific culture and outreach  
**Totes les cares de l’astrologia (Diari de Barcelona)**, Interview for a news report on astrology, where I debunked its unscientific claims.  
**Ràdio Olot - La Butaca d’Einstein**, 6 radio sections on Quantum Physics

- 2022 **Ràdio Estel**, Radio section on Quantum Teleportation  
**Radio OndaCero Barcelona**, Radio section on Einstein, Bohr and Quantum Entanglement  
**“Explica’m, tresor” podcast**, Podcast episode on research and scientific outreach

#### TALKS AND WORKSHOPS

- 2024 **Una astronomia poc convencional: física de partícules per a entendre l’Univers, i viceversa.**, Outreach talk at ASTER, the astronomical association of Barcelona.  
**Una astronomia poc convencional: física de partícules per a entendre l’Univers, i viceversa.**, Outreach talk at Can Ginestar, Sant Just Desvern.  
**Cafè Conti de l’Ateneu Barcelonès**, Invited as a speaker for a youth gathering around the vices of academia.  
**Som el futur: els i les joves parlem de la ciència**, Organized and moderated a round table on the role of youth on science and its impact on society.
- 2023 **“Els LEGO de la matèria: més enllà de protons, neutrons i electrons.”**, Teacher of a 20h Introduction to Particle Physics course, aimed to people without no deep knowledge on Physics.  
**“L’Univers és ple de colors: l’astrofísica a través de múltiples mirades”**, Co-organizer of a round table on multimessenger astronomy, together with some ICCUB colleagues.  
**Tesimarató Física UB 2023**, Physics UB winner in a contest to disseminate the thesis in 4 minutes  
**Victoriano Pineda prize for PhD research and outreach**, Obtained this prize in recognition of the best outreach short talk during the UB PhD Day.  
**Premis InnoBages 2023**, Round table on scientific outreach at Manresa, Bages.  
**3/4-Minute-Thesis**, UB finalist in two contests to disseminate the thesis in 3 or 4 minutes.  
**“Un Univers en expansió”**, **Jornades del Cosmos**, Talk about cosmology to a general public. Furthermore, I helped organize the outreach weekend event.  
**“Biennal Ciutat i Ciència: Joves fent camí per la ciència”**, Round table with young researchers about the challenges and opportunities in Science for the youth.  
**“Taula rodona sobre cosmologia i el paper de la dona a la ciència”**, **ICCUB**, Round table on cosmology and the role of women in STEM.
- 2022 **“Veure allò que és invisible: observem la matèria fosca”**, **InSpiracy 2022**, Talk about dark matter to high-schools.  
**“Veure allò que és invisible: observem la matèria fosca”**, **Sopa de partícules**, Talk about dark matter to a general public.  
**“Com de grans som a l’Univers?”**, **Cal Forner Castellcir**, Talk about cosmic scales to a general public.  
**Pèntagon UPF 2022**, Round table on different outreach projects, I talked about Neurons Fregides.

#### OUTREACH ON THE SOCIAL NETWORKS

**Del buit al tot** is a personal project of scientific outreach in Physics addressed to the youth and in Catalan. Between YouTube, Twitter, Instagram and TikTok, it gathers around 9.000 followers.

**Neurons Fregides** is a platform of scientific outreach in Catalan, which I have co-founded. It assembles different outreach projects centered in social media. Between YouTube, Twitter, Instagram and Twitch, it gathers almost 30.000 followers.

- 2024 **“Ajuts Joan Oró per a projectes divulgatius 2023”**, Won a grant for carrying the outreach project “La Hipòtesi Absurda”, a podcast on science, society and culture.
- 2022 **“Ajuts Joan Oró per a projectes divulgatius 2021”**, Won a grant for carrying the outreach project “Disseccionem la ciència” within the platform “Neurons Fregides”.  
**“Premios de divulgación científica CPAN”**, Won a prize for an outreach video about the IceCube telescope and neutrino astronomy.
- 2021 **“Premis de divulgació ACCC”**, Won a prize on outreach for my project “Del buit al tot”.