

# Curriculum Vitae

## Arthur Touati

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### Personal information

- *Nationality* French,
- *Birth* August 1995 in Bordeaux, France,
- *Address* Institut des Hautes Etudes Scientifiques, Office 0N7  
35 route de Chartres, 91440 Bures-sur-Yvette, France,
- *Mail* [touati@ihes.fr](mailto:touati@ihes.fr),
- *Website* [arthurtouati.fr](http://arthurtouati.fr),
- *Languages* French (mothertongue), English (professional), German (B1 level).

### Positions

- *2022-2024* **Postdoc** Huawei Young Talents Program at IHES.

### Education

- *2019-2022* **PhD** at CMLS (Ecole Polytechnique):
  - Advisor: Cécile Huneau,
  - Title: Construction of high-frequency spacetimes,
  - Defended on October 6th 2022,
  - Referees : Lars Andersson and David Lannes,
  - Jury : Lars Andersson, Cécile Huneau, David Lannes, Frédéric Rousset, Jacques Smulevici and Jérémie Szeftel,
- *2017-2019* **Master in mathematics** at Université Paris-Sud,
- *2016-2017* **Licence in mathematics** at Université Paris-Sud,
- *2015-2016* **Licence in physics** at Université Paris-Sud,
- *2015-2019* Student in physics and mathematics at **Ecole Normale Supérieure**, Paris,
- *2013-2015* Student in *Classes préparatoires PCSI-PC\** at **Lycée Louis-le-Grand**.

## Research interests

I am interested in the mathematical theory of **general relativity**. My research is twofold:

- construction of high-frequency solutions to the Einstein vacuum equations,
- stability of black holes as solutions to the Einstein vacuum equations.

**Keywords** : mathematical general relativity, Einstein equations, Burnett conjecture, Cauchy problem, geometric optics, black holes, stability.

## Articles & preprints

In reverse chronological order taking into account the first release on arXiv.

4. **High-frequency solutions to the constraint equations** *Commun. Math. Phys.*, 402(1):97-140, 2023.
3. **Geometric optics approximation for the Einstein vacuum equations** *Commun. Math. Phys.* 402(3):3109-3200, 2023.
2. **Global existence of high-frequency solutions to a semi-linear wave equation with a null structure** *Asymptotic Analysis*, 131(3-4):541–582, 2023.
1. **Einstein vacuum equations with  $U(1)$  symmetry in an elliptic gauge: local well-posedness and blow-up criterium** *Journal of Hyperbolic Differential Equations*, 19(04):635–715, 2022.

Articles 2, 3 and 4 above compose my PhD thesis.

## Proceedings

1. **Geometric optics approximation for the Einstein vacuum equations** *Séminaire Laurent Schwartz — EDP et applications*, Exposé no. 7, 12 p. (2022-2023)

## Seminar & talks

- 2023
  - Séminaire de Physique Mathématique EDP, IMB Bordeaux,
  - Greater Paris Postdocs in Mathematics Welcome Day, IHES,
  - Séminaire Analyse & EDP, CY AGM,
  - Journée des Jeunes EDPistes, Tours,
  - Gravity Initiative Seminar, Princeton University,
  - Séminaire du laboratoire, LMR Reims,
  - London PDE Seminar, Imperial-UCL-Queen Mary London,
  - Séminaire de physique mathématique, Institut Fourier Grenoble,
  - Groupe de lecture en relativité générale, LJLL Sorbonne Université.
- 2022
  - Séminaire Laurent Schwartz, CMLS-IHES,
  - Séminaire EDP, IRMAR Université Rennes 1,
  - Mathematical GR and Hyperbolic PDE Seminar, Columbia University,
  - Topics in general relativity, WWU Münster,

- **HADES Seminar**, Berkeley University,
- **Analysis & PDE Seminar**, Stanford University,
- **Séminaire EDP et Physique mathématique**, LAGA Université Sorbonne Paris Nord.
- *2021*
  - **Vienna Relativity Seminar**, University of Vienna,
  - **Seminar on Mathematical General Relativity**, LJLL Sorbonne Université,
  - **Séminaire des doctorants du CMAP et du CMLS**, Ecole Polytechnique, "How to solve Einstein's equations?",
  - **Groupe de travail en analyse**, CMLS Ecole Polytechnique.
- *2020* **Groupe de lecture en relativité générale**, LJLL Sorbonne Université, on the article *Nonlinear interaction of impulsive gravitational waves* of Luk and Rodnianski,
- *2019* **Séminaire des doctorants ANH et ANEDP**, LMO Orsay, "Le problème de Cauchy en relativité générale et les équations d'Einstein dans une jauge elliptique".

## Organization

- *2022-?* **Groupe de lecture en relativité générale**, LJLL Sorbonne Université.

## Teaching

- *2022-2023* Lecturer (in English) of MAA310 "Measure and Integration (Condensed)" for the third year of the **Bachelor of Science** of Ecole Polytechnique,
- *2019-2022* Tutorials (in English) for the **Bachelor of Science** of Ecole Polytechnique, lecture MAA202 "Topology and multivariable calculus",
- *2015-2019* Oral interrogations in mathematics in **Classes Préparatoires aux Grandes Ecoles** in Lycées Louis-le-Grand and Henri IV.

## Supervision

- *2022-2023* PSC (Projet Scientifique Collectif), four second year Polytechnique students working on the Gregory-Laflamme instability,
- *2022 (Mai to June)* Antoine Peyronnet, L3 internship from ENS Rennes, on approximate solutions of the Einstein-Maxwell system.

## Other activities

- *2022-2023* Member of the press review writing team for the website **Images des mathématiques**,
- *2022* "Trous noirs : sont-ils stables ?", short popular piece on **Polytechnique Insights website**,
- *2021* "Ecrire un livre de vulgarisation scientifique pendant sa thèse", interview on **IP-Paris website**,
- *2021* Guest of **La Conversation Scientifique** on France Culture hosted by Etienne Klein (June 26th 2021),
- *2021* Writing and publication (First Editions) of **Voyage au coeur de l'espace-temps**, a popularization book on relativity,

- *2018-2020* **Animath**, organization of week-ends for high-school girls around mathematics and coaching of several teams for french tournaments,
- *2017* **Savoir Pour Tous** (presentation for high-school student available on Youtube), "Vers l'infini et au-delà..."