

## Mauricio Bustamante

### Contact information

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Copenhagen 2100, Denmark	<a href="http://mbustamante.net">http://mbustamante.net</a>
Citizenship – Peru (born in Lima)	ORCID: 0000-0001-6923-0865

### Research interests

Astroparticle physics, neutrino physics, ultra-high-energy astrophysical neutrinos and cosmic rays, gamma-ray bursts, new physics in ultra-high-energy phenomena

### Employment

Assistant Professor, Niels Bohr Institute, U. of Copenhagen	2020–Present
Postdoctoral Researcher, Niels Bohr Institute, U. of Copenhagen	2017–2020
Postdoctoral Fellow, Center for Cosmology and AstroParticle Physics, Ohio State U.	2014–2017

### Education

Ph.D., Physics, Julius-Maximilians-Universität Würzburg, Germany	2014
Also: Graduate Assistant in the Astroparticle Theory group, DESY Zeuthen, Germany	
M.S., Physics, Pontificia Universidad Católica del Perú, Peru	2010
B.Sc., Physics, Pontificia Universidad Católica del Perú, Peru	2006

### Projects funded

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|---|-----------|
| 1. Villum Fonden Young Investigator Award<br>“Pushing neutrino physics to the cosmic frontier”<br>(Project no. 29388)<br>Amount: ~1.3M euro<br>Role: Principal investigator           | 2020–2025 |
| 2. Fermi Guest Investigator Program — Cycle 12<br>“Correlating Fermi-LAT and ASAS-SN data to understand blazars”<br>(GSFC #121122, NSPIRES #18-FERMI12-0026)<br>Role: Co-investigator | 2019–2020 |

### Awards and distinctions

Ohio State U. Annual International Scholar Research Exposition	2016
KITP Fellowship “Present and future neutrino physics”, UC Santa Barbara	2014
DFG Research Training Group GRK1147 “Theoretical astrophysics and particle physics”, U. Würzburg, Germany	2012–2014
Program for Latin American Students, Fermilab Theory Department	2009
M.Sc. thesis project awarded 2009 Prize for Research Support of Graduate Students, PUCP, Peru	2009
CERN High Energy Latinamerican-European Network (HELEN) STT Fellow, IFIC, Spain	2008
CERN High Energy Latinamerican-European Network (HELEN) CT Fellow, CINVESTAV, Mexico	2007–2008
CERN High Energy Latinamerican-European Network (HELEN) CT Fellow, CINVESTAV, Mexico	2006–2007

**Refereed journal publications**

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26. N. Song, S. W. Li, C. A. Argüelles, **M. Bustamante**, A. C. Vincent, *The Future of High-Energy Astrophysical Neutrino Flavor Measurements*, JCAP 04, 054 (2021) [arXiv:2012.12893]
25. M. Ahlers, **M. Bustamante**, N. G. Nortvig Wilesen, *Flavors of astrophysical neutrinos with active-sterile neutrinos*, JCAP 07, 029 (2021) [arXiv:2009.01253]
24. **M. Bustamante**, I. Tamborra, *Using high-energy neutrinos as cosmic magnetometers*, PRD 102, 123008 (2020) [arXiv:2009.01306]
23. **M. Bustamante**, *New limits on neutrino decay from the Glashow resonance of high-energy cosmic neutrinos*, [arXiv:2004.06844]
22. **M. Bustamante**, C. Rosenstrøm, S. Shalgar, I. Tamborra, *Bounds on secret neutrino interactions from high-energy astrophysical neutrinos*, PRD 101, 123024 (2020) [arXiv:2001.04994]
21. S. Shalgar, I. Tamborra, **M. Bustamante**, *Core-collapse supernovae stymie secret neutrino interactions*, PRD 103, 123008 (2021) [arXiv:1912.09115]
20. **M. Bustamante**, *NuOscProbExact: a general-purpose code to compute exact two-flavor and three-flavor neutrino oscillation probabilities*, [arXiv:1904.12391]
19. **M. Bustamante**, M. Ahlers, *Inferring the Flavor of High-Energy Astrophysical Neutrinos at Their Sources*, PRL 122, 241101 (2019) [arXiv:1901.10087]
18. M. Ahlers, **M. Bustamante**, S. Mu, *Unitarity Bounds of Astrophysical Neutrinos*, PRD 98, 123023 (2018) [arXiv:1810.00893]
17. **M. Bustamante**, S. K. Agarwalla, *A Universe's Worth of Electrons to Probe Long-Range Interactions of High-Energy Astrophysical Neutrinos*, PRL 122, 061103 (2019) [arXiv:1808.02042]  
[Selected as APS Editors' Suggestion](#)
16. **M. Bustamante**, A. Connolly, *Extracting the Energy-Dependent Neutrino-Nucleon Cross Section Above 10 TeV Using IceCube Showers*, PRL 122, 041101 (2019) [arXiv:1711.11043]
15. **M. Bustamante**, K. Murase, J.F. Beacom, *Testing Decay of Astrophysical Neutrinos with Incomplete Information*, PRD 95, 063013 (2017) [arXiv:1610.02096] [INSPIRE 50+](#)
14. S. W. Li, **M. Bustamante**, J. F. Beacom, *Echo Technique to Distinguish Flavors of Astrophysical Neutrinos*, PRL 122, 151101 (2019) [arXiv:1606.06290]
13. **M. Bustamante**, J. Heinze, K. Murase, W. Winter, *Multi-messenger light curves from gamma-ray bursts in the internal shock model*, ApJ 837, 33 (2017) [arXiv:1606.02325]
12. J. Heinze, D. Boncioli, **M. Bustamante**, W. Winter, *Cosmogenic Neutrinos Challenge the Cosmic Ray Proton Dip Model*, ApJ 825, 122 (2016) [arXiv:1512.05988] [INSPIRE 50+](#)
11. ARA Collaboration, D. Guetta, **M. Bustamante**, *Constraints on the Ultra-High Energy Neutrino Flux from Gamma-Ray Bursts from a Prototype Station of the Askaryan Radio Array*, Astropart. Phys. 88, 7 (2017) [arXiv:1507.00100]
10. **M. Bustamante**, J. F. Beacom, W. Winter, *Theoretically palatable flavor combinations of astrophysical neutrinos*, PRL 115, 161302 (2015) [arXiv:1506.02645] [INSPIRE 100+](#)
9. **M. Bustamante**, P. Baerwald, K. Murase, W. Winter, *Neutrino and cosmic-ray emission from multiple internal shocks in gamma-ray bursts*, Nature Commun. 6, 6783 (2015) [arXiv:1409.2874] [INSPIRE 50+](#)
8. P. Baerwald, **M. Bustamante**, W. Winter, *Are gamma-ray bursts the sources of ultra-high energy cosmic rays?*, Astropart. Phys. 62, 66 (2015) [arXiv:1401.1820] [INSPIRE 50+](#)
7. P. Baerwald, **M. Bustamante**, W. Winter, *UHECR escape mechanisms for protons and neutrons from GRBs, and the cosmic ray-neutrino connection*, ApJ 768, 186 (2013) [arXiv:1301.6163] [INSPIRE 50+](#)

6. P. Baerwald, **M. Bustamante**, W. Winter, *Neutrino Decays over Cosmological Distances and the Implications for Neutrino Telescopes*, JCAP 1210, 020 (2012) [arXiv:1208.4600] [INSPIRE 50+](#)
5. C. A. Argüelles, **M. Bustamante**, A. M. Gago, *Searching for cavities of various densities in the Earth's crust with a low-energy  $\bar{\nu}_e$   $\beta$ -beam*, Mod. Phys. Lett. A 30, 1550146 (2015) [arXiv:1201.6080]
4. **M. Bustamante**, A. M. Gago, J. Jones-Perez, *SUSY Renormalization Group Effects in Ultra High Energy Neutrinos*, JHEP 1105, 133 (2011) [arXiv:1012.2728]
3. C. A. Argüelles, **M. Bustamante**, A. M. Gago, *IceCube expectations for two high-energy neutrino production models at active galactic nuclei*, JCAP 1012, 005 (2010) [arXiv:1008.1396]
2. **M. Bustamante**, A. M. Gago, C. Pena-Garay, *Energy-independent new physics in the flavour ratios of high-energy astrophysical neutrinos*, JHEP 1004, 066 (2010) [arXiv:1001.4878]
1. J. L. Bazo, **M. Bustamante**, A. M. Gago, O. G. Miranda, *High energy astrophysical neutrino flux and modified dispersion relations*, Int. J. Mod. Phys. A 24, 55819 (2009) [arXiv:0907.1979]

### Reviews, white papers, and lectures

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11. A. V. Olinto *et al.*, *The POEMMA (Probe of Extreme Multi-Messenger Astrophysics) Observatory*, JCAP 06, 007 (2021) [arXiv:2012.07945]
10. IceCube-Gen2 Collaboration, *IceCube-Gen2; The window to the extreme Universe*, J. Phys. G 48, 060501 (2021) [arXiv:2008.04323]
9. A. Romero-Wolf *et al.*, *An Andean Deep-Valley Detector for High-Energy Tau Neutrinos*, White paper prepared for the Latin American Strategy Forum for Research Infrastructure [arXiv:2002.06475]
8. D. Grant *et al.*, *Neutrino astronomy with the next generation IceCube Neutrino Observatory*, APC white paper prepared for the US Astro2020 Decadal Survey (2019) [arXiv:1911.02561]
7. M. Mostafá *et al.*, *Science and Design for the Giant Radio Array for Neutrino Detection*, APC white paper prepared for the US Astro2020 Decadal Survey (2019)
6. A. Olinto *et al.*, *POEMMA: Probe of Extreme Multi-Messenger Astrophysics*, APC white paper prepared for the US Astro2020 Decadal Survey (2019) [arXiv:1907.06217]
5. R. Alves-Batista, J. Biteau, **M. Bustamante** *et al.*, *Open Questions in Cosmic-Ray Research at Ultrahigh Energies*, Front. Astron. Space Sci. 6, 23 (2019) [arXiv:1903.06714]
4. M. Ackermann, M. Ahlers, L. Anchordoqui, **M. Bustamante** *et al.*, *Astrophysics Uniquely Enabled by Observations of High-Energy Cosmic Neutrinos*, White paper prepared for the US Astro2020 Decadal Survey, Bull. Am. Astron. Soc. 51, 185 (2019) [arXiv:1903.04334]
3. M. Ackermann, M. Ahlers, L. Anchordoqui, **M. Bustamante** *et al.* (corresponding author), *Fundamental Physics with High-Energy Cosmic Neutrinos*, White paper prepared for the US Astro2020 Decadal Survey, Bull. Am. Astron. Soc. 51, 215 (2019) [arXiv:1903.04333]
2. GRAND Collaboration (**M. Bustamante** editor and contributor), *The Giant Radio Array for Neutrino Detection (GRAND): Science and Design*, Sci. China-Phys. Mech. Astron. 63, 219501 (2020) [arXiv:1810.09994] [INSPIRE 100+](#)
1. **M. Bustamante**, L. Cieri, J. Ellis, *Beyond the Standard Model for Montaneros*, CERN Yellow Report CERN-2010-001, 1455 (2010) [arXiv:0911.4409]

### Conference proceedings

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15. L. J. Schumacher, M. Huber, M. Agostini, **M. Bustamante**, F. Oikonomou, *PLE $\nu$ M: A global and distributed monitoring system of high-energy astrophysical neutrinos*, Proceedings of the 37th International Cosmic Ray Conference (ICRC 2021), PoS ICRC2021, 1185 (2021) [arXiv:2107.13534]

14. V. Van Elewyck, **M. Bustamante**, *et al.*, *GeV–TeV Neutrino Spectra from Proton-Proton Interactions in Astrophysical Environments*, Proceedings of the 36th International Cosmic Ray Conference (ICRC 2019), PoS ICRC2019, 1023 (2019)
13. C. Argüelles, **M. Bustamante**, *et al.*, *Fundamental physics with high-energy cosmic neutrinos today and in the future*, Proceedings of the 36th International Cosmic Ray Conference (ICRC 2019), PoS ICRC2019, 849 (2019) [arXiv:1907.08690]
12. A. Olinto, **M. Bustamante**, *et al.*, *The POEMMA (Probe of Extreme Multi-Messenger Astrophysics) mission*, Proceedings of the 36th International Cosmic Ray Conference (ICRC 2019), PoS ICRC2019, 378 (2019) [arXiv:1909.09466]
11. **M. Bustamante**, *Pushing the Energy and Cosmic Frontiers with High-Energy Astrophysical Neutrinos*, Proceedings of the 6th Symposium on Prospects in the Physics of Discrete Symmetries (DISCRETE 2018), [arXiv:1904.01595]
10. K. Fang, **M. Bustamante**, *et al.*, *The Giant Radio Array for Neutrino Detection (GRAND): Present and Perspectives*, Proceedings of the 35th International Cosmic Ray Conference (ICRC 2017), PoS ICRC2017, 996 (2018) [arXiv:1708.05128]
9. Q. Gou, **M. Bustamante**, *et al.*, *The GRANDproto35 Experiment*, Proceedings of the 35th International Cosmic Ray Conference (ICRC 2017), PoS ICRC2017, 388 (2018)
8. A. Olinto, **M. Bustamante**, *et al.*, *POEMMA: Probe Of Extreme Multi-Messenger Astrophysics*, Proceedings of the 35th International Cosmic Ray Conference (ICRC 2017), PoS ICRC2017, 542 (2018) [arXiv:1708.07599] [INSPIRE 50+](#)
7. J. Heinze, D. Boncioli, **M. Bustamante**, W. Winter *Cosmogenic Neutrinos Challenge the Cosmic Ray Proton Dip Model*, Proceedings of the 35th International Cosmic Ray Conference (ICRC 2017), PoS ICRC2017, 589 (2018)
6. O. Martineau-Huynh, **M. Bustamante**, W. Carvalho, *et al.*, *The Giant Radio Array for Neutrino Detection*, Proceedings of the 7th international workshop on Acoustic and Radio EeV Neutrino Detection Activities (ARENA 2016), EPJ Web Conf. 135, 02001 (2017) [arXiv:1702.01395]
5. O. Martineau-Huynh, K. Kotera, **M. Bustamante**, *et al.*, *The Giant Radio Array for Neutrino Detection*, Proceedings of the 7th Very Large Volume Neutrino Telescope Workshop (VLVnT155), EPJ Web Conf. 116, 03005 (2016) [arXiv:1508.01919]
4. **M. Bustamante**, P. Baerwald, W. Winter, *UHE neutrino and cosmic ray emission from GRBs: revising the models and clarifying the cosmic ray-neutrino connection*, Proceedings of the 6th Very Large Volume Neutrino Telescope Workshop (VLVnT13), AIP Conf. Proc. 1630, 78 (2014) [arXiv:1402.1497]
3. **M. Bustamante**, P. Baerwald, W. Winter, *Escape and propagation of UHECR protons and neutrons from GRBs, and the cosmic ray-neutrino connection*, Proceedings of the 33rd International Cosmic Ray Conference (ICRC 2013), Braz. J. Phys. 44, 415 (2014) [arXiv:1306.2755]
2. **M. Bustamante**, A.M. Gago, J.L. Bazo, O.G. Miranda, *Extreme scenarios of new physics in the UHE astrophysical neutrino flavour ratios*, Proceedings of DISCRETE08, J. Phys. Conf. Ser. 171, 012048 (2009) [arXiv:0906.5329]
1. **M. Bustamante**, A.M. Gago, J.L. Bazo, O.G. Miranda, *On the sensitivity of neutrino telescopes to a modified dispersion relation*, Proceedings of the 11th Mexican Workshop on Particles and Fields (MWPF 2007), AIP Conf. Proc. 1026, 251 (2008)

## Professional activities

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Proposal Reviewer, National Science Center, Poland	2018
Proposal Reviewer, Chilean Antarctic Institute	2017
Referee, Physical Review Research	2019–
Referee, Communications Physics (Nature)	2019–
Referee, European Physical Journal C	2019–
Referee, Journal of High-Energy Physics (JHEP)	2018–Present
Referee, Journal of Cosmology and Astroparticle Physics (JCAP)	2018–Present
Referee, Advances in Space Research	2017–Present
Referee, Physical Review Letters	2015–Present
Referee, Physical Review D	2015–Present
Referee, The Astrophysical Journal	2015–Present
Referee, International Journal of Modern Physics A	2015–Present
Member, American Physical Society	2015–Present
Member, Deutsches Physikalische Gesellschaft (DPG, German Physical Society)	2012–Present
Member, Helmholtz Alliance for Astroparticle Physics HAP	2012–2014

### Supervising experience

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#### PhD students

1. Víctor Valera (Niels Bohr Institute, U. of Copenhagen) 2020–  
“Pushing neutrino physics to the cosmic frontier”

#### MSc students

3. Marie Hansen (Niels Bohr Institute, U. of Copenhagen) 2021–  
“Probing axions with high-energy cosmic neutrinos”
2. Kjartan Másson (Niels Bohr Institute, U. of Copenhagen) 2020–  
“Secret interactions of ultra-high-energy neutrinos in next-generation detectors”
1. Charlotte Rosenstrøm (Niels Bohr Institute, U. of Copenhagen) 2018–2020  
Co-supervisor: Irene Tamborra  
“Secret interactions of high-energy astrophysical neutrinos”

#### BSc students

3. Jonathan Balthazar Steensgaard Mu (Niels Bohr Institute, U. of Copenhagen) 2021  
“New Limits on the Neutrino Lifetime Using the Flavour Composition of High-Energy Astrophysical Neutrinos”
2. Niels Gustav Nortvig Wilesen (Niels Bohr Institute, U. of Copenhagen) 2020  
Co-supervisor: Markus Ahlers  
“Flavours of astrophysical neutrinos in active-sterile mixing”
1. Siqiao Mu (Caltech, SURF Program visitor at NBI) 2018  
Co-supervisor: Markus Ahlers  
“Unitarity Bounds of Astrophysical Neutrinos”

### Teaching experience

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Teaching assistant, Elementary Particles, PUCP, Peru	2007–2008
Teaching assistant, Quantum Mechanics I, PUCP, Peru	2007
Teaching assistant, Modern Physics, PUCP, Peru	2007
Teaching assistant, General Physics 3 (Basic Electromagnetism), PUCP, Peru	2006–2007
Teaching assistant, Computational Physics, PUCP, Peru	2006
Teaching assistant, Introduction to Computing, PUCP, Peru	2006

## Scientific presentations, colloquia, seminars, lectures

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*Note:* Slides are available at [mbustamante.net/talks/](http://mbustamante.net/talks/).

- 118. Invited talk**, Sinapsis 2021 (online) 2021  
 “Pushing Neutrino Physics to the Cosmic Frontier”
- 117. Invited talk**, IceCube-Gen2 Workshop / Technical Design Report Kickoff (online) 2021  
 “UHE neutrino science with IceCube-Gen2”
- 116. Invited talk**, CERN Theory Colloquium (online) 2021  
 “Pushing high-energy neutrino physics to the cosmic frontier”  
 Video: [cds.cern.ch/record/2784018](https://cds.cern.ch/record/2784018)
- 115. Invited talk**, NuTau 2021 workshop (online) 2021  
 “High-energy and ultra-high-energy tau neutrinos and BSM”
- 114. Talk**, European Physical Society Conference on High Energy Physics (EPS-HEP 2021) (online) 2021  
 “The future of high-energy astrophysical neutrino flavor measurements”
- 113. Invited lectures**, Mexican Astro-Particle School (MAPS) (online) 2021  
 “High-energy and ultra-high-energy cosmic neutrinos”  
 Videos: Lecture 1 — [youtu.be/77siO6wTsjg](https://youtu.be/77siO6wTsjg); Lecture 2 — <https://youtu.be/HIYHMaJFc-I>
- 112. Invited talk**, 29th JEM-EUSO International Collaboration Meeting (online) 2021  
 “Secret interactions of UHE neutrinos with POEMMA”
- 111. Invited talk**, 1st EuCAPT Annual Symposium (online) 2021  
 “High-energy and ultra-high-energy cosmic neutrinos: great today, better tomorrow”  
 Video: [cds.cern.ch/record/2766430](https://cds.cern.ch/record/2766430)
- 110. Invited talk**, Astroparticle Physics Seminar, Max Planck Institute for Physics (online) 2021  
 “Astrophysics and particle physics with high-energy cosmic neutrinos today and in the future”
- 109. Invited talk**, Thursday Morning Science, University of L’Aquila (online) 2021  
 “The exceptional life and times of the neutrino”  
 Video: [youtu.be/kPKAbLHb6FQ](https://youtu.be/kPKAbLHb6FQ)
- 108. Invited talk**, III Encuentro Científico Internacional de Exalumnos de Física UNSAAC (ENCEFIS) (online) 2021  
 “High-energy cosmic neutrinos: a window into particle physics and astrophysics”  
 Video: [youtu.be/tH6uVJ\\_cee8](https://youtu.be/tH6uVJ_cee8)
- 107. Invited talk**, Cosmic Rays and Neutrinos in the Multi-Messenger Era (online) 2020  
 “Flavor composition of high-energy neutrinos”
- 106. Invited talk**, 28th JEM-EUSO Collaboration Meeting (online) 2020  
 “Physics beyond the Standard Model with POEMMA”
- 105. Invited talk**, Michigan State University, USA (online) 2020  
 “Astrophysics and particle physics with high-energy cosmic neutrinos today and in the future”
- 104. Invited talk**, UNICAMP, Brazil (online) 2020  
 “Neutrino Physics with High-Energy Cosmic Neutrinos”  
 Video: [youtu.be/uqXRfTSxbs](https://youtu.be/uqXRfTSxbs)
- 103. Poster**, Neutrino 2020 (online) 2020  
 “Bounds on Secret Interactions from High-Energy Astrophysical Neutrinos”
- 102. Poster**, Neutrino 2020 (online) 2020  
 “New Limits on Neutrino Decay from the Glashow Resonance of High-Energy Cosmic Neutrinos”
- 101. Invited talk**, King’s College, UK (online) 2020  
 “Pushing Neutrino Physics to the Cosmic Frontier”

- 100. Invited talk**, Multimessengers @ Prague Workshop, Czech Republic 2019  
“Fundamental Physics with High-Energy Cosmic Neutrinos”
- 99. Invited talk**, TTK Theory Seminar, RWTH Aachen University, Germany 2019  
“Pushing Neutrino Physics to the Cosmic Frontier”
- 98. Invited talk**, CERN Neutrino Platform Week 2019: Hot Topics in Neutrino Physics, CERN, Switzerland 2019  
“High-Energy Cosmic Neutrinos: Current Status and Future Prospects”
- 97. Invited talk**, 4th Uppsala workshop on Particle Physics with Neutrino Telescopes (PPNT19), Uppsala, Sweden 2019  
“The Flavor of High-Energy Cosmic Neutrinos as a Tool for Particle Physics and Astrophysics”
- 96. Invited talk**, Perspectives in Astroparticle physics from High Energy Neutrinos (PAHEN), Berlin, Germany 2019  
“Flavor in High-Energy Cosmic Neutrinos: Interpretation and New Challenges”
- 95. Invited lecture**, HIRSAF PhD School and Workshop, Karlsruhe, Germany 2019  
“High-Energy Cosmic Neutrinos: Where Do We Stand, Where Do We Go, and How Do We Get There”
- 94. Talk**, Cosmic Physics Center, Fermilab, USA 2019  
“Pushing Neutrino Physics to the Cosmic Frontier”
- 93. Talk**, 36th International Cosmic Ray Conference (ICRC), Madison, WI, USA 2019  
“Fundamental Physics with High-Energy Astrophysical Neutrinos Today and in the Future”
- 92. Poster**, 36th International Cosmic Ray Conference (ICRC), Madison, WI, USA 2019  
“Flavor Probes the Production of High-Energy Astrophysical Neutrinos”
- 91. Invited talk**, Particle and Astroparticle Theory Seminar, Max Planck Institute for Nuclear Physics, Heidelberg, Germany 2019  
“Fundamental Physics with High-Energy Cosmic Neutrinos”
- 90. Invited talk**, DARK Transient Tuesdays, DARK, Denmark 2019  
“Gamma-ray bursts: a high-energy multi-messenger view”
- 89. Invited talk**, DESY Astroparticle Seminar, DESY, Germany 2018  
“Pushing the Energy and Cosmic Frontiers of Particle Physics with High-Energy Astrophysical Neutrinos”
- 88. Invited talk**, DISCRETE 2018, Vienna, Austria 2018  
“Pushing the Energy and Cosmic Frontiers of Particle Physics with High-Energy Astrophysical Neutrinos”
- 87. Invited talk**, Nuclear and Particle Physics Seminar, Uppsala U., Sweden 2018  
“Pushing the Energy and Cosmic Frontiers of Particle Physics with High-Energy Astrophysical Neutrinos”
- 86. Talk**, TeVPA 2018, Berlin, Germany 2018  
“Bounds on Ultra-Long-Range Flavored Neutrino Interactions with IceCube”
- 85. Poster**, TeVPA 2018, Berlin, Germany 2018  
“GRAND: The Giant Radio Array for Neutrino Detection”
- 84. Invited talk**, GRAND Collaboration Workshop, Paris, France 2018  
“Fundamental Neutrino Physics at Ultra-High Energies in GRAND”
- 83. Invited talk**, 30th Rencontres de Blois, France 2018  
“Neutrino Properties from Observations in Particle Physics”
- 82. Invited talk**, Advanced Workshop on Physics of Atmospheric Neutrinos (PANE), Abdus Salam ICTP, Trieste, Italy 2018  
“Measurement of Multi-TeV Neutrino Cross Section Via Earth Absorption”
- 81. Invited talk**, 20th International Symposium on Very High Energy Cosmic Ray Interactions (ISVHECRI), Nagoya, Japan 2018  
“Neutrinos from Ultra-High-Energy Cosmic Rays”
- 80. Invited talk**, GRAPPA, Amsterdam, The Netherlands 2018  
“Distilling fundamental high-energy neutrino physics from the sky”

79. Talk, “The High-Energy Universe: Gamma-ray, Neutrino, and Cosmic-Ray Astronomy” Program, Munich Institute for Astro- and Particle Physics (MIAPP), Munich 2018  
“Prompt GRB neutrinos from multiple in-jet collisions”
78. **Invited talk**, “The High-Energy Universe: Gamma-ray, Neutrino, and Cosmic-Ray Astronomy” Program, Munich Institute for Astro- and Particle Physics (MIAPP), Munich 2018  
“Heaven-sent high-energy fundamental neutrino physics”
77. **Colloquium**, Virginia Tech 2018  
“The wondrous life and times of high-energy astrophysical neutrinos”
76. **Invited talk**, HEP Seminar, University College London 2017  
“Heaven-sent neutrino interactions from TeV to PeV”
75. Talk, NBI N-Talk, Niels Bohr Institute 2017  
“Heaven-sent high-energy neutrino interactions”
74. Talk, GRAPPA@5, Amsterdam, The Netherlands 2017  
“ $\nu$  Interactions from the Heavens: Measuring Neutrino Cross Sections Above 10 TeV”
73. Talk, TeVPA 2017, Columbus, OH 2017  
“High-energy neutrino interactions: first cross section measurements at TeV and above”
72. Talk, CCAPP Summer Seminar Series, Ohio State U. 2017  
“A first measurement of high-energy neutrino cross sections with astrophysical neutrinos”
71. **Invited talk**, NEUCOS Workshop, DESY, Germany 2017  
“New Physics Tests with High-Energy Astrophysical Neutrinos”
70. **Invited talk**, Interuniversity Institute for High Energies ULB-VLB, Brussels, Belgium 2017  
“High-energy neutrinos, cosmic rays, and gamma rays from GRBs”
69. **Invited talk**, Laboratoire Astroparticule & Cosmologie (APC), Paris 2017  
“High-energy neutrinos, cosmic rays, and gamma rays from GRBs”
68. **Invited talk**, IceCube Particle Astrophysics Symposium (IPA 2017), WIPAC, Madison, WI 2017  
“High-energy neutrinos, cosmic rays, and gamma rays from GRBs”
67. **Invited talk**, IceCube Collaboration Meeting, WIPAC, Madison, WI 2017  
“Laying Siege to New Physics in High-Energy Astrophysical Neutrinos”
66. **Invited talk**, LHC Results Forum 2017  
“Overview of recent IceCube results”
65. **Invited talk**, Particle Astrophysics Seminar, Case Western Reserve University, OH 2017  
“Prospecting for new physics with high-energy astrophysical neutrinos”
64. **Invited talk**, Astrophysics Seminar, Purdue University, IN 2017  
“High-energy neutrinos, cosmic rays, and gamma rays from gamma-ray bursts”
63. **Invited talk**, Joint Particle Seminar, University of California, Irvine, CA 2017  
“High-energy astrophysical neutrinos: testing ground for new physics”
62. **Invited talk**, Workshop “High-energy neutrino and cosmic-ray astrophysics – The way forward”, Weizmann Institute of Science, Rehovot, Israel 2017  
“Tasting high-energy astrophysical neutrinos”
61. **Invited talk**, Astroparticle Physics @ Yachay, Yachay Tech, Ecuador 2016  
“An overview of astrophysical neutrinos; theoretical aspects”
60. Talk, 8th Huntsville Gamma-Ray Burst Symposium, Huntsville, AL 2016  
“Multi-messenger light curves from gamma-ray bursts”
59. Talk, TeVPA 2016, Geneva, Switzerland 2016  
“Multi-messenger light curves from gamma-ray bursts”
58. Poster, TeVPA 2016, Geneva, Switzerland 2016  
“Searching for new physics in the flavor composition of high-energy astrophysical neutrinos”



57. **Invited talk**, WIPAC, Madison, WI 2016  
 “Discovering ultra-high-energy neutrinos with GRAND, the Giant Radio Array for Neutrino Detection”
56. **Invited talk**, WIPAC, Madison, WI 2016  
 “High-energy astrophysical neutrinos: testing ground for new physics”
55. **Talk**, CCAPP Summer Seminar Series, Ohio State U. 2016  
 “Probing neutrino lifetime using high-energy astrophysical neutrinos”
54. **Invited talk**, The National Space Science & Technology Center, Huntsville, AL 2016  
 “Multi-messenger light curves from gamma-ray bursts”
53. **Invited talk**, Multi-Messenger Approaches to Cosmic Rays: Origins and Space Frontiers (MACROS 2016), Pennsylvania State U. 2016  
 “Gamma-ray bursts as UHECR sources”
52. **Invited talk**, DESY Astroparticle Seminar, DESY, Germany 2016  
 “High-energy astrophysical neutrinos: testing ground for new physics”
51. **Invited talk**, Niels Bohr Institute, Denmark 2016  
 “New physics in high-energy astrophysical neutrinos”
50. **Invited talk**, Lab. de Physique Nucléaire et de Hautes Énergies (LPNHE), France 2016  
 “High-energy astrophysical neutrinos: where do we stand, where do we go?”
49. **Invited talk**, GReCO Seminar, Institut d’Astrophysique de Paris (IAP), France 2016  
 “High-energy astrophysical neutrinos: probes of new physics”
48. **Invited talk**, Workshop on Perspectives on the Extragalactic Frontier: From Astrophysics to Fundamental Physics, ICTP, Trieste, Italy 2016  
 “Multi-messenger source models: the neutrino-UHECR connection”
47. **Invited talk**, APS April Meeting, Salt Lake City, UT 2016  
 “Tests of new physics with (high-energy) astrophysical neutrinos”
46. **Invited talk**, Seminar Center for Neutrino Physics, Virginia Tech 2016  
 “Probing neutrino lifetime using high-energy astrophysical neutrinos”
45. **Invited talk**, Next-Generation Techniques for UHE Astroparticle Physics (UHEAP), KICP, Chicago, IL 2016  
 “Flavor composition of high-energy astrophysical neutrinos: present and future”
44. **Talk**, 1st Pheno in Indiana, Kentucky, Illinois, and Ohio (PIKIO), U. Cincinnati 2016  
 “Decay of high-energy astrophysical neutrinos: present and near future”
43. **Invited talk**, Very High Energy Particle Astronomy (VHEPA 2016), Honolulu, HI 2016  
 “Discovering ultra-high-energy neutrinos with GRAND, The Giant Radio Array for Neutrino Detection”
42. **Invited talk**, GRAND Mini-workshop, KICP, Chicago, IL 2015  
 “Gamma-ray bursts: high-energy neutrino predictions in the IceCube era”
41. **Invited talk**, HEP Seminar, Pennsylvania State U. 2015  
 “Gamma-ray bursts: high-energy neutrino predictions in the IceCube era”
40. **Invited talk**, ICEHAP Seminar, Chiba U., Japan 2015  
 “Rethinking GRBs as sources of high-energy neutrinos”
39. **Invited talk**, TeVPA 2015, Tokyo, Japan 2015  
 “The landscape of flavor composition of high-energy astrophysical neutrinos”
38. **Invited talk**, HEP Seminar, Fermilab 2015  
 “Theoretically tasting the flavor composition of high-energy astrophysical neutrinos”
37. **Invited talk**, HEP Seminar, U. Cincinnati 2015  
 “What to expect for the flavor composition of high-energy astrophysical neutrinos”

36. Talk, “Crossroads of Neutrino Physics” Program, Mainz Institute for Theoretical Physics, Mainz, Germany 2015  
“Revealing the flavor composition of astrophysical neutrinos: interplay of theory and experiment”
35. Talk, Nu@Fermilab Workshop, Fermilab 2015  
“Flavor in high-energy astrophysical neutrinos”
34. Talk, “Neutrino Astrophysics and Fundamental Properties” Program (INT-15-21), Institute for Nuclear Theory, Seattle, WA 2015  
“Recent results on the theoretical expectations of the flavor composition of astrophysical neutrinos”
33. Talk, CCAPP Summer Seminar Series, Ohio State U. 2015  
“Honing in on the flavour composition of high-energy astrophysical neutrinos: the view from theory”
32. Talk, IceCube Particle Astrophysics Symposium (IPA 2015), WIPAC, Madison, WI 2015  
“Ultra-high-energy emission from an evolving gamma-ray burst: neutrinos, cosmic rays, and gamma rays”
31. **Invited talk**, Latin American Webinars on Physics 2015  
“Gamma-ray bursts: sources of ultra-high-energy cosmic rays and neutrinos”  
Video: [youtu.be/K5tJaJvB5Lo](https://youtu.be/K5tJaJvB5Lo)
30. **Invited talk**, IV Int. Workshop Math., Phys., and App., U. Nacional Callao, Peru 2015  
“Gamma rays, cosmic rays and neutrinos: windows into the ultra-energetic Universe”
29. **Invited talk**, II Meeting on Theoretical Physics, U. Nacional Callao, Peru 2015  
“Ultra-high energy neutrinos and cosmic rays from gamma-ray bursts”
28. Talk, “Present and Future Neutrino Physics” Program, KITP, Santa Barbara, CA 2014  
“Neutrino decays over cosmological distances: GRBs”  
Video: [online.kitp.ucsb.edu/online/neutrinos14/bustamante/rm/flashtv.html](http://online.kitp.ucsb.edu/online/neutrinos14/bustamante/rm/flashtv.html)
27. Talk, Seminar Series “Recent Results in Astroparticle Physics”, DESY, Germany 2014  
“A dynamical GRB fireball model: new gamma-ray, cosmic-ray, and neutrino predictions”
26. Talk, Research Training Group GRK1147, U. Würzburg, Germany 2014  
“Ultra-high-energy cosmic rays and neutrinos from gamma-ray bursts: new predictions for a new era”
25. Talk, Astroparticle Physics / TeVPA 2014, Amsterdam, The Netherlands 2014  
“A revised view of the ultra-high energy cosmic ray-neutrino connection: the case of gamma-ray bursts”
24. Talk, Gamma-ray Bursts in the Multi-Messenger Era Workshop, Paris, France 2014  
“Improved ultra-high energy cosmic ray and neutrino predictions from gamma-ray bursts”
23. **Invited talk**, IFIC Seminars, IFIC, Spain 2014  
“Revisiting the cosmic ray-neutrino connection in gamma-ray bursts”
22. Talk, Astroparticle Physics Group, Uppsala U., Sweden 2014  
“Ultra-high energy cosmic rays and neutrinos: revising the predictions and clarifying the connection”
21. **Invited talk**, Physics Colloquium, PUCP, Peru 2014  
“Ultra-high-energy astrophysical cosmic rays and neutrinos: a half-century mystery”  
Video: [educast.pucp.edu.pe/video/3252/](http://educast.pucp.edu.pe/video/3252/)
20. Talk, Research Training Group GRK1147, U. Würzburg, Germany 2013  
“An introduction to nuclear astrophysics”
19. Talk, Cosmology Lunch, Princeton U., Princeton, NJ 2013  
“Gamma-ray bursts: revised prediction for ultra-high-energy neutrinos and cosmic rays”
18. Talk, Astro Coffee Blackboard Talk, IAS, Princeton, NJ 2013  
“Decay of astrophysical neutrinos”
17. Talk, CCAPP Astroparticle Lunch, Ohio State U., Columbus, OH 2013  
“Revised predictions of ultra-high-energy neutrinos from gamma-ray bursts and the cosmic ray-neutrino connection”

16. Talk, 6th Very Large Volume Neutrino Telescope Workshop, Stockholm, Sweden 2013  
“UHE neutrino and cosmic ray emission from GRBs: revising the models and clarifying the cosmic ray-neutrino connection”
15. Talk, 33rd International Cosmic Ray Conference (ICRC), Rio de Janeiro, Brazil 2013  
“Escape and propagation of UHECR protons and neutrons from GRBs, and the cosmic ray-neutrino connection”
14. Talk, 77th Annual Meeting of the Deutsches Physik. Gesellschaft, Dresden, Germany 2013  
“Decay of neutrinos from cosmological sources and prospects of observation at neutrino telescopes”
13. Talk, Helmholtz Alliance for Astroparticle Physics Code Retreat, Zeuthen, Germany 2012  
“Efficient computation of photohadronic interactions — an application to UHECR propagation and cosmogenic neutrinos”
12. Talk, Research Training Group GRK1147, U. Würzburg, Germany 2012  
“The inert Higgs doublet model”
11. **Invited talk**, Two-day course, I Physics Summer School, U. Nacional Callao, Peru 2011  
“An introduction to particle physics”
10. **Invited talk**, II Symposium on Antarctic Research, Lima, Peru 2010  
“Neutrino physics at the South Pole”
9. Talk, 5th CERN Latin American School of High-Energy Physics, Antioquía, Colombia 2009  
“Cosmic ray acceleration mechanisms”
8. Poster, 5th CERN Latin American School of High-Energy Physics, Antioquía, Colombia 2009  
“Effect of energy-independent new physics on the high-energy astrophysical neutrino flavour ratios”
7. Poster, VII Latin American Symposium on High Energy Physics / IX Argentine Symposium on Particles and Fields, Bariloche Atomic Center, Argentina 2009  
“Effect of energy-independent new physics on the high-energy astrophysical neutrino flavour ratios”
6. Talk, DISCRETE 2008, IFIC, Spain 2008  
“Extreme scenarios of new physics in the UHE astrophysical neutrino flavour ratios”
5. Talk, XVII National Physics Symposium, PUCP, Peru 2008  
“Modified dispersion relations and high-energy astrophysical neutrinos”
4. Poster, XI Mexican Workshop on Particles and Fields, Tuxtla, Mexico 2007  
“Detecting the effects at IceCube of a quantum-gravity modified dispersion relation on the neutrino flux from FR-II radio galaxies and blazars”
3. Talk, A New Kind of Science Summer School 2005, Brown U. 2005  
“Finding clusters of cellular automata rules with similar behavior”
2. Poster, Midwest New Kind of Science Conference 2005, Indiana U. 2005  
“Two methods for finding cellular automata that perform simple computations”
1. Talk, VII National Symposium of Physics Students, PUCP, Peru 2003  
“An introduction to cellular automata and Boolean networks”

### Public talks and panels

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7. Journal Club Peru — Particle Physics (online) 2021  
“Research in high-energy neutrinos: getting excited and getting started”
6. Association of Physics Students PUCP (online) 2021  
“My experience in research: thoughts and lessons”  
Video: [facebook.com/watch/?v=217439216782462](https://www.facebook.com/watch/?v=217439216782462)
5. Extraordinary Colloquium for the Undergraduate Symposium of Physics (CESPreFi), PUCP, Lima, Peru (online) 2020  
“Starting out in research: why and how”  
Video: [facebook.com/watch/?v=1091597971253202](https://www.facebook.com/watch/?v=1091597971253202)

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| 4. Wizard World Comic Con, Columbus, OH  | 2017 |
| “Science of Superheroes” Panel   |      |
| 3. TEDxTukuy, Lima, Peru   | 2016 |
| “Neutrinos: secret messengers of the Universe”   |      |
| Video: <a href="https://youtu.be/C6EZU9-nsKw">https://youtu.be/C6EZU9-nsKw</a> (In Spanish, English subtitles) |      |
| 2. New Vistas in Astronomy Public Talk Series, Perkins Observatory, Delaware, OH                               | 2016 |
| “High-energy neutrinos: ghosts from beyond the Solar System”   |      |
| 1. “Astronomy on Tap”, Columbus, OH  | 2015 |
| “Cosmic rays and neutrinos: windows into the ultra-high-energy Universe”                                       |      |

### Research and collaboration visits

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| Munich Institute for Astro- and Particle Physics (MIAPP), Munich, Germany          | 2018 |
| Program: “The High Energy Universe: Gamma Ray, Neutrino, and Cosmic Ray Astronomy” |      |
| Deutsches Elektronen-Synchrotron (DESY), Zeuthen, Germany                          | 2016 |
| Invited by: Walter Winter  |      |
| Niels Bohr Institute, Copenhagen, Denmark  | 2016 |
| Invited by: Irene Tamborra   |      |
| Institut d’Astrophysique de Paris (IAP), Paris, France                             | 2016 |
| Invited by: Kumiko Kotera  |      |
| Laboratoire de Physique Nucléaire et de Hautes Énergies (LPNHE), Paris, France     | 2016 |
| Invited by: Olivier Martineau  |      |
| Chiba University, Tokyo, Japan   | 2015 |
| Invited by: Shigeru Yoshida  |      |
| Deutsches Elektronen-Synchrotron (DESY), Zeuthen, Germany                          | 2015 |
| Invited by: Walter Winter  |      |
| Mainz Institute for Theoretical Physics (MITP), Mainz, Germany                     | 2015 |
| Program: “Crossroads of Neutrino Physics”  |      |
| Institute for Nuclear Theory (INT), Seattle, WA                                    | 2015 |
| Program: “Neutrino Astrophysics and Fundamental Properties” (INT-15-2A)            |      |
| Kavli Institute for Theoretical Physics (KITP), Santa Barbara, CA                  | 2014 |
| Program: “Present and Future Neutrino Physics”                                     |      |
| Instituto de Física Corpuscular (IFIC), Valencia, Spain                            | 2014 |
| Invited by: Joel Jones   |      |
| Institute for Advanced Study, Princeton, NJ  | 2013 |
| Invited by: Kohta Murase   |      |
| Center for Cosmology and AstroParticle Physics (CCAPP), Columbus, OH               | 2013 |
| Invited by: John Beacom  |      |

### Conferences, workshops, schools — participation as attendee

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| 2nd Pheno in Indiana, Kentucky, Illinois, and Ohio (PIKIO), Ohio State U.                                 | 2016 |
| 1st MERCUR Winter School on Plasma-Astroparticle Physics, Bad Honnef, Germany                             | 2014 |
| Cosmic Ray Anisotropy Workshop, WIPAC, Madison, WI  | 2013 |
| Helmholtz Alliance for Astroparticle Physics Realtime Astroparticle Physics Workshop,<br>U. Bonn, Germany | 2013 |
| 2012 CTEQ-Fermilab School on QCD and Electroweak Phenomenology, PUCP, Peru                                | 2012 |
| Workshop on Cosmic Rays and Cosmic Neutrinos: Looking at the Neutrino Sky,<br>ICTP, Italy                 | 2011 |
| Summer School on Particle Physics, ICTP, Italy  | 2011 |

Workshop: From Neutrinos to Dark Matter, U. Guanajuato, Mexico	2006
6th Latin American Symposium on High Energy Physics / 12th Mexican School on Particles and Fields, Puerto Vallarta, Mexico	2006
Second School on Cosmic Rays and Astrophysics, Puebla, Mexico	2006
Advanced Summer School in Physics, CINVESTAV, Mexico	2006
School and Conference on Fundamental Aspects of Complexity, ICTP, Italy	2004

### Experimental collaborations

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IceCube-Gen2 Associate member (icecube.wisc.edu)	2019–
GRAND (Giant Radio Array for Neutrino Detection) Member of the core team of the collaboration, work on building science case, editor of the white paper (grand.cnrs.fr/)	2015–Present

### Organization of scientific events

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NBIA International PhD School: “Here, There & Everywhere” (online) Organizer	2021
TeVPA 2019, Sydney, Australia Convener of neutrino track	2019
GRAND Collaboration Workshop, Nijmegen, The Netherlands Co-organizer	2018
TeVPA 2017, Columbus, OH Co-chair of the local organizing committee	2017
GRAND Collaboration Workshop, Paris, France Co-organizer	2017
CCAPP Weekly Seminars Organizer	2015–2016
CCAPP Workshop “Making sense of the ultra-high-energy sky” Chair and organizer; brought together experts on theory and experiment in UHE cosmic rays, gamma rays, and neutrinos	2015
I Peruvian School on High-Energy Physics and Cosmology (EPFAEC 2015) Member of the organizing committee	2015
Physics Colloquia at PUCP, Lima, Peru Founder; organized 200+ colloquia so far; tasks include selecting and contacting speakers, logistics, and advertising	2011–Present

### Popular press

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Interviewed for Scientific American article on radio-detection of neutrinos “Searching for the Universe’s Most Energetic Particles, Astronomers Turn on the Radio” [link]	2021
Press release about GRAND for AAAS EurekAlert! news service (author and contact person) “Giant neutrino telescope to open window to ultra-high-energy Universe” [link]	2019
Interviewed for Gizmodo “Astronomers Propose Huge New Telescope System to Understand the Most Energetic Particles Ever Detected” [link]	2018
Interviewed for Live Science “Bizarre Particles Keep Flying Out of Antarctica’s Ice, and They Might Shatter Modern Physics” [link]	2018
Article (third party), CERN Courier	2018

- “The case of the disappearing neutrinos” [link]  
 Article (authored), PuntoEdu PUCP Newsletter, Peru 2017
- “Why is the scientific attitude relevant today?” (In Spanish) [link]  
 Interview, Radio Show of National University of Cuyo, Argentina 2015
- Magnetic wormholes (Audio in Spanish) [link]  
 Article (authored), PuntoEdu PUCP Newsletter, Peru 2015
- “Nuclear Fusion: The Golden Apples of the Sun” (In Spanish) [link]  
 Article (authored), PuntoEdu PUCP Newsletter, Peru 2015
- “The Enigma Code: Alan Turing and the birth of computer science” (In Spanish) [link]  
 Article (third party), Big Ten Network 2015
- “Ohio State scientist studies the largest explosions in the universe” [link]  
 Article (third party), OSU News 2015
- “Cosmic debris: Study looks inside the universe’s most powerful explosions” [link]  
 Article (authored), PuntoEdu PUCP Newsletter, Peru 2014
- “Is it possible to travel in space and time via a wormhole?” (In Spanish) [link]  
 Article (authored), PuntoEdu PUCP Newsletter, Peru 2014
- “Neil deGrasse Tyson’s “Cosmos” rediscovering our capacity to be awed” (In Spanish) [link]  
 Article (authored), PuntoEdu PUCP Newsletter, Peru 2014
- “Doing science together in Peru” (In Spanish) [link]  
 Interview, PuntoEdu PUCP Newsletter, Peru 2014
- “Cosmic rays have influenced evolution” (In Spanish) [link]  
 Interview, Universia Latin American Academic Portal, Peru 2008
- “Good ideas are not enough; results are necessary” (In Spanish) [link]

### Professional references

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