

# Paul BARRÈRE

## Curriculum Vitae

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## Research interests

- Objects Magnetar formation, core-collapse supernovae, stellar physics
- Physics Magnetohydrodynamics (MHD), dynamo theory, turbulence, instabilities
- Methods Numerical simulations, high performance computing (HPC), computational fluid dynamics (CFD)

## Postdoctoral research

Since 10/2024 **Postdoctoral researcher**, *Observatory of Geneva, Switzerland.*

## Education

- 2024 **PhD in Astronomy and Astrophysics**, *CEA Saclay/AIM – Paris-Saclay University, Paris, France.*  
Thesis: *Modelling magnetar formation*  
Supervisors: Jérôme Guilet & Raphaël Raynaud
- 2021 **Master's degree of Science in astronomy and astrophysics (Magistère)**, *Paris-Cité University, Paris, France.*  
*With honours*
- 2019 **Bachelor's degree of Science in physics (Magistère)**, *Paris Diderot University - P7, Paris, France.*  
*With honours*
- 2016 **Baccalauréat Série S**, *Lycée Pardailhan, Auch, France.*  
*With honours*

## Given talks and poster presentations

### 5 invited seminars/interviews

- 26/11/2024 **Lagrange seminar**, *Observatoire de la Côte d'Azur, Nice, France.*
- 11/12/2023 **Interview for the MPA Postdoc Fellowship**, *Max Planck Institute for Astrophysics, Garching, Germany.*
- 07/12/2023 **Stellar Group Seminar**, *Observatory of Geneva, Geneva, Switzerland.*
- 29/11/2023 **Albert Einstein Institute seminar**, *Max Planck Institute for Gravitational Physics (AEI), Potsdam, Germany.*
- 25/07/2023 **Zoom seminar, Department of Astronomy and Astrophysics at the University of Valencia**, *Universidad de Valencia, Valencia, Spain.*

### 7 conferences

- 11/12/2024 – **CoCoNuT Meeting 2024**, *Universidad de Valencia, Valencia, Spain.*  
13/12/2024
- 04/11/2024 – **Journées Programme National des Hautes Énergies 2024**, (talk by J. Guilet),  
07/11/2024 *APC laboratory, Paris, France.*
- 16/10/2023 – **MIAPbP program: stellar magnetic fields from protostars to supernovae**,  
27/10/2023 *MIAPbP, Garching, Germany.*

20/06/2023 – **Journées de la SF2A 2023**, *Université de Strasbourg*, Strasbourg, France.  
23/06/2023

27/06/2022 – **Workshop on Codes in Stellar Physics**, *Centre de Conférence Jules Janssen*,  
01/07/2022 Observatoire de Paris, Meudon, France.

16/05/2022 – **PHAROS conference 2022**, *Sapienza Università di Roma*, Rome, Italy.  
19/05/2022

28/03/2022 – **Workshop ANR BEAMING**, *IRAP*, Observatoire Midi-Pyrénées, Toulouse,  
29/03/2022 France.

### 3 posters

01/07/2024 – **Annual meeting of European Astronomical Society 2024**, New magnetar  
05/07/2024 formation scenario: Tayler-Spruit dynamo in a proto-neutron star spun up by fallback,  
*Padova Congress*, Padova, Italy.

04/06/2023 – **Thematic school GWsNS-2023: Gravitational waves from neutron stars**,  
09/06/2023 Numerical simulations of the Tayler-Spruit dynamo in proto-magnetars, *Centre Paul  
Langevin*, Aussois, France.

28/11/2022 – **Workshop Modeling, observing and understanding flows and magnetic  
02/12/2022 fields in the Earth's core and in the Sun**, Numerical simulations of the Tayler-  
Spruit dynamo in proto-magnetars, *Isaac Newton Institute*, University of Cambridge,  
Cambridge, UK.

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## Teaching

2022 – 2024 **Numerical methods**, *Lectures and practical works given to first-year undergraduate  
students (190 hours)*, Paris-Saclay University, Orsay, France.

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## Outreach

2022 – 2024 **Conférence Elbereth**, *Member of the organisation committee*, Paris, France.

03/11/2023 – **Scientific animation at the Explor'Espace 2023 festival**, Beffroi de Montrouge,  
05/11/2023 Montrouge, France.

05/11/2021 – **Scientific animation at the Explor'Espace 2021 festival**, Beffroi de Montrouge,  
07/11/2021 Montrouge, France.

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## Languages

French Native speaker

English C1 level

Spanish B2 level

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## Computing skills

Programming languages: 

- Fortran 90, Python (advanced)
- MATLAB (basics+)
- SQL, Caml Light (basics)

Numerical codes 

- MagIC (spectral method)
- Code to simulate light diffusion (Monte-Carlo method, development)
- Code to solve hyperbolic PDEs (Godunov scheme, development)

Parallel computing 

- MPI
- OpenMP

# Paul BARRÈRE

*Publication list*

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## Refereed/submitted publications

6. A. Reboul-Salze, **P. Barrère**, K. Kiuchi, J. Guilet, R. Raynaud, S. Fujiyabashi, M. Shibata, *Tayler-Spruit dynamo in binary neutron star merger remnant*, submitted to A&A, November 2024.  
DOI: 2411.19328
5. **P. Barrère**, J. Guilet, R. Raynaud, A. Reboul-Salze, *Tayler-Spruit dynamo in stably stratified rotating fluids: Application to proto-magnetars*, accepted for publication in A&A, December 2024.  
DOI: 2407.01775
4. A. Igoshev, **P. Barrère**, R. Raynaud, J. Guilet, T. Wood, R. Hollerbach, *From proto-neutron star dynamo to low-field magnetars*, accepted for publication in Nature Astronomy, December 2024.
3. F. Rincon, **P. Barrère**, T. Roudier, *Observational characterisation of large-scale transport and horizontal turbulent diffusivity in the quiet Sun*, submitted to A&A, April 2024.  
DOI: 2404.14383
2. **P. Barrère**, J. Guilet, R. Raynaud, A. Reboul-Salze, *Numerical simulations of the Tayler-Spruit dynamo in protomagnetars*, MNRAS Letters 526, L88-L93, August 2023.  
DOI: 10.1093/mnrasl/slad120
1. **P. Barrère**, J. Guilet, A. Reboul-Salze, R. Raynaud, & H.-T. Janka, *A new scenario for magnetar formation: Tayler-Spruit dynamo in a proto-neutron star spun up by fallback*, A&A 668, A79, December 2022.  
DOI: 10.1051/0004-6361/202244172

## Conference proceedings

2. **P. Barrère**, J. Guilet, R. Raynaud, A. Reboul-Salze, *A new scenario for magnetar formation in a proto-neutron star spun up by fallback*, SF2A proceedings, 2023.
1. M. Bendahman, **P. Barrère**, A.-C. Buellet, M. Bugli, et al., *Core-collapse supernovae: from  $\nu$  physics to new physics*, 38th International Cosmic Ray Conference, 2023.