

## Clémence Fontanive



### Title

Strength In Numbers: How Do Stellar Companions Affect Giant Planet Formation?

### Abstract

While numerous exoplanets have now been uncovered in stellar binaries, the impact of companion stars on planet formation and evolution is still not understood. In this talk, I will present results of population trends seen among the known sample of planets in multiple star systems, which allows us to investigate the effects of stellar binarity on the resulting planetary architectures. In particular, observations of stars hosting high-mass close-in giant planets and brown dwarfs find an excess of binary companions on few hundred AU separations, and different planet demographics for these systems, suggesting that such binaries may provide favourable conditions for the formation of the observed inner companions. I will show results from simulations of self-gravitating protoplanetary disks adapted to binary-star environments, which show that certain binary configurations may trigger gravitational fragmentation and lead to the formation of giant planets in otherwise-stable disks.

# CLÉMENCE FONTANIVE

## CSH Research Fellow

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### RESEARCH INTERESTS

- Direct detection and characterisation of giant exoplanets and brown dwarfs.
- Demographics, formation, and atmospheres of stellar, substellar, and exoplanetary populations.
- High-resolution imaging and astrometry with ground and space-based observations.

### EDUCATION

- Jun 2019 **PhD in Astronomy.** Institute for Astronomy, University of Edinburgh, UK.  
PhD Thesis supervised by Prof. B. Biller.  
*Brown Dwarfs and Giant Exoplanets: Bridging Observations and Theory with Statistical Methods.*
- Jul 2015 **MSci in Physics** (4-yr undergraduate). Department of Physics, Imperial College London, UK.  
Masters Thesis supervised by Dr. I. Mueller-Wodarg.  
*Refining General Circulation Models of Titan's Upper Atmosphere with Cassini Data.*

### RESEARCH EXPERIENCE

- 2019–present **CSH Fellow.** Center for Space and Habitability, University of Bern, Switzerland.
- 2015–2019 **PhD Student.** Institute for Astronomy, University of Edinburgh, UK.
- 2014–2015 **Masters Student.** Department of Physics, Imperial College London, UK.
- Summer 2013 **Research Intern.** Institut d'Astronomie et d'Astrophysique, ULB, Belgium.

### TEACHING EXPERIENCE

- 2015–2019 **Teaching Assistant.** Department of Physics and Astronomy, University of Edinburgh, UK.  
Leading tutorials, workshops and lab sessions for undergraduate physics and astronomy courses.
- Tutor: Discovering Astronomy, Introductory Astrophysics, Physics 1A/1B.
  - Demonstrator: Scientific Programming, Computer Simulations, Observational Astronomy.

### GRANTS AND AWARDS

- Jan 2020 **Winton Astronomy Thesis Prize 2019.** Award from Winton Capital Management.
- Sep 2019 **CSH Research Fellowship.** 3-yr prize fellowship for independent research in exoplanet science.
- Apr 2019 **Principal's Go Abroad Fund.** £350 conference travel grant from University of Edinburgh.
- May 2018 **SUPA Short-Term Visit Scheme.** £2500 funding for a 5-week visit to NASA Goddard.
- Oct 2017 **Physics and Astronomy Poster Competition.** First prize winner, University of Edinburgh.
- Jul 2017 **Other Worlds Laboratory Travel Grant.** \$2500 USD for 1-month visit to UCSC.

### AWARDED TELESCOPE TIME

- HST **3 Programs as PI:** 61 orbits — GO 14686 (WFC3), GO 15201 (WFC3), GO 16229 (WFC3)  
**PI programs worth over \$400 000 USD funds** from Space Telescope Science Institute.  
1 Program as co-I: 132 orbits (WFC3).
- JWST 2 Programs as co-I: 48.2 hours (NIRSpec, NIRCam).
- Gemini **1 Program as PI:** 4 hours — GN-2017B-Q-40 (NIRI)  
1 Program as co-I: 4.4 hours (GNIRS).

VLT **1 Program as PI:** 4.5 hours — 099.C-0728 (NACO)  
6 Programs as co-I: 146 hours (SPHERE, GRAVITY, SOFI).  
5 nights of visitor mode SPHERE observations for the SPHERE Consortium.

## SELECTED PRESENTATIONS

- Nov 2021 **Invited Seminar.** Astronomy Seminar Series, University of Hawaii, USA.  
Oct 2021 **Invited Talk.** The Star-Planet Connection ESO Workshop, European Southern Observatory, Chile.  
Mar 2021 **Invited Seminar.** ESPF Seminar Series, Space Telescope Science Institute, USA.  
Mar 2021 **Invited Seminar.** Exoplanets & Habitability Seminars, ETH Zurich, Switzerland.  
Feb 2021 **Invited Seminar.** Astronomy Colloquium, University of Michigan, USA.  
Jan 2021 **Contributed Talk.** Exoplanets Orbits & Dynamics Workshop, University of Liège, Belgium.  
Dec 2020 **Invited Seminar.** CENTRA Seminar Series, University of Lisbon, Portugal.  
Nov 2020 **Invited Seminar.** Leicester Astrophysics Seminars, University of Leicester, UK.  
Aug 2020 **Invited Seminar.** Exeter Astrophysics Seminars, University of Exeter, UK.  
Aug 2019 **Contributed Talk.** Extreme Solar Systems IV Conference, Reykjavik, Iceland.  
Jan 2019 **Invited Talk.** CSH Symposium, University of Bern, Switzerland.  
May 2018 **Invited Seminar.** Extrasolar Planets Seminar, NASA Goddard Space Flight Center, USA.  
May 2018 **Contributed Talk.** Chesapeake Bay Area Exoplanet Meeting, Carnegie DTM, USA.  
Feb 2018 **Invited Seminar.** Astronomy Seminars, Stockholm University, Sweden.  
Nov 2017 **Invited Seminar.** INAF Seminar, Osservatorio di Padova, Italy.

## PROFESSIONAL SERVICE

- 2021 **CSH Fellowships Search Committee.** Center for Space and Habitability, Switzerland.  
2021 **External Reviewer for HST Time Allocation Committee.** Space Telescope Science Institute.  
2020–present **Software Developer of the SIMPLE Database** for brown dwarfs and directly-imaged planets.  
2020–present **Review Editor for Frontiers in Astronomy and Space Sciences.** Exoplanet Section.  
2020–present **Associate Member of NCCR Planets.** Swiss National Centre of Competence in Research.  
2019–present **CSH Management Committee Member.** Center for Space and Habitability, Switzerland.  
2019–present **Referee for the AAS Journals:** The Astronomical Journal, The Astrophysical Journal Letters.  
2016–present **Member of the SPHERE Consortium.** Science Team for the large SHINE observing program.

## OUTREACH AND DEI ACTIVITIES

- Sep 2021 **Women in NCCR Video Campaign** promoting female researchers. NCCR Planets, Switzerland.  
Jun 2021 **First Author of Petition** for Codes of Conduct in Astronomy Collaborations [\[Link\]](#).  
Apr 2021 **Radio Interview about Astronomy Career.** Radio Télévision Suisse (CQFD), Switzerland [\[Link\]](#).  
2021–present **Member of IDEEA** – Inclusion, Diversity, and Equity in European Astronomy.  
Feb 2021 **Public Lecture for the IAU Women in Astronomy Day.** HEPAC, Marrakech, Morocco [\[Link\]](#).  
Feb 2021 **Radio Interview about Brown Dwarfs.** France Culture (La Méthode Scientifique), France [\[Link\]](#).  
Jan 2021 **Radio Interview about the Oph 98 Binary.** Radio Télévision Suisse (CQFD), Switzerland [\[Link\]](#).  
2020–2021 **Consultant on Media Articles.** Inside Science, Futura Sciences, Espiloon, Pour la Science.  
Dec 2020 **Writer of Press Release Article.** University of Bern & NCCR Planets, Switzerland [\[Link\]](#).  
2017–2020 **Event Speaker and Organiser for Astronomy on Tap.** Edinburgh, UK & Bern, Switzerland.  
2017–2018 **Public Lectures for Astronomy Winter Talks.** Royal Observatory Visitor Centre, Edinburgh, UK.  
2015–2018 **Volunteer and Speaker at the Annual ROE Open Days.** Royal Observatory of Edinburgh, UK.