

Introduction to your Astronomy PhD

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Useful contacts

Astro PG course directors:

Sownak Bose & Francesca Fragkoudi

(all Durham emails are firstname.lastname@durham.ac.uk)

Director of Postgraduate Studies of Physics:

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Physics PG admin:

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Astro PG recruitment:

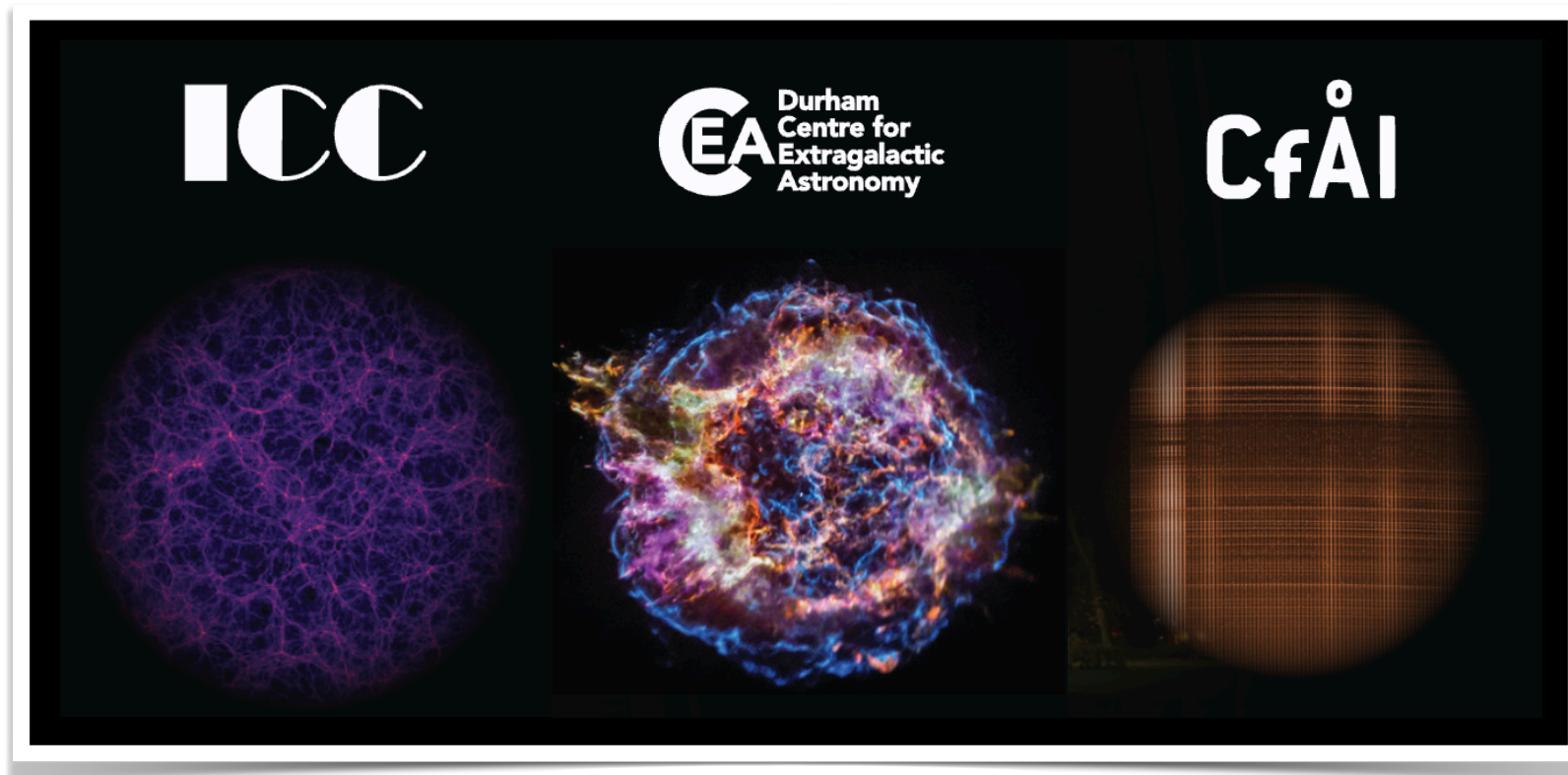
Dimitri Gadotti, Ryan Cooke

What we'll cover today

- Overview of the astronomy post-graduate course
- Basic guidance on what you should expect in your PhD
- What is expected of you

Astronomy at Durham

- Institute for Computational Cosmology
- Centre for Extragalactic Astronomy
- Centre for Advanced Instrumentation



- ~34 permanent members of staff and long-term fellows
- ~100 postdocs, student and support staff



Postgraduate course structure

Aim is to give basic research skills needed for your PhD and to give you a broad scientific background

1. **Research Skills & Professional Development:**

- Computing, programming, high-performance computing
- Instrumentation
- Scientific paper writing, evaluating scientific papers
- Science communication

2. **Astrophysics Lectures:**

- Covering a broad range of topics from stars to cosmology
- Coursework is set for most lectures (typically ~3 hours of your time)
- Aim is to give you grounding in key principals in astrophysics
- Typically 1 hour each, Monday-Friday mornings, 9-11am, OCW017 (will get an email invitation to course calendar today)
- It is fine to discuss homework in groups, but hand in your own solutions

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1. RS&PD: Computing, Programming & HPC

- Programming: Python (self-study)
 - Uses course designed by ARCHER for Durham.
 - <http://www.archer.ac.uk/training/course-material/2018/09/scipy-durham/index.php>
 - Self-study: work through L01-L05
- Basic computing & local system (Lecture next week by Aleksander Wawrzynczak)
- Introduction to COSMA (Lecture next week by Alastair Basden)
- For **ICC students** we also recommend: Scientific Computing & High Performance Computing MISCADA Lectures (more on this later)

1. RS&PD: Instrumentation

- Series of lectures in the week of the 3rd of November
 - Adaptive Optics - Tim Morris
 - Astroparticles - Paula Chadwick
 - Imaging and Detectors - Jorgen Schmoll
 - Spectrographs/slicers/fibers - Jorgen Schmoll
- If you are a **CfAI** student you should be taking these
- Optional for ICC and CEA students

1. RS&PD: Paper writing & Evaluation

- Training on “How to read and write papers?”
- Lecture and practical examples by Peder Norberg & Richard Massey
- Will take place in Epiphany term

1. RS&PD: Science Communication

- Half-day training in the 3rd term (Easter term) on how to communicate your science to various audiences:
 - Academic
 - General public
- Combination of lectures and a workshop from an external expert on science communication (e.g. Pint of Science director, Head of Public Engagement at Centre for Life Newcastle)

Talk by International director of
Pint of Science Festival



Carlos Frenk participating in a
science communication
workshop on spinning plates

MISCADA Lectures

MSc in Scientific Computing and Data Analysis

In addition to the “core astronomy PG lectures” we recommend attending from the following MISCADA lectures:

- Introduction to Data Analysis — Anna McLeod
- Scientific Computing — Tom Theuns
- Introduction to Machine Learning — Will Yeadon
- High Performance Computing — Chris Marcotte

All in Michaelmas term (starting next week)

Timetable: <https://timetable.dur.ac.uk/module.htm>

Codes: PHYS51915, PHYS52015

Tuesday: 2-4pm **PH30 & CC-0007** Anna McLeod & Will Yeadon

Friday: 9-11am **PH30 & CC-0007** Anna McLeod & Will Yeadon

Tuesday: 4-6pm **PH30 & TLC025** Tom Theuns & Chris Marcotte

Wednesday: 11am-1pm **PH30 & ENGEX1** Tom Theuns & Chris Marcotte

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2. Astrophysics Lectures

Michaelmas term:

- Stellar populations
- Black holes & Active Galactic Nuclei
- Dynamics of Spiral Galaxies
- Clusters and Groups of Galaxies
- Large Scale structure
- Cosmological Simulations
- Astronomical Instrumentation

Epiphany term:

- Stellar Structure & Evolution
- Stellar Dynamics
- Galaxy formation
- The Interstellar & Intergalactic medium
- Radio astronomy

Course Progression

1. Essay/critique & Talk

- ~2500 word critique of opposing studies - designed to develop your science evaluation skills and also your scientific writing skills
- ~12 min presentation of the critique with 3 min of questions
- Takes place in 2nd term
 - Start of March: deadline for submitting draft to supervisor
 - Mid-March: deadline for final draft
 - End of March: Talks

2. Friday lunchtime astronomy talk

- (~20 mins) on your research towards the end of the first year

3. Progression report and viva (towards end of year)

- ~5000 word report on your research to date - background material, techniques, and results
- ~30-45 min oral defence of your report with 2 examiners (before 31st of July)
- Note: you will also need to fill in the postgraduate **quarterly reports** on the physics database to progress

Progression into second year is dependent on

- passing the post-graduate course and completing the course work
- successfully completing your progression report and viva

Time Management

You'll need to divide your time between research and PG course

- Post-graduate course runs mostly over the first two terms
- 25-50% of your time will be spent attending lectures and completing course work
 - ➡ Manage your time so you can make progress on your research
- Third term: complete your research report and pass your viva (often this is the first draft of your research paper)

Your supervisors know that you attend the PG course and undertake course work

Weekly Events

- **You are expected to attend**

- Wednesday colloquium
 - There is also the opportunity to go to lunch and dinner with speaker (costs are subsidised)
- Friday lunchtime astronomy talks (FLATS)
- Student astro-ph Journal Club

- **You are encouraged to attend:**

- Mondays at 1pm: a series of events organised in succession once per month (e.g. All-astro lunch, IDEA, CosmICConnections)
- arXiv journal club (every day 10:45am OCW Level 1)

Full list of things going on: <https://icc.dur.ac.uk/index.php?content=Events/Events>

Postgraduate Research key skills

- **Problem solving**

- Do not feel intimidated about asking others (students/PDRAs/staff) for help
- Achieve a balance between being independent and seeking advice when necessary
- Different supervisor/student combinations will have different approaches - work out what works for you both!

- **Presenting your scientific results**

- Improve your presentation skills: give presentations to the group then progress to larger national meetings and then international conferences
- Improve your writing skills by writing research papers and proposals
- Discuss your results with others (students/PDRAs/staff) - explaining your work helps you better understand what you have done and why!

- **Understanding how your work fits into the bigger picture**

- Follow the background scientific literature and recognise the strengths and weaknesses of your research and the research of others
- Follow new research in your area by following, e.g., arXiv.org pre-print archive daily and using NASA ADS

Building your research portfolio

- **Your success in research so often depends on your research portfolio**
 - Your scientific papers
 - Giving good presentations
 - Your visibility within your research community
 - Talking to researchers from outside Durham (e.g. seminar speakers/visitors)
- **Directing your PhD research**
 - At first your supervisor will guide your research
 - Towards the end of your PhD you should start to take control and design your own research experiments/projects

Where to find information?

- **ICC and CEA websites have a lot of useful information:**
 - Travel Procedures: How to book your travel
 - Seminars, Clubs and Events (Google calendar)
 - New Starters information
 - Postgraduate Study: <https://icc.dur.ac.uk/index.php?content=Postgraduate/Course>
- There is an unofficial Astronomy **Slack** workspace. Link to join: https://join.slack.com/t/astrodurham/shared_invite/zt-3eblukj4z-s0uJsPIBr9bpB3ye8Ql17g
- You should have a **buddy** (another astro PhD student) assigned to you who can help you navigate your start at Durham



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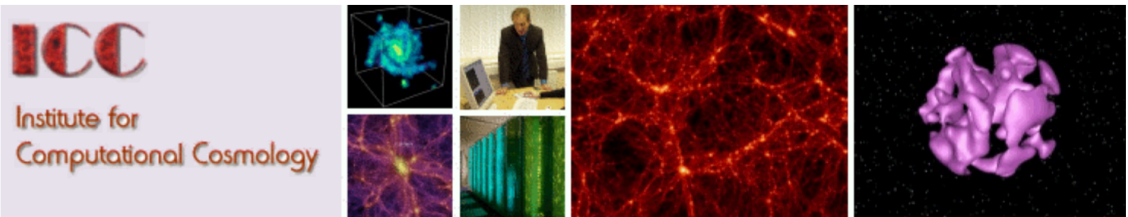
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The Institute for Computational Cosmology (ICC) is a leading international centre for research into the origin and evolution of the Universe at [Durham University](#). We address some of the most fundamental questions in science: What were the first objects in the Universe? How do galaxies form? What is the nature of the dark matter and dark energy? Where does the large-scale structure of the universe come from? What is the fate of the Universe?

The ICC is part of the [Ogden Centre for Fundamental Physics](#) and interacts closely with the [Centre for Extragalactic Astronomy](#) and the [Centre for Advanced Instrumentation](#) in the [Department of Physics](#). We offer both PhD and Msc [postgraduate studentships](#).

In November 2016, the ICC moved into the brand new Ogden Centre for Fundamental Physics building, designed by the world renowned [Studio Daniel Libeskind](#). The new building now houses all three astronomy groups in the Department of Physics, including the Centre for Advanced Instrumentation and the Centre for Extragalactic Astronomy, as well as the Institute for Computational Cosmology.

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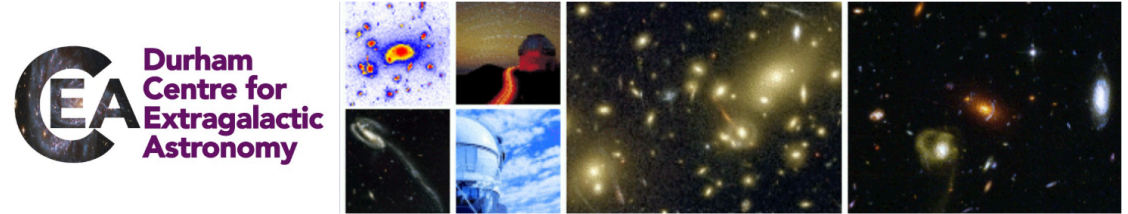
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Foundation: 2015 marked the 40th anniversary of the renaissance of observational astronomy and cosmology in the Department of Physics at Durham University. This activity has grown substantially over this period and we are now one of the largest astronomy groups in the UK and Europe, hosting world-class activities in observational extragalactic astronomy and cosmology, encompassing the formation and evolution of galaxies, clusters and large scale structure. To mark this anniversary and to recognise the scale of the observational research activity at Durham, in 2015 we founded the Centre for Extragalactic Astronomy (CEA). Together with the associated astronomy research centres focusing on theoretical and instrumentation development, the CEA provides a rich research environment to enhance productivity by fostering cross-disciplinary collaboration. The Clarivate Analytics Highly Cited Researchers 2018 list puts Durham's astronomers and cosmologists first in the UK, second in Europe and sixth in the world for the quality and influence of their research in space science.

Career Development Fellowship

- The Royal Society have started a fellowship to support the career development of under represented groups in STEM. In this first round they are specifically supporting researchers with Black heritage. The fellowship offers 4 years support to early career researchers who have less than 2 years postdoc experience. Applicants can be from outside the UK.
- [Career Development Fellowship website](#)

The deadline is 24th January 2024.

Mission: Observational astronomy and astrophysics is the fundamental foundation of our understanding of the

Questions?