

FRUZZINA JULIA AGOCS

+44(0)7835293746 ◇ fa325@cam.ac.uk ◇ <https://fruzzinaagocs.github.io>

Gonville and Caius college ◇ CB2 1TA Cambridge, UK

Kavli Institute for Cosmology ◇ Madingley road, CB3 0HA Cambridge, UK

EDUCATION

PhD: Cosmology (CDT in Data Intensive Science programme) 2017–present
University of Cambridge

Thesis: Theoretical and computational methods for the evolution of primordial perturbations

Supervisors: Prof. Anthony Lasenby, Prof. Mike Hobson, Dr. Will Handley

MA, MSci: Theoretical and Experimental Physics, 1st class 2016–2017
Gonville & Caius college, University of Cambridge

Part III project: [The Runge-Kutta-Wentzel-Kramers-Brillouin method and the primordial Universe](#) (1st class)

Supervisor: Dr. Will Handley

BA: Natural Sciences, 1st class 2013–2016
Gonville & Caius college, University of Cambridge

Part II research review: The quantum density operator and decoherence (1st class)

Supervisor: Prof. Stafford Withington

AWARDS AND PRIZES

Funded research visit Feb–Mar 2020
Institute of Particle Physics and Cosmology, RWTH Aachen University

I secured funding (worth €1000) for a 6-week research collaboration to build a computational tool I developed into CLASS, a large-scale cosmology simulation.

Duncan Bruce memorial prize for Physics, Book Prize 2017
Gonville & Caius college

Senior scholarship 2016
Gonville & Caius college

RESEARCH EXPERIENCE

British Antarctic Survey (BAS), Cambridge, UK Jul 2019–Jan 2020
Research student

As an integral part of my PhD studentship I completed a 6-month industrial placement at BAS. During this time I built a data pipeline to retrieve climate-related observations such as sea ice thickness, extent, snow coverage and temperature maps from satellites, and used a machine learning technique called a temporal convolutional network to predict the regional sea ice coverage of the Arctic. Knowing sea ice coverage months in advance is essential for planning ship routes and can be used to inform physics-based climate models.

Kokoon Technology Ltd., London, UK Jul–Sept 2016, Jul–Aug 2017
Research Engineer

I worked on the 5-stage classification (Wake, Sleep 1-3, REM) of sleep based on voltage readings of a skull electroencephalogram and an accelerometer attached to the head of the patient, using machine learning techniques such as random forests and support vector machines.

To better understand the mechanism of accretion in supermassive black holes situated in the centres of host galaxies, I wrote a pipeline which (with or without user supervision) subtracts contamination from the host galaxy from the spectral energy distribution of such objects.

PUBLICATIONS

- [1] Quantum initial conditions for inflation and canonical invariance. **F. J. Agocs**, L. T. Hergt, W. J. Handley, A. N. Lasenby, and M. P. Hobson. *Phys. Rev. D*, 102:023507, Jul 2020.
- [2] Efficient method for solving highly oscillatory ordinary differential equations with applications to physical systems. **F. J. Agocs**, W. J. Handley, A. N. Lasenby, and M. P. Hobson. *Phys. Rev. Research*, 2:013030, Jan 2020.
- [3] Dense output for highly oscillatory numerical solutions. **F. J. Agocs**, M. P. Hobson, W. J. Handley, and A. N. Lasenby. *Submitted to Phys. Rev. Research*, Jul 2020, [arXiv:2007.05013](https://arxiv.org/abs/2007.05013).
- [4] Finite inflation in curved space. L. T. Hergt, **F. J. Agocs**, W. J. Handley, A. N. Lasenby, and M. P. Hobson. *Manuscript in preparation*.
- [5] Beyond the traditional WKB approximation of Boltzmann equations. N. Schöneberg and **F. J. Agocs**. *Manuscript in preparation*.

ACADEMIC TALKS AND POSTERS

Cosmology seminar, University of Oxford <i>Invited speaker, Pyoscode: fast solutions of oscillatory ODEs in Physics</i>	Jul 2020
Scipy 2020 (virtual) conference <i>Pyoscode: fast solutions of oscillatory ODEs in Physics</i>	Jul 2020
Seminar, Battcock Centre for Experimental Astrophysics, Cambridge <i>Invited speaker, Robustness of quantum initial conditions for inflation</i>	Apr 2020
Seminar, Institute of Astronomy, Cambridge <i>oscode: fast solutions of oscillatory ODEs in Cosmology</i>	Jan 2020
MCR-SCR talk, Gonville and Caius college, Cambridge <i>Numerically solving the early universe</i>	Jan 2020
Cavendish Graduate Student Conference, Cambridge (poster)	Dec 2019
KICC10: conference for the 10 th year anniversary of Kavli Institute, Cambridge (poster)	Sept 2019
Astro Hack Week, Cambridge <i>Invited participant, led breakout session on Gaussian processes</i>	Aug 2019
Seminar, Kavli Institute for Cosmology, Cambridge <i>Invited speaker, Efficient numerical solutions for oscillatory differential equations</i>	Oct 2018
CDT Summer school in machine learning, University College London (poster)	Jul 2018
Seminar, Battcock Centre for Experimental Astrophysics, Cambridge <i>Invited speaker, The Runge-Kutta-Wentzel-Kramers-Brillouin method and the primordial Universe</i>	Jun 2017

TEACHING AND OUTREACH

Supervising

Part IA Mathematics (for Natural Sciences) <i>6 students, 56 hours total</i>	2018/19
Part II General Relativity <i>11 students, 11 hours total, included revision session</i>	2017/18, 2018/19
Part III Relativistic Astrophysics and Cosmology <i>50 students, 28 hours total</i>	2017/18–2019/20

Outreach

Astronomy lecture and observation session at the Logikatóbor summer camp, Visegrád, Hungary <i>6 hours of teaching, ~90 children aged 10-17</i>	2020
Interviewed for article on meteor showers and their observation (in Hungarian) <i>In online magazine www.divany.hu which reaches ~100 000 readers a day</i>	2020
Periscope broadcast at RWTH Aachen University <i>Viewed by ~1900 people live</i>	2020
Invited speaker at the Women in STEM residential , Gonville and Caius college <i>Presentation and Q&A for ~40 girls doing their GCSEs</i>	2018
Observation secretary for the Cambridge University Astronomical Society (CUAS) <i>I was responsible for telescope training and conducting observations</i>	2016/17

ACADEMIC SERVICE

Reviewer <i>Journal of Open-Source Software (JOSS)</i>	2020–
Top reviewer, programme committee member <i>Scipy 2020 (virtual) conference</i>	2020
reviewer, programme committee member <i>Scipy Japan (virtual) conference 2020</i>	2020

TECHNICAL SKILLS

Programming	(strong) Python, C/C++, Maple (familiar) Mathematica, MATLAB, Fortran, parallelisation
Computing	Unix, bash, vim, git, \LaTeX , TikZ
OS	(experienced) Linux, Mac OS, (familiar) Windows

REFEREES

Prof. Anthony Lasenby

Cavendish Astrophysics Group and Kavli Institute for Cosmology, Cambridge,
a.n.lasenby@mrao.cam.ac.uk

Prof. Mike Hobson

Cavendish Astrophysics Group, Cambridge,
mph@mrao.cam.ac.uk

Prof. Julien Lesgourgues

Institute of Particle Physics and Cosmology, RWTH Aachen University,
lesgourg@hysik.rwth-aachen.de

Dr. Will Handley

Cavendish Astrophysics Group and Kavli Institute for Cosmology, Cambridge,
wh260@cam.ac.uk