Role of the Post-Graduate student

Carlton Baugh

Astronomy Postgraduate Course Director

Aims:

- 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

Durham University

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

- **33 permanent members of staff and long-term fellows**
- **around 100 postdocs, students, and support staff.**

PG course: structure, lectures, and course work

- **Astro Lectures:**
  - typically 1 hour each, on average 1 per day
  - 9am in OCW017 (sometimes also 10am lecture)
  - Some afternoon classes/workshops
  - will have email invitation to Outlook calendar

  - Calendar gives lecture course name, lecturer
- **Aim:** basic research and specific skills needed for PhD and give wider background - become an independent researcher

More about lecture courses & assessment

- **Research skills: general computing, statistics, programming, high-performance computing, instrumentation, data reduction, scientific paper writing, evaluating scientific papers**

- **Science lecture courses cover broad range of astrophysics from stars to cosmology**
  - Coursework is set for every lecture series
  - should typically take ~3 hours of your time
  - Aim is to give you grounding in key principals in astrophysics

  Fine to discuss homework – virtual homework club?

  Hand in your own solutions

Computing

- Programming: **Python (self-study)**
- Basic computing & local system
- **Introduction to COSMA**
- Workshops: choose **Data Reduction** or **High Performance Computing MSc lectures**
- Scientific computing: python & compiled language: lectures and exercises

Python self study course

- 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

Astrophysics courses

Michaelmas term:

- Stellar populations
- Stellar structure
- Galaxy clusters
- Black holes
- High-z universe
- Gravitational lensing
- Milky Way

- Active Galactic Nuclei
- Cosmology
- Data reduction workshop
- Astronomical instrumentation
- Large-scale structure

Astrophysics courses

Epiphany term:

- Stellar dynamics

- Secular evolution in galaxies

- Galaxy formation

- Simulations & modified gravity

- Interstellar medium/intergalactic medium (+workshop)

- Radio astronomy

Recent addition

- Leah Morabito

- Introduction to radio interferometry: basic techniques and current results

"I will introduce the basic concepts of interferometry and why it can be a powerful observational tool. We will cover how radio images are made using interferometers, and discuss both the advantages of and the challenges to using interferometry. We will cover the emission mechanisms relevant at radio wavelengths and discuss current results that showcase what we can learn from radio observations, with a focus on active galactic nuclei. There will be a hands-on tutorial for making radio images, and a panel discussion with the authors of recent papers on the newest radio interferometry highlights."

PG course: optional components

- HPC,
  Data reduction workshop,
  radio interferometry workshop
  simulation workshop, TBC

- Tell me which ones you pick

- e.g. ICC – HPC, simulations

- e.g. CEA – data reduction workshop, radio interferometry

MISCADA MSc lectures

- Term 1: Module PHYS52015
- First 4 weeks:
- Data Analysis – Anna McLeod
- Scientific computing – Tom Theuns
- Middle week – no MISCADA lectures
- Last 4 weeks of term:
- Machine learning
- High Performance Computing – for theorists/simulators

MISCADA timetable

Module number: PHYS52015

Core 1b

Weeks 1-4:   16.00- 18.00 Tuesdays TLC025   Tom Theuns Numerical methods
**   14.00- 16.00 Thursdays CC0007 Tom Theuns Numerical methods**

Week 5 – no MISCADA lectures

Weeks 6-10   16.00-18.00 Tuesdays   TLC025 Chris Marcotte   HPC
**   13.00-15.00 Wednesday CC0007   Chris Marcote HPC**

MISCADA timetable

Module number: PHYS52015

Core 1a

**Weeks 1-4:   14.00-16.00 TLC025 Tuesday Statistics Anna McLeod
                 16.00-18.00 TLC025   Friday Statistics Anna McLeod**

Week 5 – no MISCADA lectures

**Weeks 6-10   14.00-16.00 TLC025   Tuesday Machine Learning Daniel Maitre
                16.00-18.00 TLC025   Friday Machine Learning Daniel Maitre**

Course Assessment:
critique, talk, progression report and viva

- **Essay/critique**
  - ~2500 word critique of opposing studies - designed to develop your science evaluation skills and also your scientific writing skills
    - Will have lecture on scientific writing skills before the essay is set
  - ~12 min presentation of the critique with 3 min of questions

- **Friday lunchtime talk** (~20 mins) on your research towards the end of the first year

- **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

- **Progression into second year is dependent on**
  (1) passing the post-graduate course and completing the course work
  (2) successfully completing your progression report and viva

Astro-PG Course Assessment: critique, talk, progression report and viva

Critique and talk:
- 2nd term
- Start of March – deadline for submitting draft to supervisor
- mid March – deadline for final draft
- end of March – talks

Progression report:
- 5000 word report
- 15th June – deadline for submitting draft to supervisor
- Supervisor arranges examiners, date for viva and date for final submission – before 31st July
- Process to be completed in advance of university progression deadline 31st August

PG research: some of the key skills

- **Problem solving,** which you will develop. Do not feel intimidated about asking others (students/PDRAs/staff) for help!
  - Achieve a balance between being independent and seeking advice when necessary
  - Achieve a good relationship with your supervisor: 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 regularly (e.g., each day or week) and NASA ADS

Dividing your time between research and PG course

- Post-graduate course runs for 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 (by end of June) - often this is the first draft of your research paper

- Postgraduate quarterly reports on physics database; annual review reports on duo

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

Building your research portfolio

- **Your success in research so often depends on your research portfolio**
  - Your scientific papers
  - Your reputation for 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 PhD you should start to take control and design your own research experiments/projects

Other training opportunities

- All students complete a Training Needs Analysis with supervisor
- Identify training needs beyond those met by PG course
- Centre for Academic, Researcher and Organisation Development (CAROD)
- HPC/Fortran – Hamilton/CIS
- https://www.dur.ac.uk/cis/training/courses

Weekly events

Expected to attend:

- Wednesday seminars (/CfAI seminars)
  - ➢ 3 pm seminar
  - ➢ Student journal club: Weds 11am
  - ➢ Opportunity to go with speaker

- Friday lunchtime talks (internal speakers)

- 1st year astro-ph journal club – Mondays 2nd & 3rd terms

- Monday 1pm: a series of events organised in succession once per month:
  All-astro lunch, Theory lunch

Other events:

- arXiv journal club (every day 10.45 OCW Level 1)

- Wednesdays 11 – student journal club

- For full list see:
  http://icc.dur.ac.uk/index.php?content=Events/InterestGroups