



Dr Lucien HEURTIER

Address: 14 Durham Road,
Spennymoor DL166SH, United Kingdom

Phone : +44(0)7719164999

Email Address : Lucien.heurtier@kcl.ac.uk

Website : <https://lheurtier.github.io/>

Research

- ▶ **Oct. 2023 - Present:** Postdoctoral Research Associate, **King's College London**, UK
- ▶ **Oct. 2020 - Sept. 2023:** Postdoctoral Research Associate, **Durham University**, UK
- ▶ **Oct. 2017 - Sept. 2020:** Postdoctoral Fellowship, **University of Arizona**, USA
- ▶ **Oct. 2015 - Sept. 2017:** Postdoctoral Fellowship, **Université Libre de Bruxelles**, Belgium

Education

- ▶ **2012 –2015:** **Phd in Theoretical Physics** (Highest Honour), École Polytechnique, Palaiseau
(Supervised by Emilian Dudas)
- ▶ **2010 –2012:** **MSc in Theoretical Physics**, École Normale Supérieure (ENS) de Paris.
- ▶ **2008 –2011:** **MSc in Applied Mathematics** from ENSTA-ParisTech, Paris, France
- ▶ **2009 –2010:** **Bachelor in Fundamental Mathematics** from Université Sorbonne, France

Teaching

- ▶ **2021 – 2023 (32h):** **Teaching assistant**, MSc *Particles, Strings and Cosmology*, Durham University
- ▶ **July 2022 (30 min):** **Invited Lecture** - YETI 2022: *Phenomenology in the sky*, Durham University
- ▶ **2020 – 2021 (20h):** **Teaching assistant**, Foundations of Physics (Level 1), Durham University
- ▶ **Jan. 2021 (8h):** **Teaching assistant** (online), ENSTA-Paristech (France) in Statistical Physics
- ▶ **2017 – 2019 (8h):** **Substitute professor** of S. Su (undergraduate level, Quant. Mechanics) U. of Arizona
- ▶ **2015 – 2017 (8h):** **Teaching Assistant**, MSc Fundamental Physics (Introduction to QFT) ULB, Brussels
- ▶ **June 2014 (3h):** **Invited lecture** about Cosmic Inflation (SINJE, LPT Orsay, France)
- ▶ **2012 – 2015 (80h):** **Teaching assistant**, Engineer program (Ensta Paristech, Paris) in Quantum Mechanics, Astrophysics, Field Theory, and General Relativity

Mentoring

- ▶ **May – Aug. 2023:** **Supervisor of a master Student** (Ensta-Paristech, France)
Internship on the *Heat equation around evaporating primordial black holes*.
- ▶ **May – Jul. 2022:** **Supervisor of a master Student** (Université Paris Saclay, France)
Internship on the *production of primordial black holes from inflation*, which **led to publication** in July 2022.
- ▶ **Mar. – Jul. 2021:** **Supervisor of a master Student** (BITS Pilani, India)
internship on *quintessential inflation models*
- ▶ **Mar. – Jul. 2016:** **Supervisor of a master Student** from École Polytechnique, France. Internship on the *inflaton portal to dark matter*. **Awarded as best research internship of École Polytechnique that year.**

Organisational Activities

- ▶ **Jun. 2024:** Organizer of the **New Horizons for Primordial Black Hole Physics 2024 edition** (NEHOP) workshop, Edinburgh
- ▶ **Oct. 2023:** **Chairman and discussion session animator** at the Astroparticle Symposium 2023 – Institut Pascal, Orsay, France
- ▶ **Jun. 2023:** Co-Creator and Organizer of the **New Horizons for Primordial Black Hole Physics** workshop, Naples (>80 in-person participants)
- ▶ **Nov. 2022:** **Chairman** at the Astroparticle Symposium 2022 – Institut Pascal, Orsay, France
- ▶ **Nov. 2022:** **Chairman** at the Ogden at 20 conference – Durham University, UK
- ▶ **Apr. 2022:** **Parallel Session Convener** at the international Planck Conference 2022 – Paris, France
- ▶ **May 2021:** Co-Organizer and convener of the **international Planck Conference 2021**, Durham University (> 200 online participants)
- ▶ **2018 – 2020:** Organizer of the U. of Arizona **High-Energy and Gravitation Journal Club**
- ▶ **2016 – 2017:** Organizer of the **Theory Group Journal Club** and Seminar series at ULB, Brussels
- ▶ **2013 – 2015:** Organiser of the **Student Seminars** of École Polytechnique
- ▶ **2012 – 2013:** **Administrative organizer** of a Physics lecture series at ENSTA-ParisTech, France

Referee for Peer-Reviewed Journals

Reviews requested by:

- | | |
|---|-------------------------------|
| ▶ Physical Review Letters (PRL) | ▶ Int. J. of Modern Physics A |
| ▶ Physical Review D (PRD) | ▶ SciPost Physics |
| ▶ J. of Journal of Cosmology and Astroparticle Physics (JCAP) | ▶ Nature Scientific Reports |

External Funding

- ▶ Jan. 2023: Application to **University Research Fellowship** with Durham University, UK. **First round of panel selection passed successfully.**
- ▶ Sept. 2020: Application to **Marie Curie Fellowship** with the LPTHE, Paris. **Total Score: 82.60%**
- ▶ Feb. 2019: **CNRS visiting fellowships** (CPHT, France) **Funded upon competitive application**
- ▶ July 2015: **Visiting Grant - PIER Short Visits 2015**, DESY theory group. **Funded upon competitive application**

Outreach / Dissemination

- ▶ Mar. 2023: Online event **"I'm a scientist"**, elected **weekly winner** by the students
- ▶ May 2022: Invited presentation for the **Pint of Science 2022**, Leeds, UK
- ▶ Mar. 2022: Animation of the **Post Offer Day**, Durham University, UK
- ▶ Nov. 2021: **Dark Matter Day 2021**, virtual exhibition
- ▶ Sept. 2018: **Invited Tech Talk** on Big Bang Cosmology in front of young entrepreneurs, Tucson, USA

Public Engagement

- ▶ Jan. 2023: Registered as a **STEM Ambassador** in the UK – **North East England STEM Hub (RTC North).**

Conferences and Seminars

- ▶ Oct. 2023: **Invited Plenary Talk - AstroParticle Symposium 2023**, Orsay France
- ▶ Oct. 2023: **Invited Plenary Talk - London Cosmology Discussion Meeting**, Royal Astro. Soc., London, UK
- ▶ May. 2023: **Parallel Talk - Planck conference 2023**, Warsaw, Poland
- ▶ Apr. 2023: **Invited Seminar - University of Strasbourg**, France
- ▶ Mar. 2023: **Invited Seminar - Lapth Annecy**, France
- ▶ Feb. 2023: **Invited Seminar - University of Helsinki**, Finland
- ▶ Jan. 2023: **Plenary Talk - UK Cosmo**, Sussex University, Brighton, UK
- ▶ Nov. 2022: **Invited Plenary Talk - AstroParticle Symposium 2022**, Orsay France
- ▶ Sept. 2022: **Invited Seminar - University of Nottingham**, UK
- ▶ Jul. 2022: **Parallel Talk - SUSY conference 2022**, Ioannina, Greece
- ▶ June 2022: **Invited Seminar - University of Sussex**, Brighton, UK
- ▶ May 2022: **Invited Seminar (Online) - Bologna University**, Italy
- ▶ May 2022: **Plenary Talk - DMUK conference**, Birmingham, UK
- ▶ Apr. 2022: **Parallel Talk - Planck conference 2022**, Paris, France
- ▶ Nov. 2021: **Invited Seminar - YITP**, USA
- ▶ Nov. 2021: **Plenary Talk (Online) - DMUK conference**, RAL, UK

- ▶ Nov. 2021: **Invited Plenary Talk (Online)** - **AstroParticle Symposium 2021**, Orsay France
- ▶ Aug. 2021: **Parallel Talk (Online)** - **SUSY 2021**, Shanghai, China
- ▶ Jun. 2021: **Plenary Talk (Online)** - **IRN Terascale**
- ▶ May. 2021: **Parallel Talk (Online)** - **PPC 2021**, Oklahoma, USA
- ▶ Mar. 2021: **Invited Seminar**, **LUPM**, Montpellier, France
- ▶ Feb. 2021: **Invited Seminar (Online)**, **UC Irvine**, USA
- ▶ Feb. 2021: **Invited Seminar**, **LAPth**, Annecy, France
- ▶ Oct. 2020: **Invited Plenary Talk (Online)** - **CEPC workshop**, Shanghai, China
- ▶ Apr. 2020: **Parallel Talk** - **Pheno 2020**, Pittsburgh, USA
- ▶ Feb. 2020: **Invited Seminar**, **Chicago University**, USA
- ▶ Feb. 2020: **Invited Seminar**, **FermiLab**, USA,
- ▶ Jan. 2020: **Invited Seminar**, **KIAS**, Seoul, South Korea
- ▶ Jan. 2020: **Invited Plenary Talk** - **APCTP Workshop**, Pohang, South Korea
- ▶ Nov. 2019: **Invited Seminar** - **Texas A&M**, College Station, Texas, USA
- ▶ Oct. 2019: **Invited Seminar**, **DESY**, Hamburg, Germany
- ▶ Oct. 2019: **Plenary Talk** - **IRN Terascale**, ULB, Brussels, Belgium
- ▶ Jun. 2019: **Parallel Talk** - **Planck conference 2019**, Granada, Spain
- ▶ May 2019: **Parallel Talk** - **SUSY conference 2019**, Corpus Christi, Texas, USA
- ▶ Apr. 2019: **Invited Seminar** - **ASU**, Phoenix AZ, USA
- ▶ Mar. 2019: **Invited Seminar** - **ULB**, Brussels, Belgium
- ▶ Jan. 2019: **Invited Seminar** - **IBS**, Daejeon, South Korea
- ▶ Jan. 2019: **Invited Seminar** - **KIAS**, Seoul, South Korea
- ▶ Jan. 2019: **Invited Plenary Talk** - **APCTP workshop**, Pohang, South Korea
- ▶ Jun. 2018: **Plenary Talk** - **IRN Terascale**, Strasbourg, France
- ▶ May 2018: **Parallel Talk** - **Planck conference 2018**, Bonn University, Germany
- ▶ May 2018: **Parallel Talk** - **Pheno 2018**, University of Pittsburgh, USA
- ▶ Mar. 2018: **Invited Seminar** - **University of Washington**, St. Louis, USA
- ▶ Oct. 2017: **Invited Seminar** - **University of Arizona**, Tucson, USA
- ▶ Sept. 2017: **Invited Seminar** - **Université de Montpellier**, France
- ▶ Jun. 2017: **Invited Seminar** - **CPHT**, Palaiseau, France
- ▶ May 2017: **Parallel Talk** - **Planck conference 2017**, Warsaw, Poland
- ▶ Nov. 2016: **Invited Seminar** - **DESY Theory Group**, Hamburg, Germany
- ▶ Jul. 2016: **Invited Plenary Talk** - **PAI meeting**, Louvain La Neuve, Belgium
- ▶ May 2016: **Parallel Talk** - **Planck conference 2016**, Valencia, Spain
- ▶ Oct. 2015: **Invited Seminar** - **ULB**, Brussels, **October 2015**
- ▶ May 2015: **Parallel Talk** - **Planck conference 2015**, Ioannina, Greece
- ▶ Feb. 2015: **Invited Seminar** - **CPHT École Polytechnique**, France
- ▶ Dec. 2014: **Plenary Talk** - **GDR Terascale**, Heidelberg, Germany
- ▶ Nov. 2014: **Invited Seminar** - **ATLAS group of IFIN-HH**, Bucarest, Romania
- ▶ Sep. 2014: **Invited Seminar** - **IFAE**, Barcelona, Spain
- ▶ Sep. 2014: **Plenary Talk** - **Corfu Summer Institute**, Corfu, Greece
- ▶ Jul. 2014: **Parallel Talk** - **SUSY conference 2014**, Manchester University, UK
- ▶ May 2014: **Parallel Talk** - **Planck conference 2014**, Paris, France
- ▶ Dec. 2013: **Plenary Talk** - **JRJC (Student Conference)**, Barbaste, France
- ▶ Nov. 2013: **Plenary Talk** - **String, Cosmology and Gravity Student Conference**, Max Planck Inst., Germany
- ▶ Nov. 2013: **Plenary Talk** - **GDR Terascale**, Annecy, France
- ▶ Oct. 2013: **Plenary Talk** - **II Postgraduate Meeting on Theoretical Physics**, IFT, Madrid, Spain
- ▶ Sept. 2013: **Plenary Talk** - **Corfu Summer Institute**, Corfu, Greece
- ▶ Sept. 2013: **Invited Seminar** - **LPTHE Student Seminar**, Paris, France

Publications

Preprint Articles

- [1] S. Abel, L. Heurtier, *Exact Schwinger Proper Time Renormalisation*, Nov 2023 **To appear on ArXiv on the 11/22/2023**
- [2] L. Hamaide, L. Heurtier, S.-Q. Hu, and A. Cheek, *Primordial Black Holes Are True Vacuum Nurseries*, Nov 2023 [ArXiv: 2311.01869] **Prepared for submission to PRL**
- [3] K. R. Dienes, L. Heurtier, F. Huang, T. M. P. Tait, and B. Thomas, *Stasis, Stasis, Triple Stasis*, Sep 2023 [ArXiv: 2309.10345] **Submitted for publication to PRD**
- [4] K. R. Dienes, L. Heurtier, F. Huang, D. Kim, T. M. P. Tait, and B. Thomas, *Primordial Black Holes Place the Universe in Stasis*, Dec 2022 [ArXiv:2212.01369] **Submitted for publication to PRD**

Peer Reviewed Journal Articles

- [1] A. Ghoshal, Y. Gouttenoire, L. Heurtier, P. Simakachorn, *Primordial Black Hole Archaeology with Gravitational Waves from Cosmic Strings*, Apr 2023, **J. High Energ. Phys.** 08 (2023) 196 [ArXiv:2304.04793]
- [2] R. Heighton, L. Heurtier, M. Spannowsky, *Hunting for Neutral Leptons with Ultra-High-Energy Cosmic Rays*, Mar 2023 [ArXiv:2303.11352] **Accepted for publication by PRD**
- [3] A. Cheek, L. Heurtier, Y. F. Perez-Gonzalez, and J. Turner, *Evaporation of Primordial Black Holes in the Early Universe: Mass and Spin Distributions*, Dec 2022 [ArXiv:2212.03878] **Accepted for publication by PRD**
- [4] L. Heurtier, A. Moursy, L. Wacquez, *Cosmological Imprints of SUSY Breaking in Models of Sgoldstinoless Non-Oscillatory Inflation*, Jul 2022, **JCAP** 03 (2023) 020 [ArXiv:2207.11502]
- [5] A. Ghoshal, L. Heurtier, A. Paul, *Signatures of Non-thermal Dark Matter with Kination and Early Matter Domination: Gravitational Waves versus Laboratory Searches*, Aug 2022, **J. High Energ. Phys.** 2022, 105 (2022) [ArXiv:2208.01670]
- [6] A. Cheek, L. Heurtier, Y. F. Perez-Gonzalez, J. Turner, *Redshift Effects in Particle Production from Kerr Primordial Black Holes*, Jul 2022, **Phys. Rev. D** 106 (2022) 10, 103012 [ArXiv:2207.09462]
- [7] K. R. Dienes, L. Heurtier, F. Huang, D. Kim, T.M.P. Tait, B. Thomas, *Stasis in an Expanding Universe: A Recipe for Stable Mixed-Component Cosmological Eras*, Nov 2021, **Phys. Rev. D** 105 (2022) 2, 023530, [arXiv:2111.04753].
- [8] A. Cheek, L. Heurtier, Y. F. Perez-Gonzalez, and J. Turner, *Primordial Black Hole Evaporation and Dark Matter Production: I. Solely Hawking radiation*, Jul 2021., **Phys. Rev. D** 105 (2022) 1, 015022, Jan. 2022 **PRD Editors' Suggestion** [arXiv:2107.00013].
- [9] A. Cheek, L. Heurtier, Y. F. Perez-Gonzalez, and J. Turner, *Primordial Black Hole Evaporation and Dark Matter Production: II. Interplay with the Freeze-In/Out Mechanism*, Jul 2021, **Phys. Rev. D** 105 (2022) 1, 015023 Jan. 2022 **PRD Editors' Suggestion**, [arXiv:2107.00016].
- [10] L. Heurtier, F. Huang, and T.M.P. Tait, *Resurrecting Low-Mass Axion Dark Matter Via a Dynamical QCD Scale*, Apr. 2021, **J. High Energ. Phys.** 12 (2021) 216, [arXiv:2104.13390].
- [11] L. Heurtier, H.-L. Li, H. Song, S. Su, W. Su, *Precision Higgs Couplings in Neutral Naturalness Models: an Effective Field Theory Approach*, Jul 2020. **J. High Energ. Phys.** 02 (2021) 234 [arXiv:2007.15021].
- [12] E. Dudas, L. Heurtier, K. Olive, M. Pierre, and Y. Mambrini, *A Model of Metastable EeV Dark Matter*, Mar 2020. **Phys. Rev. D** 101 (2020) 11, 115029 [arXiv:2003.02846].
- [13] L. Heurtier and H. Partouche, *Spontaneous Freeze Out of Dark Matter From an Early Thermal Phase Transition*, Dec 2019. **Phys. Rev. D** 101 (2020) 4, 043527, DOI:10.1103/PhysRevD.101.043527 [arXiv:1912.02828].
- [14] L. Heurtier, D. Kim, J. C. Park and S. Shin, *Explaining the ANITA Anomaly with Inelastic Boosted Dark Matter*, May 30, 2019. **Phys. Rev. D** 100 (2019) no.5, 055004, DOI: 10.1103/Phys-RevD.100.055004

- [arXiv:1905.13223];
- [15] **L. Heurtier** and F. Huang, *The Inflaton Portal to a Highly decoupled EeV Dark Matter Particle*, May 13, 2019. **Phys. Rev. D** 100 (2019) no.4, 043507, DOI: 10.1103/PhysRevD.100.043507 [arXiv:1905.05191];
 - [16] **L. Heurtier**, Y. Mambrini and M. Pierre, *Dark matter interpretation of the ANITA anomalous events*, Dec 2018. **Phys. Rev. D** 99, no. 9, 095014 (2019) [arXiv:1902.04584].
 - [17] T. Coudarchet, **L. Heurtier**, H. Partouche, *Spontaneous dark-matter mass generation along cosmological attractors in string theory*, Dec 2018. **JHEP** 1903, 117 (2019) [arXiv:1812.10134].
 - [18] **L. Heurtier**, *The Inflaton Portal to Dark Matter*, July 2017. **JHEP** 1712 (2017) 072 [arXiv:1707.08999].
 - [19] R. Argurio, D. Coone, **L. Heurtier**, A. Mariotti, *Sgoldstino-less inflation and low energy SUSY breaking*, July 2016. **JCAP** 1707 (2017) no.07, 047 [arXiv:1705.06788].
 - [20] T. E. Gonzalo, **L. Heurtier**, A. Moursy, *Sneutrino driven GUT Inflation in Supergravity*, Sept 2016. **JHEP** 1706 (2017) 109 [arXiv:1609.09396].
 - [21] **L. Heurtier**, Y. Zhang, *Supernova Constraints on Massive (Pseudo)Scalar Coupling to Neutrinos*, Sept 2016. **JCAP** 1702 (2017) no.02, 042 [arXiv:1609.05882].
 - [22] **L. Heurtier**, D. Teresi, *Dark matter and observable Lepton Flavour Violation*, July 2016. **Phys. Rev. D** 94 (2016) no.12, 125022 [arXiv:1607.01798].
 - [23] E. Dudas, **L. Heurtier**, C. Wieck, M. Winkler, *UV Corrections in Sgoldstino-less Inflation*, Jan 2016. **Phys. Lett. B** 759 (2016) 121-125 [arXiv:1601.03397].
 - [24] I. Bena, **L. Heurtier**, A. Puhm, *AdS₃: the NHEK generation*, Oct, 2015. **JHEP** 1605 (2016) 120 [arXiv:1510.08055].
 - [25] O. Ducu, **L. Heurtier**, J. Maurer, *LHC signatures of a Z' mediator between dark matter and the SU(3) sector*, Sept 2015. **J. High Energ. Phys.** 1603 (2016) 006 [arXiv:1509.05615].
 - [26] **L. Heurtier**, S. Khalil, A. Moursy, *Single Field Inflation in Supergravity with a U(1) Gauge Symmetry*, May 27, 2015. **JCAP** 1510 (2015) no.10, 045 [arXiv:1505.07366].
 - [27] W. Buchmüller, E. Dudas, **L. Heurtier**, A. Westphal, C. Wieck, M. W. Winkler, *Challenges for Large-Field Inflation and Moduli Stabilization*, Jan 23, 2015. **J. High Energ. Phys.** 1504 (2015) 058 [arXiv:1501.05812].
 - [28] H. Erbin, **L. Heurtier**, *Supergravity, complex parameters and the Janis-Newman algorithm*, Jan 9, 2015. **Class. Quant. Grav.** 32 (2015) no.16, 165005 [arXiv:1501.02188].
 - [29] H. Erbin, **L. Heurtier**, *Five-Dimensional Janis-Newman Algorithm*, Nov 7, 2014. **Class. Quant. Grav.** 32 (2015) no.16, 165004 [arXiv:1411.2030].
 - [30] W. Buchmüller, E. Dudas, **L. Heurtier** and C. Wieck., *Large-Field Inflation and Supersymmetry Breaking*, Jul 1, 2014. **J. High Energ. Phys.** 1409 (2014) 053 [arXiv:1407.0253].
 - [31] E. Dudas, **L. Heurtier**, Y. Mambrini, *Generating X-ray lines from annihilating dark matter*, Apr 7, 2014. **Phys. Rev. D** 90 (2014) 035002 [arXiv:1404.1927].
 - [32] E. Dudas, M. Goodsell, **L. Heurtier**, P. Tziveloglou, *Flavour models with Dirac and fake gluinos*, Dec 6, 2013. **Nucl. Phys. B** 884 (2014) 632-671 [arXiv:1312.2011].
 - [33] E. Dudas, **L. Heurtier**, Y. Mambrini, B. Zaldivar, *Extra U(1), effective operators, anomalies and dark matter*, Jun 28, 2013. **JHEP** 1311 (2013) 083 [arXiv:1307.0005].

Proceedings

- [1] T. Coudarchet, **L. Heurtier**, H. Partouche, *Spontaneous Freeze Out of Dark Matter*, Published in: **PoS CORFU2019** (2020) 136 - Contribution to: CORFU2019, 136. Dec 21, 2019 [arXiv:1912.10276].
- [2] **L. Heurtier**, *Extra U(1), effective operators, anomalies and dark matter*, Journées de Rencontre des Jeunes Chercheurs 2013: Proceedings.