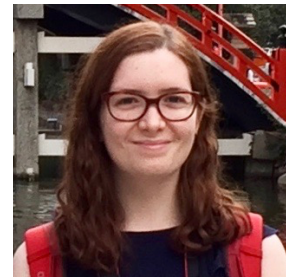# Dr. Fran Lane

POSTDOCTORAL RESEARCH ASSISTANT · THEORETICAL COSMOLOGIST

Institute for Astronomy, Royal Observatory, Blackford Hill, Edinburgh, EH9 3HJ

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Postdoctoral Research Assistant - Royal Observatory Edinburgh   *Sept. 2020 - Jan. 2021*

PhD Astrophysics - Edinburgh University   *Sept. 2016 - Aug. 2020*

COMPLETED VIVA EXAMINATION WITH MINOR CORRECTIONS

- Thesis title: Modelling cosmological structure formation in the non-linear regime
- Supervisors: Prof. Andy Taylor and Dr. Daniele Sorini

MMath Pure and Applied Mathematics - Newcastle University   *Sept. 2012 - Sept. 2016*

UPPER 2:1 - 67 PER CENT

- Thesis title: Alternative dark matter theories: modelling fuzzy dark matter
- Supervisor: Dr. Gerasimos Rigopoulos

Research interests

I work on the development of **perturbative methods to model large-scale structure** formation in the non-linear regime. My technique, the **General Cosmological Trajectories Method (GCTM)**, is based on Lagrangian Perturbation Theory. The GCTM can be used with multiple approximations, at a range of redshifts, and with a range of cosmological parameters. In my PhD thesis I demonstrate that observables, such as the power spectrum and correlation function, can be calculated numerically for the GCTM. I then use the GCTM in conjunction with a range of approximations to study features such as **Baryon Acoustic Oscillations (BAO)** (in both real and redshift-space) and **redshift-space distortions**. The ultimate goal of this work is to **produce mock observables** that can be compared to data in order to constrain cosmological parameters. I am currently working on a pair of papers, based on my PhD thesis, describing this work.

Awards

2019   **Scottish Universities Physics Alliance Postgraduate and Early Career Researcher Award**

  Worked with Dr. Zvonimir Vlah and Dr. Marko Simonovic on BAO reconstruction techniques during a month at CERN

2019   **Durham Edinburgh Extragalactic Conference XV talk prize**

Selected Talks

Jan. 2020	**Durham Edinburgh Extragalactic Conference XVI, Durham, UK**	**Talk**
Dec. 2019	**Texas Symposium, Portsmouth, UK**	**Talk**
Dec. 2019	**SUPA Cormack meeting, Edinburgh, UK**	**Talk**
Sept. 2019	**Cosmo19, Aachen, Germany**	**Talk**
Mar. 2019	**University of Geneva, Geneva, Switzerland**	**Invited talk**
Jan. 2019	**Durham Edinburgh Extragalactic Conference XV, Edinburgh, UK**	**Talk**

Publications

2020	**The General Cosmological Trajectories Method I: Modelling large-scale structure**	**In prep**
2020	**The General Cosmological Trajectories Method II: Modelling redshift-space distortions**	**In prep**

Supervision experience

2019	**School of Physics and Astronomy Career Development Scholarship Programme: Niall Rodgers** Project title: Entering the Golden Age of Cosmology: Are our N-body simulations good enough?	**1st supervisor**
2017	**Edinburgh Physics Summer Scholarship: Florian Regnault** Project title: Simulating viscous dark matter	**2nd supervisor**