

# Charlotte Gehan

## Junior Investigator

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Nationality: French



Application to a Research Position in Stellar Science  
at MPS: Asteroseismology (ref. St2020)

### Education

- 2015 – 2018 **PhD thesis in Stellar Astrophysics**, *Laboratoire d'Etudes Spatiales et d'Instrumentation en Astrophysique (LESIA)*, Paris Observatory, Meudon, France.  
**Evolution of the core rotation of stars on the red giant branch : from large-scale measurements towards a characterisation of the angular momentum transport**, with Benoît Mosser and Eric Michel, defended on September 21, 2018.
- 2013 – 2015 **Master of Science in Astrophysics**, *Université Pierre and Marie Curie (UPMC)*, Paris, France.  
Graduated with high honours ("Mention Bien"). Ranking: 6/34.
- 2010 – 2013 **Bachelor of Science in Physics, speciality Physics and Chemistry**, *UPMC*, Paris, France.  
Graduated with honours ("Mention Assez Bien"). Ranking: 8/23.

### Attended Schools

- July 2016 **Asteroseismology and Exoplanets: Listening to the Stars and Searching for New Worlds**, *IVth Azores International Advanced School in Space Science*, Horta, Faial, Azores Islands, Portugal, 10 days.  
Poster presentation.
- Oct. 2015 **Space-Inn school on astero/helioseismology and stellar/Solar physics**, *CEA*, Saclay, France, 3 days.

### Research Experience

- Oct. 2019 – Now **Junior Investigator**, *Centro de Astrofísica da Universidade do Porto (CAUP)*, Porto, Portugal.  
Measurement of global seismic parameters for planet host red giants observed by TESS (using the EACF method), evolution of rotational kernels on the red giant branch (using the ADIPLS pulsation code).
- 2018 – 2019 **Temporary Teaching and Research Assistant (ATER)**, *LESIA, Paris Observatory*, Meudon, France, 1 year.  
Development of an automated and general approach to measure stellar inclinations, validation through large-scale measurements for red giant branch stars observed by *Kepler* ( $\sim 1200$ , publication submitted to KASOC).

2015 – 2018 **PhD thesis**, *LESIA, Paris Observatory*, Meudon, France, 3 years.

1. Ensemble asteroseismic analysis of evolved stars observed by *Kepler* to constrain the internal rotation and the angular momentum transport.
  - Development and application of a novel seismic diagnostic tool to probe the core rotation of red giants.
  - Large-scale measurements ( $\sim 900$ ) of the mean core rotation rate of red giant branch stars: unveiling for the first time the impact of the stellar mass on the evolution of the mean core rotation on the red giant branch from observations.
  - Skills: Fourier and Hough transforms, chi-square minimization, Python coding.
2. Characterisation of the angular momentum transport on the red giant branch through modelling (work in progress).
  - Using large-scale measurements and variations of the internal moment of inertia to constrain the angular momentum extraction rate from the red giant core as a function of stellar mass and evolution.
  - Skills: handling the MESA stellar evolution code and ADIPLS pulsation code, Fortran coding.

### Research Stays

May 2019 **Solar & Stellar Physics research group**, *University of Birmingham*, Birmingham, United-Kingdom, May 21-23.

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## Oral Communications

### Invited

- Apr. 2020 **Workshop on Pulsations in Intermediate-mass, Massive and/or Multiple Stars**, *Institute of Advanced Studies, University of Surrey*, Guildford, UK.  
Review on the seismology of solar-type pulsators. Postponed due to the COVID-19 pandemic.
- Sept. 2019 **PLATO Input Catalogue (PIC) Workshop (I)**, *Provincia di Padova*, Padova, Italy.  
Interior Rotation from Red Giants.

### Selected

- July 2019 **TASC5/KASC12 Workshop**, *Massachusetts Institute of Technology (MIT)*, Cambridge, USA.  
Large-scale analysis of red giant inclinations.
- July 2018 **TASC4 – KASC11 Workshop: First Light in a new Era of Astrophysics**, *Aarhus University*, Aarhus, Denmark.  
Core rotation braking on the red giant branch: characterizing the influence of the stellar mass on the braking efficiency.
- July 2017 **TASC3 – KASC10 Workshop: TESSting stellar astrophysics**, *University of Birmingham*, Birmingham, UK.  
The era of large-scale measurements of red giant core rotation.
- July 2017 **SF2A Semaine de l'Astrophysique Française**, *FIAP*, Paris, France.  
Large-scale measurements of red giant core rotation through asteroseismology.
- June 2016 **AstroFluid 2016 International Conference**, *IAP*, Paris, France.  
Toward a better understanding of red giants rotation.

### Invited seminars

- Feb. 2020 **Red giant seismology: large-scale measurements of the core rotation and stellar inclination, and new constraints on the angular momentum transport through modelling**, *CAUP*, Porto, Portugal.
- May 2019 **Evolution of the core rotation of stars on the red giant branch and stellar inclination measurements**, *University of Birmingham*, UK.

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## Teaching duties

- 2016 – 2018 **Physics courses**, *Paris Observatory*, Paris, France.
- Directed exercises in Signal Processing (Master level, 18 hours): probabilities, Bayesian statistics, convolution product and Fourier transform.
  - Teacher in the Massive Online Open Course "(Astro)Physics I: Electromagnetism" (Bachelor level, 83 hours): preparation and correction of exercises, course on the physical bases of asteroseismology (1 hour).

2018 – 2019 **Astrophysics courses**, *Paris Observatory*, Paris, France.

- Teacher in the Online University Degree "Lights on the Universe" (Bachelor and Master levels, 46 hours): correction of exercises, online student tutoring, preparation of exercises to be included in the final exam subject.
- Practical work in Instrumentation (Master level, 38 hours): night observations with Meudon 1m and 60cm telescopes, processing of the recorded data.
- Practical work on computers in the frame of school teachers' training (6 hours): pedagogical exercises on the solar system, the solar rotation, and on various uses of the Stellarium software.

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## Student supervision

Mar. – Aug. 2020 **Co-supervision of a Master trainee (5 months)**, *CAUP*, Porto, Portugal.

Testing the transport of chemical elements using red-giant stars.

Mar. – June 2019 **Co-supervision of a Master trainee (3 months)**, *Paris Observatory*, Meudon, France.

Seismic analysis of red giants on the asymptotic giant branch.

Jan. 2017 **Co-supervision of a Bachelor trainee (1 month)**, *Paris Observatory*, Meudon, France.

Comparing stellar distances computed through astrometry and asteroseismology.

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## Event organisation

2016 – 2018 **Member of the Local Organizer Committee of the Elbereth conference**, *IAP*, Paris, France.

Annual conference organized by and for PhD students in astrophysics in the Parisian region, gathering about 120 PhD students with diversified nationalities.

Management of all organization aspects: budget, call for laboratory fundings, update of the website, creation and printing of the advertising poster and of the participant badges, call for invited reviewers, chairwoman role, organisation of the coffee breaks and the final buffet, organisation of a visit of Paris Observatory.

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## Scientific outreach

Oct. 2018 **Scientific facilitator during *Planètes en Guyane***, *French Guiana*, 10 days.

Scientific mediation operation along the coastline of French Guiana, supported by Paris Observatory. Presentation of the solar system and the BepiColombo space mission to classes and the general public.

2016 – 2019 **Supervision of Paris Observatory visits for elementary, medium and high school pupils (19 hours)**, *Paris Observatory*, Meudon, France.

Discovery of the solar system scaled model, the 60cm and 1m telescopes and the spectroheliograph.

Oct. 2016 **Scientific facilitator during *Spacebus Maroc 2016***, *Morocco*, 10 days.

Itinerant scientific mediation operation in Morocco, supported by Paris Observatory. A truck designed for the occasion crossed different villages and towns along a 3000 km itinerary, allowing about 15 000 people from all social categories to be initiated to science through astronomy.

2015 – 2016 **Complementary PhD mission of scientific mediation to the general public (128 hours)**, *Palais de la Découverte*, Paris, France.

Entertaining presentations on stellar evolution, the red giant phase and asteroseismology.

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## Computer skills

Languages **Python, Fortran**

Software **LaTeX, Modules for Experiments in Stellar Astrophysics (MESA), Aarhus Adiabatic Pulsation code (ADIPLS), Microsoft Office**

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## Language skills

French **Mother tongue**

English **C1 level**

Spanish **B2 level**