Pierre AUCLAIR

Laboratoire APC
10 rue Alice Domon et Leonie Duquet
75013 Paris, France
✉ *auclair@apc.in2p3.fr*

Current position

2018 – Today **Université de Paris**, *Laboratoire Astroparticule and Cosmologie (APC).*
PhD candidate on the subject : *Cosmology with gravitational waves*
Under the supervision of Danièle Steer and Chiara Caprini

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

Experience

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.

Teaching

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)

Grants / fundings

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.

List of publications

[1] P. Auclair, D. A. Steer, and T. Vachaspati. "Particle Emission and Gravitational Radiation from Cosmic Strings: Observational Constraints". In: *Phys. Rev. D* 101.8 (Apr. 2020), p. 083511. ISSN: 2470-0010, 2470-0029. DOI: 10.1103/PhysRevD.101.083511. arXiv: 1911.12066.

[2] Pierre Auclair et al. "Irreducible Cosmic Production of Relic Vortons". In: *arXiv:2010.04620 [astro-ph, physics:gr-qc, physics:hep-ph, physics:hep-th]* (Oct. 2020). arXiv: 2010.04620 [astro-ph, physics:gr-qc, physics:hep-ph, physics:hep-th].

[3] Pierre Auclair et al. "Probing the Gravitational Wave Background from Cosmic Strings with LISA". In: *J. Cosmol. Astropart. Phys.* 2020.04 (Apr. 2020), pp. 034–034. ISSN: 1475-7516. DOI: 10.1088/1475-7516/2020/04 arXiv: 1909.00819.

[4] Pierre G. Auclair. "Impact of the Small-Scale Structure on the Stochastic Background of Gravitational Waves from Cosmic Strings". In: *arXiv:2009.00334 [astro-ph, physics:gr-qc, physics:hep-ph]* (Sept. 2020). arXiv: 2009.00334 [astro-ph, physics:gr-qc, physics:hep-ph].

[5] Manuel Arca Sedda et al. "The Missing Link in Gravitational-Wave Astronomy: Discoveries Waiting in the Decihertz Range". In: *Class. Quantum Grav.* 37.21 (Nov. 2020), p. 215011. ISSN: 0264-9381, 1361-6382. DOI: 10.1088/1361-6382/abb5c1. arXiv: 1908.11375.

[6] Pierre Auclair et al. "Cosmic String Loop Production Functions". In: *J. Cosmol. Astropart. Phys.* 2019.06 (June 2019), pp. 015–015. ISSN: 1475-7516. DOI: 10.1088/1475-7516/2019/06/015. arXiv: 1903.06685.

Articles in preparation

October – November 2020 **Primordial black holes from metric preheating: mass fraction in the excursion-set approach**, *P. Auclair, V. Vennin.*

October – November 2020 **O3 cosmic string analysis**, *LIGO/Virgo collaboration.*
Member of the paper writing team.

References

PhD advisors
- Chiara Caprini, caprini@apc.in2p3.fr, Laboratoire APC, Université de Paris
- Danièle Steer, steer@apc.in2p3.fr, Laboratoire APC, Université de Paris

Collaborators
- Mark Hindmarsh, mark.hindmarsh@helsinki.fi, University of Helsinki
- Christophe Ringeval, christophe.ringeval@uclouvain.be, Université Catholique de Louvain
- Patrick Peter, peter@iap.fr, Institut d'Astrophysique de Paris
- Tanmay Vachaspati, tvachasp@asu.edu, Arizona State University
- Vincent Vennin, vennin@apc.in2p3.fr, Laboratoire APC, Université de Paris
- David Weir, david.weir@helsinki.fi, University of Helsinki

Seminars and conferences

Invited seminars

- *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

- *3rd Paris Primordial Cosmology Meetings*, 3 December 2019 [Invited talk]
- Deuxième Assemblée Générale du *GdR Ondes Gravitationnelles*, Institut de Physique Nucléaire de Lyon, 10-11 October 2019 [Invited talk])
- *Gravitational Waves from the Early Universe*, Nordita, Sweden, 26 August 2019 to 20 September 2019 [Invited talk]
- 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 [Invited talk]

Participation at conferences

- *Remnants of the Big Bang 2020*, Arizona State University, 23-24 January 2020
- *7th LISA Cosmology Working Group Workshop*, Department of Physics and Astronomy "G. Galilei", Padua, Italy, 23-27 September 2019
- *Cosmic Topological Defects: Dynamics and 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