

Pierre AUCLAIR

Current position

2021 – **UCLouvain**, *Cosmology, Universe and Relativity (CURL)*
Post-Doctoral researcher

Experience

- 2018 – 2021 **Université de Paris**, *Laboratoire Astroparticule & Cosmologie (APC)*
PhD candidate on the subject : *Primordial cosmology and gravitational waves: from phase transitions to cosmic strings and primordial black holes*
Under the supervision of Danièle Steer and Chiara Caprini
- Summer 2018 **Université Paris Diderot, Laboratoire Astroparticule et Cosmologie (APC)**
Summer internship under the supervision of Danièle Steer: "Influence of Cosmic Strings on the Stochastic Gravitational Wave background".
Used Python and Mathematica codes for numerical computations.
- Summer 2017 **University of Exeter – Centre de Recherche Astrophysique de Lyon**
Astrophysics intership under the supervision of Gilles Chabrier. Studied the galactic initial mass function in the excursion set formalism.
For numerical estimations, used Fortran90 and OpenMP codes.
- Summer 2016 **Airbus Defence and Space – Toulouse**
Summer internship in the Advanced Studies department. Participated in the development of a proof of concept for vision based navigation systems in the team "Guidance, Navigation et Control".
Most of the code was in Java and C using the Java Native Interface. Also worked with OpenCV in C++ for image processing.

Education

- 2017 – 2018 **École Normale Supérieure – Paris, France**, *Master 2*
International Center for Fundamental Physics : Theoretical Physics program.
- 2014 – 2018 **École Polytechnique – Palaiseau, France**, *Ingénieur Polytechnicien Program*
Four-year degree which provides a multidisciplinary scientific training, from physics to computer sciences.
- 2012 – 2014 **Preparatory school (equivalent to first two years of University) - Lycée Berthollet – Annecy, France**
Subjects: Mathematics, Physics and Computer Sciences

Teaching

- 2022–2023 **UCLouvain**, *Advanced Quantum Mechanics*
Teaching assistant to Prof Christophe Ringeval in *Bachelier 3ème année*
- 2020–2021 **Université de Paris**, *Complex analysis and partial differential equations*
Teaching assistant to Prof Ken Sekimoto in *Licence de Physique L3*
- 2019–2020 **Université de Paris**, *Advanced mechanics*
Teaching assistant to Prof Francesca Carosella in *Licence de Mathématique L1*
- 2019–2020 **Université de Paris**, *Complex analysis and partial differential equations*
Teaching assistant to Prof Danièle Steer in *Licence de Physique L3*
- 2018–2019 **Université Paris-Diderot**, *Physics classes*
Teaching assistant to Prof Isabelle Grenier in first year of medical school (PACES)

Referee in scientific journals

- Since 2022 **Journal of High Energy Physics**, *JHEP*
Since 2021 **General Relativity and Gravitation**, *GERG*
Since 2021 **Journal of Cosmology and Astroparticle Physics**, *JCAP*
Since 2021 **Physical Review Letters**, *PRL*
Since 2021 **Physical Review D**, *PRD*

Prizes / Grants

- 2022 **MODE (Machine-learning Optimized Design of Experiments) Data Challenge**
Ranked second on the MODE Data Challenge
- 2022 **GWIC-Braccini Thesis Prize**
Honorable mention
- 2020 **PRACE Project Access – Call 20**, *GCS at HLRS, Germany*
GRaSPT – Gravitational Radiation from Strong Phase Transitions.
Project Leader: Dr David Weir, University of Helsinki, Finland.
- 2019 **HPC-Europa3 Transnational Access programme**, *Helsinki Institute of Physics*
Visit as part of the HPC-Europa3 Scheme (grant number HPC17PP8RK): Vorticity generation from first order phase transitions. I wrote the project proposal.
Hosted by Prof. Mark Hindmarsh of the Department of Physics, University of Helsinki.

Published articles

1. Auclair P and Ringeval C. Slow-roll inflation at N³LO. *Phys. Rev. D* 2022;106:063512.
2. Auclair P, Caprini C, Cutting D, et al. Generation of gravitational waves from freely decaying turbulence. *JCAP* 2022;09:029.
3. Sedda MA et al. The missing link in gravitational-wave astronomy: A summary of discoveries waiting in the decihertz range. *Exper. Astron.* 2021;51:1427–40.
4. Abbott R et al. Constraints on Cosmic Strings Using Data from the Third Advanced LIGO–Virgo Observing Run. *Phys. Rev. Lett.* 2021;126:241102.
5. Auclair P and Vennin V. Primordial black holes from metric preheating: mass fraction in the excursion-set approach. *JCAP* 2021;02:038.
6. Auclair P, Peter P, Ringeval C, and Steer D. Irreducible cosmic production of relic vortons. *JCAP* 2021;03:098.
7. Auclair PG. Impact of the small-scale structure on the Stochastic Background of Gravitational Waves from cosmic strings. *JCAP* 2020;11:050.
8. Auclair P, Steer DA, and Vachaspati T. Particle emission and gravitational radiation from cosmic strings: observational constraints. *Phys. Rev. D* 2020;101:083511.
9. Auclair P et al. Probing the gravitational wave background from cosmic strings with LISA. *JCAP* 2020;04:034.
10. Sedda MA et al. The missing link in gravitational-wave astronomy: discoveries waiting in the decihertz range. *Class. Quant. Grav.* 2020;37:215011.
11. Auclair P, Ringeval C, Sakellariadou M, and Steer D. Cosmic string loop production functions. *JCAP* 2019;06:015.

Articles in preprint

12. Auclair P. Mean-field approach to Random Apollonian Packing. 2022. arXiv: 2211.07509 [math-ph].
13. Auclair P, Blasi S, Brdar V, and Schmitz K. Gravitational Waves from Current-Carrying Cosmic Strings. 2022. arXiv: 2207.03510 [astro-ph.CO].
14. Auclair P et al. Cosmology with the Laser Interferometer Space Antenna. 2022. arXiv: 2204.05434 [astro-ph.CO].
15. Auclair P, Leyde K, and Steer DA. A window for cosmic strings. 2021. arXiv: 2112.11093 [astro-ph.CO].

Seminars and conferences

- Invited seminars
- *Slow-roll inflation at N3LO*
 - École Normale Supérieure, Séminaire de Graces, 24 November 2022
 - Institut d’Astrophysique de Paris, Séminaire du GReCO, 21 November 2022
 - *Population of cosmic strings and gravitational waves* : UCLouvain, 6 October 2021
 - *Primordial black holes from metric preheating: mass fraction in the excursion-set approach*
 - Laboratoire APC, groupe théorie, 12 January 2021
 - Department of Theoretical Physics, UPV/EHU, Bilbao, 18 November 2020
 - Instituto de Física Teórica, Universidad Autónoma de Madrid, 12 November 2020
 - *Constraints on cosmic strings from gravitational waves, diffuse gamma-ray background and dark matter*
 - Instituto de Física Corpuscular, Valencia, 6 November 2020
 - Theoretical Particle Physics & Cosmology group, King’s College, London, 4 November 2020
 - Institute of Cosmology & Gravitation, University of Portsmouth, 28 October 2020
 - DESY, University of Hamburg, 19 October 2020
 - Theoretical subatomic physics & cosmology, University of Stavanger, 8 October 2020
 - Particle Cosmology & Quantum Gravity groups, University of Nottingham, 25 September 2020
 - *Cosmic strings and its Stochastic Background of Gravitational Waves*
 - Institut d’Astrophysique de Paris, Séminaire du GReCO, 23 June 2020
 - Laboratoire APC, groupe théorie, 23 June 2020
 - University of Helsinki – 14 May 2019

- Talks at conferences
- *Gravitational Wave Orchestra*, UCLouvain, 8-9 September 2022 [Poster]
 - *LISA Symposium 2022*, Online, 25-29 August 2022
 - *Circle University Meeting 2022*, King’s College London, 7-9 June 2022
 - *Mini-Workshop on Primordial Black Holes*, Université Libre de Bruxelles, 25 April 2022
 - *Listening for signals from the distant Universe* : webinaire of the LIGO/Virgo/KAGRA collaboration, 4 February 2021
 - *Zooming in on Strings and Vortons*, CERN, 22 October 2020
 - Troisième Assemblée Générale du *GdR Ondes Gravitationnelles*, online, 14-15 October 2020
 - *3rd Paris Primordial Cosmology Meetings*, 3 December 2019
 - Deuxième Assemblée Générale du *GdR Ondes Gravitationnelles*, Institut de Physique Nucléaire de Lyon, 10-11 October 2019
 - *Gravitational Waves from the Early Universe*, Nordita, Sweden, 26 August 2019 to 20 September 2019
 - PhD Student Conference organized by the STEP’UP doctoral school, 25-29 March 2019 [Poster]
 - *6th LISA Cosmology Working Group Workshop*, Institute of Theoretical Physics (IFT) in Madrid, 14-18 January 2019

- Participation at conferences
- *Carter Fest: Black Holes and other Cosmic Systems*, IAP, Paris & Observatoire de Paris, Meudon, 4-6 July 2022
 - *Fundamental Physics with LISA "Cosmological Frontiers in Fundamental Physics 2022 Workshop"*, Solvay Institute, 26-28 April 2022
 - *Remnants of the Big Bang 2020*, Arizona State University, 23-24 January 2020
 - *7th LISA Cosmology Working Group Workshop*, Department of Physics & Astronomy "G. Galilei", Padua, Italy, 23-27 September 2019
 - *Cosmic Topological Defects: Dynamics & Multi-Messenger Signatures*, Lorentz Center, 22-26 October 2018

- Organisation of scientific events
- *8th LISA Cosmology Working Group Workshop*, , 15-17 July 2020
 - PhD Student Conference organized by the STEP’UP doctoral school, March 25-29 2019

Outreach

- Fête de la science During the french national science festival, I organized activities popularizing astronomy and space exploration to students from 8 to 15 years old at École polytechnique on behalf of the Student Space Center. October 2015/October 2016
- SpaceUP SpaceUP are space (un)conferences, also known as user-generated conferences aiming at popularizing any subject related to space. I have presented there the nano-satellite and other projects lead by the Student Space Center at École Polytechnique.
- SpaceUp Finland, Aalto University, February 2016
 - SpaceUp X, Ecole Polytechnique, November 2015