
The PhD Guide

AstroMundus 3rd & 5th Edition

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This document was inspired by our discussions during the AstroMundus retreats. We hope that it will be helpful for future generations in setting off their careers.

1 Introduction

Applying for PhDs can be quite a long and baffling process. Not only do you have to figure out what field you want to go into, but you have to consider country, supervisor, department, funding, and so much more. Hopefully this guide will give you a headstart and an insight into what lies ahead.

The most important thing is to apply for anything and everything that appeals to you, apply, apply, apply! You never know where you will and won't get accepted, so make life as easy as possible for your future self. You might also find that you change your mind about your likes and your dislikes, so be as open minded as possible. Remember to check long in advance when the deadlines are! Read papers from your field of interest and find out where people do what you would like to do. Look at web pages of institutes and job newsletters, all year round. Email groups that you are interested in working with to make yourself known and to see if they will have any openings coming up (especially at smaller insti-

tutions), but most importantly, to see if you like them!

The usual application procedure is as follows:

1. Fill out an application form, usually with a short personal statement about your research interests.
2. Provide up-to-date transcripts, CV, English language certificate, 2-3 referees/letters of recommendation, and BSc diploma.
3. Attend an interview (20-60 min long); either in person (travel costs covered) or via Skype.
4. Offer is made and it is decision time.

Here we will discuss the whole process in detail.

2 General remarks

All places. Don't be put off applying from somewhere if you feel like you have bad grades. Your motivation and enthusiasm for astrophysics stands out much more than a grade on a piece of paper! So don't give up! Also, if you find an amazing opportunity and you've missed the deadline (even by a month!) email them because you never know. Miracles are possible! Departments can vary greatly with the way they organise their PhDs. For example, you may have to take courses or teach, and some places allow you to decide on a project + supervisor after a few weeks of being there. Maybe there are opportunities to do Studentships abroad. There are many things to

consider, depending on your preferences.

Europe. You will need an English certificate, this may be waived if previous degrees have been conducted in English. Many German and Dutch universities have deadlines in October/November/December and require applications to be sent by post.

U.K. Deadlines are usually around January/February. Oxford and Cambridge have application fees.

Germany. If admitted, they will ask for your high school diploma to be translated to German and certified by the embassy, so allocate time to do that.

USA. You need the TOEFL specifically. Additionally you need extra tests: the GRE General and GRE Physics, which cost around 200\$ each and require a lot of preparation. The GRE in Physics is offered only 3 times per year (April, September, October). On top of that, each school has application fees of 50-100\$, and you should apply to 4-5 schools at least. Usually PhDs are several years longer, because they include a Master-like equivalent at the beginning. Even if you already have a Master degree, it's often not possible to get around this.

Japan. For international students the deadline is in October. Applications are extremely detailed and have more stages than in other countries i.e. you need to provide a research proposal, as well as examinations. There are also two different types of PhDs available, the 5 year program is for those who have not already done a Masters.

3 Funding

Europe: Generally, any European student applying for a PhD in Europe will have access to funding as though they were a national citizen. This may be different for international students, although there is always funding for places like Max Planck, Leiden, etc.

UK: British citizens will usually be considered for [STFC funding](#), every year universities are allocated a certain number of PhDs. You will have to search through the universities to find which ones are funding E.U. citizens and/or international students. This changes every year. You may be able to teach/mark work of undergraduate

students for extra money. **Scotland** has [SUPA fellowships](#) for astro-PhDs.

Germany. [DAAD scholarships](#) for Germany have an October deadline (this is where external funding can come from).

USA: Positions are funded, but it's very competitive. You often have to teach as well in order to get paid.

Japan: MEXT is the major funding entity with applications due in October. You can also apply via SOKENDAI in April or October depending on the Scholarship.

4 Places to Apply

PhDs can often be found on some of the general webpages listed below:

- [American Astronomical Society](#) job register;
- [Royal Astronomical Society](#) job list;
- [High-Energy Physics Employment Database](#) (they also advertise positions in astro-particle physics and cosmology).

Following are some of the Universities across the world which offer PhDs in Astrophysics. If only the city is listed, add in "University of [city]", unless otherwise stated. The list is by no means exhaustive, but it's a start. During your search remember to include Physics Departments and Mathematical Departments (which can have Solar Physics or Astrophysical Simulations for example).

Europe:

- Austria: Vienna, Innsbruck, Graz
- Belgium: Gent, KU Leuven
- Denmark: Copenhagen, Niels Bohr Institute
- Finland: Helsinki, Turku, Tuorla Observatory
- France: Paris Observatory, Grenoble Alpes, Toulouse, SEA Saclay, Institut d'Astrophysique de Paris, Institut d'Astrophysique Spatiale, AstroParticle and Cosmology Laboratory, L'Observatoire de la Cote d'Azur, Laboratoire d'Astrophysique de Marseille
- Germany: Heidelberg Graduate School of Fundamental Physics, Heidelberg Institute of Technology, Observatory of Hamburg, Postdam Observatory, Erlangen, Bochum University, Göttingen, TLS-Tautenburg, IMPRS (MPE,

MPA, USM, and ESO), Excellence Cluster Universe, Technical University of Munich, Technische Universität Berlin

- Max Planck Institutes: Bonn, Garching, Hannover, Heidelberg, Göttingen, Hamburg
- Iceland: Iceland
- Italy: L'Aquila Observatory, Bologna, SISSA in Trieste, Palermo, Padova (international program), joint Rome Tor Vergata/La Sapienza program
- Ireland: Cork, Armagh Observatory, Trinity College Dublin, University College Dublin, Dublin Institute for Advanced Studies
- Netherlands: Amsterdam, Leiden Observatory, Neijmegen, Groningen, Utrecht, Nikhef
- Norway: Tromsø, Oslo
- Poland: Nicolaus Copernicus Astronomical Center
- Portugal: Porto
- United Kingdom:
 - London: University College London (+ Mullard Space Science Laboratory), Queen Mary University of London, Kings College London, Imperial College of London
 - England: Oxford, Cambridge, Leicester, Bath, Sheffield, Hertfordshire, Liverpool (LJMU), Southampton, Newcastle, Northumbria University, Keele, Open University, Portsmouth, Hull (E.A. Milne Centre), Exeter, Surrey, University of Central Lancashire, Lancaster, Manchester, Birmingham, Jodrell Bank, Leeds, Durham, Warwick
 - Scotland: Edinburgh, Heriot-Watt, St Andrews, Aberdeen, Glasgow
 - Wales: Aberystwyth, Cardiff
 - Northern Ireland: Queen's University Belfast
- Spain: Universidad Autónoma de Madrid, Complutense University of Madrid, Instituto de Astrofísica de Canarias, Valencia
- Sweden: Stockholm, Nordic Institute for Theoretical Physics (Stockholm, also Copenhagen), Chalmers University of Technology, Onsala Space Observatory, Swedish Institute of Space Physics
- Switzerland: Zurich, EPFL Lausanne, ETH, Bern, Geneva University/Observatory, Basel
- Other programs: [Marie Curie training Network](#), [Hector Fellow Academy](#).

USA: A complete list of Astronomy programs with relevant statistics can be found here (you should try to look for more up-to-date versions): <http://www.aip.org/sites/default/files/statistics/graduate/astrost12.pdf>.

Note that some places with excellent astrophysical research opportunities offer PhDs in Physics only (e.g. MIT and Stanford).

Canada: Toronto, Victoria, Alberta, The Perimeter Institute, University of Western Ontario, Queen's University, Montreal, McGill University, McMaster, Concordia, University Laval, Saint Mary's University

India: Indian Institute of Astrophysics

Israel: Weizmann Institute of Science, Technion Institute of Technology

Australia: Australian National University, Swinburne University, The University of Sydney, Macquarie University, Western Sydney University, The University of New South Wales, Monash University, University of Tasmania, The University of Western Australia

New Zealand: Victoria University

Japan: Tokyo, Kyoto, Osaka, SOKENDAI

South America: Chile Universidad Católica (lots of collaborations with European researchers, ESO)

Africa: Cape Town, AIMS South Africa, University of Western Cape

5 Application

- You usually need up to 3 letters of recommendation, think about it in advance, and make them diverse. They often require that one letter is from your last degree institution, so try and make a good impression on a professor from your program - it helps if you have a strong letter from someone that knows you now (as opposed to your past professors).
- Highlight your technical skills in your CV e.g. programming languages, programs you can use (IDL, IRAF, Mathematica, ...), and if you know Linux, LaTeX etc.
- Summer internships are helpful as they show you've done research (especially since you will be applying/interviewing before starting thesis work in most cases!). Also networking - you

may meet potential supervisors!

- Where your personal statement/motivation is concerned show your enthusiasm and passion! Emphasise why you are particularly interested in the research topic, the group, and the supervisor. Mention what your hopes are for the future, why do you want to do a PhD? What are you hoping to gain? What are your thoughts on the future of Astrophysics, and this field in particular (show an understanding of the topic and its expected future development)? Talk about any conferences you have been to, outreach you have done, international outlook etc. Discuss any previous research you have done and the specific skills that you have learned: interest, dedication and a positive attitude towards research is important.

6 Interview

In most places in Europe people are invited for interviews (sometimes via Skype). Interviews can vary greatly, from a casual chat to a more vigorous analysis of physics and thought processes. You may also be asked to give a talk on your previous research. It's not uncommon that your first interview might feel like a complete and utter disaster! But do not despair, now you've had some experience and know what to expect for next time, it'll be much easier. Here are some general tips.

- In most cases it helps if you contact the potential supervisor in advance. Send them your CV and a few sentences of why you are interested in the projects.
- They will ask you about your Bachelor and Master theses, even during February interviews! So read up even before you start the actual work. Also go through what you did for your Bachelors, they may ask for a lot of detail even if it was two years ago!
- You have to be interested in the project and willing to do things you did not initially sign up for (e.g. a little bit of observations when applying for theoretical/computational projects).
- Show confidence, independence, inquisitiveness, enthusiasm, adaptability, etc. ;)
- Read papers of people you are interested in working with and mention which aspects of

their work is interesting to you.

- Use the coffee breaks/lunches during interviews to talk to your potential supervisors and make them like you: be friendly and smile :) .
- For the interviews which require a talk, it is really important. You will present your previous research. Make sure it is very well communicated and showcases your skills. You might get someone interested in you just by your talk. Explain it in a way that everyone in the room can follow and omit unnecessary technical details. Good explanations show better understanding than complicated equations and techniques. The audience will consist of all the other applicants (so people from different fields) and professors.
- Make sure you look good and feel perfectly comfortable. No need to suit up if that's not how you usually dress.
- Try to stick out in some way, it will also make it easier to start conversations later; show them you are an interesting person.

7 Acceptance

So how do you choose? If you are lucky enough to have more than one offer you may be faced with a difficult decision. Here are a few things you should consider. How busy is your supervisor? How many students do they have? Do they do a lot of outreach? Do they have a lot of collaborators around the world? Do they have a huge amount of grant funding? What is the department like - big, small, lots of groups? Are there lots of other PhD students? Will you have to do extra work (e.g. extra courses, or helping with teaching undergraduates)? What is the city like?

Definitely Skype your potential supervisor if you've never met, to ensure there's chemistry. Try to visit if you can. You want to be sure you like the place if you're going to be spending the next 4 years of your life there! Go with your gut!

8 Other Careers

Other career planning resources:

- <http://myidp.sciencecareers.org/>
explore other career possibilities
- <http://aas.org/jobs/career-profiles>
careers with astronomy degree (not necessarily
in astrophysics)
- https://www.ras.org.uk/images/stories/ras_pdfs/careers_v12.pdf
RAS PhD in Astronomy report