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Moving on:
The Physics PhD Student’s Guide to Boosting Employability

The number of people entering the labour market with a degree has grown dramatically in the last generation. Many degrees now include industrial training and focus on developing specific skills, so you might expect employers to have their pick of great candidates. The truth, though, is that every time a group of employers is surveyed, they identify skills shortages and a need for high-calibre candidates with particular technical or personal expertise. A PhD gives you the chance to develop technical knowledge and skills to a very high level, but the nature of research is such that you will also have the opportunity to develop a broader set of valuable professional skills.

These skills are not always obvious to researchers when they come to apply for jobs, so this guide will help you to identify them and show how relevant and important PhD physicists can be to employers.

Whatever career appeals to you, it is a real challenge to stand out from the crowd and demonstrate to employers that you have the skills and qualities they need. Employers are looking for a set of high-level skills from potential applicants to help their business thrive. Having a PhD in physics provides unusual and sought-after qualities that have real value in many sectors and occupations, and it also exposes you to different experiences and activities.

In this guide we will look at the advantages that a PhD in physics should give you, help you identify the skills developed through research, and look at some ways to boost your employability through involvement in activities that are open, but not always obvious, to physics researchers.

Although many students start a PhD hoping to continue with an academic career, the proportion that will ultimately secure a permanent academic position is relatively small. However, there are many other careers that you can enter following a PhD or post-doctoral work, and physicists work in all sectors in a huge range of careers.

There are many profiles and websites that can help you to identify potentially interesting careers. This guide will point you to the most useful of these, and will also identify good practice as demonstrated by physics researchers who have made successful career transitions.
What value can research experience add to your career?

The PhD differs fundamentally from any other degree and probably offers a more diverse experience than any other qualification. As a PhD student you are given the opportunity to undertake an in-depth programme of research, giving you the chance to take responsibility for defining the scope and direction of your work and the possibility of setting yourself on a trajectory for a specific career.

The flexibility of a PhD allows you to develop relevant professional networks, present and promote your work to expert audiences, come up with your own ideas, and build a reputation for, and visibility to, potential employers. If you choose to continue as a researcher through postdoctoral work, your technical expertise will grow, you will have increasing control over your work and more responsibilities for students. You may also start to develop your own projects and collaborations, continually developing higher-level skills and personal qualities that will be valued elsewhere.

The core skills that are developed as a researcher can be “invisible” because they are part of your daily routine. You probably take these skills for granted, and don’t even realise you are developing them. However, in many other employment sectors, these skills can be relatively unusual, much in demand, and worth highlighting. The trick is learning to recognise them in yourself.

Dr Grace Carolan-Rees is director of CEDAR, an NHS evaluation centre that conducts research into emerging health technologies and devices to support healthcare decision-making. She believes that the value of her PhD was not so much in the topic she researched, but in the understanding of the research process that she gained.

“The real value of my PhD has been in learning how to formulate research questions – we have to do this really effectively in order to provide the answers that clinicians and health boards need, often under time pressure and with limited resources,” she explained. “The work we do here involves all kinds of scientists and technologists and we work in multidisciplinary teams. With such diverse backgrounds it is essential to be able to value each other’s specialisms and we work hard to understand each other. The transferable skills are key in this role as in so many. As a researcher you really need to be able to emphasise how well you can work with others, communicate, and perform effectively in a professional environment.”

To find out more about Grace’s role at CEDAR and how her PhD has helped her to get ahead, visit the researchers’ portal at www.iop.org/careers.

This guide will help you to identify many of the skills and attributes you will be developing as a PhD student and show why they are so important to employers – in academia, other public sector roles and in private industry.

Independence

The PhD is a period of research during which the expectation is that you will start to develop into an independent researcher. As your knowledge of the field grows and you start to understand the research process, you will become increasingly responsible for making decisions about the direction your work takes. You will also be managing your own workload and finding the resources and support you need to carry out your work successfully. Employers will see the benefits of this in terms of your personal initiative – not needing to be managed closely, able to think through decisions, and manage your own time and work.

The value of independence to...

...academic careers cannot be underestimated. If you want to secure an academic position, you must demonstrate that you can develop your own ideas and turn these into successful grant applications. You must publish work that is novel and influences thinking and understanding in your field, and you must have clear opinions and develop a unique specialism.

...other employers is similarly vital. Staff who have initiative and are comfortable developing their own ideas and approaches are a great asset to any employer because they will help to improve their products and services. You should require a shorter induction, less supervision and start contributing much more quickly.

Build this skill by taking as much responsibility as possible for your work, as early as possible. Although you will be working under the direction of your supervisor – and this will be CLOSE direction in the early days – you must begin to develop your own ideas and...
In developing your independence, you should also develop a healthy awareness of your own limitations and work to address these.

start to steer the project. Very quickly, you will become an expert in the day-to-day running of your research. Not long after this you will be the expert in your particular topic and will know more than your supervisor about the details of your own work. Use this knowledge to make suggestions about how the project should develop. If your supervisor rejects your ideas, learn where the weaknesses lie and develop your thinking and suggestions.

Even if you are in a research group and your research is inter-twined with the work of others, you should take control of managing your own work as early as possible. You could think about developing project plans; identifying priorities and scheduling in tasks; setting deadlines and breaking down large projects into smaller tasks. Most institutions offer training in project- and time-management for researchers and will have licences for project-management software. Even if you don’t choose to employ these project-management techniques on a day-to-day basis, an understanding of them and how they could apply to managing a research project could be hugely beneficial to future employers.

During the viva, your examiners will be looking for evidence of your contribution to the direction of the project – you should not be passive. In developing your independence, you should also develop a healthy awareness of your own limitations and work to address these, but also to accept that you will always need help and support from experts.

**Critical thinking**

By the end of your PhD you will have highly developed critical thinking, meaning you are able to evaluate your own work and that of others. It does not need much imagination or commercial awareness to realise how valuable these skills are. When you add in the confident handling of data that most physicists have, and the ability to identify trends emerging from information, you can see that research experience gives you an opportunity to develop really valuable skills.

The value of critical thinking to...

...academic careers is that it will help you to make judgements about the potential importance and influence of work being carried out in other groups. It will help you decide which approaches to your research are most likely to succeed and to evaluate your results and hypotheses.

...other employers where the quality of data handling and levels of confidence with information are recognised by employers as being higher among doctoral graduates and are particularly valued in physicists. Not being intimidated by inconsistent information, being able to spot themes emerging, and to identify trends are very attractive traits to many employers, particularly in sectors that rely on the analysis and interpretation of data.
Develop this skill by...
...reading papers and looking for the strengths and weaknesses in the arguments presented. Try to think of alternative interpretations or ideas. Play devil’s advocate with your own work – keep asking yourself “so what?” or “if this is wrong, what else would explain it?”. Go to as many presentations about research as you can, even outside your field and subject, listen to the questions that are asked, and develop questions of your own. Think about how you will defend the hypothesis at the heart of your thesis. Think about your choice of methodology – what alternative experimental approaches could you use? Use team meetings as an opportunity to practise using your critical-thinking skills. You should also go to meetings with your supervisor armed with ideas and then get their feedback. Do not be afraid to be wrong in the early days – you need to work out which are the best approaches to your project by considering a range of options, and it is great to learn how to take criticism constructively.

Finding your own funding
Even at the earliest stages of your research career you should be looking for funding for additional activities such as placements or attendance at conferences. There is huge competition for academic positions and appointment committees want to see evidence of your ability to secure your own funding and signs that you are working in an area that is important and will continue to attract support from funding providers. For other sectors, the ability to secure funding is evidence of an ability to convince someone to support your ideas and the commercial acumen of producing a credible request for financial support.

The value of finding your own funding to...
...academic careers is evidence that you have a vital skill. Institutions are increasingly looking at the cost of employing people and will recruit research-active staff who can bring in enough funding to sustain their groups and contribute to the institution. Equally importantly, funding gives you the freedom to pursue your own interests and answer the questions you find intriguing.

...other employers is in providing evidence of being able to convince and persuade people of the value of your ideas. You will be able to show that you can beat stiff competition, particularly if you can report on the percentage of successful applications. Securing funding can also be interpreted as entrepreneurial thinking – in putting together a proposal you must understand the costs and benefits of your ideas and convince someone that your innovative solution is likely to succeed. The award of funding in a competitive process is a measure of your excellence in that field as well as evidence of your leadership and commercial thinking as you will have understood your competition and convinced the funding body that your approach is better.

Develop this skill by...
...looking for suitable funding schemes and starting to identify funding trends. Early applications might help you to attend an important conference, pay for an expert to visit your group, give you a chance to visit another researcher, spend time in an international research lab, or gain additional training. At first you might find writing funding applications difficult, but your institution may run courses to help you. If your supervisor or other colleagues are developing funding proposals, ask if you can look at the way their applications are constructed. Look at previous funding applications and pay particular attention to the reviewer’s comments – do you agree? How would you respond to their feedback?

Problem solving
Doing research is basically identifying and solving a succession of problems. You need to decide on the best methodology, gather together the necessary resources, choose the best way forward after considering a range of possibilities, and then take action. This fundamental process can be applied to almost any problem, and if you understand the process well, and can apply it to new kinds of challenges, it will be a fantastic asset for your future career.

The value of problem solving to...
...academic careers is that it lies at the heart of academic research. You will devote your career to identifying areas that need deeper understanding, developing new approaches or theories, and expanding human understanding.

...other employers is that most jobs are a succession of problems or tasks to be solved. Problem solving as a researcher takes place without safety nets or clear boundaries – you genuinely cannot know if something will work because you are working at the boundary of what is known. Being a researcher is to have daily familiarity with identifying and characterising problems, considering options, selecting the best ideas, following through, and delivering.

Develop this skill by...
...taking ownership of your project and making sure you are contributing to then leading, the process of identifying, understanding, working out ways forward, choosing the best option, and reflecting on your progress.
**Contributing to society**

Research in academia is increasingly expected to have a wider impact than the traditional audience of other academics. Funding bodies and those who evaluate the quality of research expect universities to engage with companies, communities, policymakers, the public, and any other relevant stakeholders or beneficiaries. As an individual researcher you might already be aware of this if your project has an industrial partner or if you have been involved in public engagement activities. These external involvements might seem to be a distraction from your project, but they give you a fantastic opportunity to engage with a wider range of people, develop your communication skills, and see the wider importance of your work. As we will see later in this guide, physicists who are involved in them will describe the advantages that they give to researchers early in their career.

The value of getting involved in outreach activities to... academic careers is to use them as an opportunity to build relationships with other stakeholders, and to build a reputation as an innovative researcher and effective communicator. These will be useful for future funding applications and help you to learn about new perspectives to your work. Hearing new interpretations or answering unusual questions about what you do helps to foster creativity. Working with different partners might also lead to ideas for potential applications or directions for research. In the modern academic world, engagement with other groups and people is increasingly expected by funding bodies and evaluators – the UK Research Evaluation Framework will measure the impact and reach of academic research beyond the academic community.

Develop this skill by...
...getting involved in one of the many outreach activities supported by the IOP (e.g. Lab in a Lorry), your institution or national programmes. To reach other groups, you might be interested in looking at the policy work of the IOP, or of organisations such as CASE, which campaigns to raise the profile of science among policymakers and the media. You will find details of the IOP’s *A Guide to Good Practice in Public Engagement with Physics* later in this guide.

**Contributing to a professional field**

Although the drive to reach new audiences is important, your success as a researcher will largely be determined by the quality of work you produce for the academic community in your field. Peer-reviewed publications are a key measure of success and the best mechanism for reaching the experts and other workers in your field.

The value of writing papers to... academic careers is obvious. Peer-reviewed papers are the essential currency of academia and the expected way to disseminate your work. A strong publishing record is a basic expectation of funding bodies, promotion panels and your peers.

...other employers may not lie in the detail within your publications. However, the fact that you have successfully delivered work

In the modern academic world, engagement with other groups and people is increasingly expected by funding bodies and evaluators.
of sufficient quality to be judged and approved by a professional audience is an indication that you have been a success as a researcher. It also demonstrates that you can produce a formally written document, tailored to an expert audience. These skills are likely to be needed for reporting to shareholders, customers, members of senior management, and colleagues.

**Develop this skill by...**

...starting to write drafts of papers, preliminary chapters, and literature reviews as early as possible. It is important to get feedback and constructive criticism of your academic writing as soon as you can. Get involved in (or set up) journal clubs in your department and offer to review drafts of papers produced by colleagues. If your supervisor is a regular reviewer of papers, they might be able to provide you with opportunities to act as a reviewer (although you would normally need to be a fairly senior researcher for this to be a formal role).

**Professional working relationships**

You are not expected to manage all the demands of being a researcher on your own. You will be working closely with at least one academic on your research and supported by a range of people around your institution. You will also need to develop effective working relationships with fellow students and researchers, some of whom might be from other cultures. Being able to identify the help you need to be an effective researcher and to secure this support, will enable you to manage your own development and to tailor your research experience to best prepare you for the career ahead. Working well with people from other countries will demonstrate that you are open-minded and appreciate alternative cultural perspectives. Taking control of your development and building your own support network will be great preparation for a move into other sectors where appraisals and performance reviews are likely to be rigorous.

**The value of working with others to...**

...academic careers is that these skills are the basis of forming collaborations, attracting good students, retaining high-quality staff, and building effective professional networks. In what can be an insular environment, it is essential to work out where to find the help you need and to make efficient use of the expertise around your institution (specialists in areas such as HR, funding and administration).

...other employers is the same, these skills are essential for team building, assimilation into existing teams, working with multinational companies, developing relationships with suppliers, customers, motivating staff, and managing conflict. The success of your working relationships in academia can also provide evidence of being able to recognise the strengths of others and using staff resources effectively – all of which are essential if you wish to move into a managerial position.

**Develop this skill by...**

...understanding how to manage and develop people more effectively, by engaging with them and taking time to understand their motivations, strengths and challenges. Take part in training, if offered, to improve your approach to demonstrating or supervision.

You should also identify people YOU need to meet – at conferences, seek out the researchers who are doing interesting things and think about the parallels between your research and theirs. Become an active member of the IOP subject Group in your research field, talk to more senior academics who could be future supervisors. Competition for academic posts can be fierce, but one of the factors that improves your chances is having worked in different labs or departments, particularly getting international experience.

If your future path lies outside academia, think about where you will get a chance to meet people in these jobs. They might be at conferences with different roles (on trade stands, representing journals), at networking events (business breakfasts, employer careers events) or have connections to you already (former students from your department, friends and family). As you will read later, becoming a member of committees and networks (such as one of the IOP’s subject Groups) can provide a great opportunity to meet people from various employment backgrounds.

**Confidence, initiative and drive**

The process of doing research is challenging and this gives you the confidence to confront difficulties, develop and express your opinions, and challenge the opinions of others. Research is fundamentally a process of questioning the ways in which things are done and what is currently believed – these qualities are very attractive to employers as they will help them to drive their organisations forward.

**The value of confidence...**

...in academia is embedded in all communication and exchanges. You must be able to assert your position with confidence during your viva, when dealing with questions at conferences, when responding to reviewers of your proposals and papers, and when working collaboratively.

...to other employers is the willingness to challenge thinking and to be comfortable with change. Most organisations operate in fast-moving markets and need to be flexible and willing to discard inefficient systems and ideas. Staff who have developed a robust approach to defending their position, based on having gathered the evidence to support this, who are confident when handling opposing views, and comfortable about presenting their ideas to senior staff and clients, are likely to move into strategically important roles.
Develop your confidence by...
...voicing your opinions and ideas in meetings with your supervisor, asking questions at conferences, learning to listen well, contributing to discussions online and face to face, getting involved in public engagement activities, opening a twitter account and sharing your thoughts. Don’t underestimate how impressive it is to many people outside academia to have given a formal presentation to a room full of the leading experts in your field and to have handled unexpected and challenging questions from them. Although this is something that many researchers do every year at conferences, it is a great example of the particular qualities and skills that are developed through academic research.

In conclusion...
If you need some guidance about which other activities are available in your institution or area, remember that you have access to a range of support.

As well as your supervisor, you can talk to staff in your institution who specifically support researchers. In addition to its specialist careers service, the Institute of Physics also has national offices in Scotland, Wales and Ireland and the staff in these will be able to share their networks and understanding. IOP staff have extensive experience, are well connected, and will be happy to share their advice to help develop your career.

Dr Sheila Gilheany is the policy officer for the Institute of Physics in Ireland, and here she adds her perspective on taking control of your own development.

“Don’t be passive! If your work has wider relevance, take the initiative and contact your university media office."

Dr Sheila Gilheany
policy officer for the Institute of Physics in Ireland

I’d strongly encourage any PhD students to look for extracurricular courses on offer at their university – particularly short courses in languages or business skills. These are often free or at very low cost for students. You need to be constantly thinking: ‘how will I differentiate my CV from the other physicists and researchers?’, and this kind of self-investment will really help.

Obviously, we see public engagement activities as an essential tool in our drive to inspire children and the public with our enthusiasm for physics, but they will also help you to clarify your own understanding of physics. In trying to express complex ideas clearly and succinctly to a non-technical audience, you gain a much sharper knowledge of the area yourself.

Something that is often taken for granted in universities is the availability of free, expert careers advice. Most universities offer one-to-one careers counselling, and research staff can usually access these facilities as well as students. Talking to an adviser can help you to get to
know yourself and see your strengths and weaknesses. With this insight you can start to address your weaknesses and enhance your strengths. These could be through courses on time management (if you struggle to prioritise demands) to finding outlets for your writing (if you have good technical writing skills). Work in partnership with your supervisor to develop higher-level skills such as grant writing by contributing paragraphs to larger proposals – even this simple step can help you on the path to writing your own proposals.

Most of all – be proactive about your career. When doing a piece of data analysis, think about the potential audience in the broadest possible terms. What is significant about your results for other researchers, grant applications, schoolchildren, the public or industry? If your work has wider relevance, take the initiative and contact your university media office. Don’t be passive!

If we start thinking about some common business challenges that companies might describe in their websites or job adverts...

- generating new customer bases;
- solving technical issues with products;
- managing conflict;
- financial management and control;
- maintaining customer loyalty or interest;
- being innovative with products

...perhaps these now seem less alien – they are all areas that would benefit from the attention of researchers.

Dr Tim Waskett is a quantitative analyst at EDF Energy. He believes that his research experience is useful in his role in a number of ways:

“Just being able to think around a problem is remarkably valuable. It’s amazing how often a false concept is taken as truth without anyone actually questioning it. Our team has overturned more than one such situation and helped reveal what’s really going on. It can change an entire business policy.

Understanding statistics is also a big plus. One of my biggest challenges is explaining analysis results to people who do not have a good grounding in statistics. People often jump to conclusions based on incomplete understanding, so the ability to explain what is really going on in understandable terms is also invaluable. Even basic statistical skills are very rare.

My advice to current researchers is do not be afraid to apply for something you have no experience in. Business and industry are crying out for numerate and analytical people, it doesn’t really matter what your exact background is.”

To learn more about Tim’s role at EDF Energy, how he got his job and made the transition from being a postdoc, visit the researchers’ portal at www.iop.org/careers.

Before you start reading the rest of the guide, just take a few moments to think about the most important day of your PhD or current contract. Not the day of your viva or when you publish a key paper; the most important day is the day after it finishes, because at this point you will know whether or not all the hard work that went into your research has benefited your career. A lot of the value of your PhD or research contract is wrapped up in you – your ability to make a successful transition to the next stage will not just depend on papers published or scientific breakthroughs, it will also be about the skills you have for dealing with people, the network(s) you have built and the experiences you have had.

If you want to finish your research in the best possible position to get a great job that you will find satisfying, demanding, and which makes the very best use of your research training, read on. The next section of this guide will help you to make the most of the next few years, to get involved in challenging but rewarding activities, and to help you demonstrate your potential to future employers.
Taking control of your career

The skills described in the previous pages will not be developed if you simply sit in your lab or office and disengage from your career for three or more years. If you want to succeed you must commit to taking control of your career, your research and your development.

As Avril Manners, director of the Scottish Universities Physics Alliance (SUPA) Graduate School explains, this commitment needs to come early in your research career.

“In SUPA we have around 500 PhD students, with 100 graduating every year. Unfortunately many students leave doing their careers research until the last minute and then they panic. Quite frankly, that’s too late. You need to take control of your career at an early stage. Look at all the options available and don’t just drift into a postdoc or a computing officer position. There’s life outside academia. A career in industry, the public sector or an SME shouldn’t be viewed as second class. My advice is make positive choices early.”

Dr Sonja Tomaskovic, research skills coordinator at the University of Salford, believes that you need to start planning your career early so that you have enough time to develop the skills you will need to secure your dream job.

“My advice to current researchers is to look for opportunities to present at conferences, to network, to collaborate with different departments/universities, and to engage in different training. You have gained many skills from your academic training – communicate them effectively. Explore all the options and career paths that are open to you and think ‘outside the box’. Don’t just sit and wait, take your career in your own hands and be proactive about your own development.”

To learn more about Sonja’s role in researcher development, how she got her job and made the transition from being a postdoc, visit the researchers’ portal at www.iop.org/careers.

One employer who sees real value in a broader view of development is Angela Mathis, chief executive of ThinkTank Maths Ltd. She employs mathematicians from all over the world and has high expectations of researchers.

“We want the very best thinkers – people who can think laterally and draw upon broad experiences and intellectual foundations. If you have spent years focusing down on one really narrow field of research you will only have one perspective on solving problems and there’s a real danger of being satisfied with the facts you’re presented with or jumping to obvious conclusions.

In our work, we need to challenge assumptions and have fertile imaginations. The broader your experience, the better the quality of your thinking.”

Generic skills are also critical in this commercial environment.

“With our work being largely team-based, it is essential for candidates to demonstrate their ability to work effectively with others. We are looking for deep-rooted behaviours that foster a group problem-solving approach. Collaboration in academia is often between researchers who work on opposite sides of the world and barely, if ever, meet. We can’t compare that situation to one where you are face to face with colleagues and clients.”

As for many employers, the scenarios in which skills are developed are secondary to the skills themselves.

“We’ve seen great leadership demonstrated by people who have led scout troupes, hill-walking societies, and been involved in many different kinds of committees. If you’ve had to convince, motivate, and develop people in these kinds of situations, you will be able to transfer the skills to our environment. Focus on developing your ‘human’ skills and broaden your perspectives on your science.”

There are many ways to broaden your knowledge, skills and experience without compromising on the quality of your research work. In this section, six different development opportunities are described – there is sure to be at least one that is within your reach.
and complements your interests. Your motivation to commit to additional activities should come from your interest rather than being a cynical box-ticking exercise. Get involved in the things that you feel passionate about and are interested in. Not only will they be more fun, but you will get far more from them, and they might help to give you the energy and drive to keep going through difficult times in your research.

In this section you will find advice on boosting your employability by...

• getting involved in public engagement;
• working on additional projects and industrial experience;
• securing funding to work overseas;
• using social media;
• managing your own development: appraisals and feedback;
• the benefits of chartered status.

These are just some of the ways in which you can broaden your experience and develop your skills in preparation for your postdoctoral career – whichever path you take.

Making more of conferences

Conferences are one of the great opportunities open to researchers. As well as being the places to find out about the latest developments in your field, they offer a chance to build your network and visibility. They are a means of getting feedback on your presentation skills, seeing how people react to the ideas that are developing in your research, meeting future employers, and starting to find contacts in your peer group – people who could be your colleagues and collaborators in the future. You also get the rare opportunity to talk to role models from all over the world – ask them what advice they have for early-career researchers and about the demands of working in research.

You should never underestimate the importance of developing your networks, making contacts, and building your reputation. For many individuals, career opportunities arise not because they respond to adverts or vacancies, but because others identify them as being suitable candidates for particular roles. People sometimes confuse this as luck, but it is actually due to their professionalism, the impression that others have of them, and the fact that they have worked hard to build up good networks.

Conferences are also a great career development tool as they give you an opportunity to meet physicists and other scientists from other sectors. Most areas of physics have some industrial or public-sector relevance so there are likely to be researchers from companies, government labs or hospitals attending who will probably be willing to talk to you if you are interested in moving into their area.

You should expect to attend conferences in your field from the earliest stages of your doctoral career, but few students make the most of them. If you go to a conference with anyone from your home group, try to spend little (if any!) time with them when you are away. Instead, focus on meeting new people and broadening your understanding and scientific knowledge.

With a little effort and preparation, conferences can be a way to help you do the following:

Develop your presentation skills

Early-career researchers can present reports on their current work at most meetings – sometimes in special sessions designed to encourage younger physicists. If you are presenting, look for training in presentation skills in the months before the event, practise in front of “critical friends” and ensure your website is up to date so that people can look into your work in more detail. (There is more information on using social media and building your own website later in this guide.) If your supervisor agrees, you could post the slides from the talk online.

Dr Alan Hodgson is chair of the Printing and Graphics Science Group of the IOP, which awards a prize for the best conference presentation to research students.

“We aren’t looking for a slick presentation – those skills will come with time. We want to see genuine enthusiasm for the topic. Being nervous isn’t a problem, as long as it isn’t down to lack of preparation. Students seem to worry about questions in particular, but you should see these as another way to show your knowledge rather than being fearful of a gladiatorial contest! If you come with the intention of enjoying the event, your audience will too.”

If you are presenting a poster, why not display a draft version in your home department for a week or so to get feedback from staff and students. Also think about having a short handout to give people with links to your website, details of any relevant publications, and a short summary of the work.

Build your reputation and impact

As well as formal presentations, conferences also offer you a chance to build a reputation through more informal actions. A great one is to get into the habit of asking questions at conferences, even though this can be as nerve-wracking as presenting at first. This is almost certain to lead to interesting conversations after the session has finished.

Build on the contacts made at conferences by keeping in touch with them and connecting using social media. Send a short follow-up email after the event thanking them for their time, or reminding them of the conversation you had – it will make it easier to pick up the connection at future meetings.
Understand different perspectives
Try to go to a wide range of presentations and to talk to people from all sectors represented at the meeting — these are invaluable opportunities to gain insight into industrial interests. If it is a general meeting with people from many different areas, attend a selection of talks from outside your own area. If there is a trade exhibition, go and ask people (when things are quiet) about the roles they play and build your awareness of the agendas in commercial organisations and potential career opportunities available.

Plan your career
Access to a room of physicists is also access to their advice on future developments. Talk to them about other meetings or professional opportunities that might help you to move your career towards a particular company or job. If you are planning to remain in research, find out if the key people in your field are at this meeting and ask them where else they go and what other opportunities, besides conferences, exist.

Build your professional network
There are always opportunities at conferences for more informal discussions — get involved in the social side and try to build your network, particularly if your research area overlaps with other disciplines, as researchers in other subjects may not be aware of your work. The larger your network, the more potential connections with future employers you have. Another more immediate benefit is the development of a support network — if some element of your research is baffling you, or there is a particular technical glitch affecting your progress, you may find someone with some fresh ideas. Of course, always check with your supervisor before discussing the details of your project, just in case there are competing groups or commercial sensitivities.

The careers of physicists in all sectors have been enhanced by the opportunities presented by conferences, whether it is the chance to hear about possible vacancies before they are advertised, meet potential collaborators, or be exposed to new ideas. Have a plan before you go to help you get more from the time you spend in the company of your professional community. Think about...

- how you will describe your research so that it engages others;
- what questions you would really like answers to;
- who you would really like to meet;
- who might be able to introduce you to key people.

Gaining awards and sponsorship
If you are fully funded to carry out your research, it may not seem obvious to look for additional funds during your PhD or postdoctoral work. In terms of your future career, though, there are few things as important as the ability to attract funding. If you intend to continue in academia and eventually build your own research group, the importance of funding cannot be underestimated — it will be critical to your success. If you plan to leave academia and work in a commercial organisation, the fact that you have previously been successful in securing additional funding gives you tangible evidence of achievement in a competitive field. The process of articulating and reasoning a case for financial support can also be translated into a business environment.

Dr Elizabeth Berry has been awarded significant funding from a range of schemes for her research into medical imaging, and has acted as a reviewer and evaluator for many years. She now runs Elizabeth Berry Ltd (www.voxelera.co.uk), which helps researchers to develop more effective funding proposals and, as she describes below, you can begin to develop a track record for success from the start of your PhD.

“...The skills associated with applying for funding develop with practice, so it makes sense to start early. Start small. PhD students might apply for the awards that are often available for student presenters at international conferences. As a postdoc you can apply for travel awards and to schemes run locally by your own institution. If your department is happy, look into working with an undergraduate to apply for a vacation scholarship that will allow them to undertake a project under your supervision. These sorts of schemes will help you to get over the first stages of learning in a relatively uncompetitive environment. You’ll benefit from the experience even if an application is unsuccessful, and when you do receive an award the benefits multiply. Not only can you add a success to your CV, you can add the skills and experience drawn from the activity that was funded, and you will have supporting evidence for any of your claims to be a self-driven individual. Finally, you might find that you are more popular than you were before: even if the amount of support is small, heads of department are usually happy to have some of the demands on their budgets lightened.”

Five tips for applying for funding:
1. Check eligibility — many funding schemes are tailored to particular groups so do not waste time completing a form only to find that you are ineligible because you are or are not a student. Make sure you really understand the administrative side of the process — do not jeopardise your success by failing to follow simple instructions.
2. Understand the objectives of the funding provider and reflect these in your application. If the funder wants to improve the science base in the UK or Ireland, describe the gap in expertise
that you will fill as a result of your training. If the objective is career development, highlight how your employability will improve; if they want to build bridges between subjects, ensure your ideas are collaborative.

3. Appoint your own review panel. Many academics will have experience of writing and reviewing proposals, so ask them for advice and feedback before you submit your form. Try to talk to people who have applied for the same funds in previous years. Build in enough time to give them a chance to review the form and for you to react to their comments – at least a fortnight.

4. Develop your proposal to highlight the gap or need for the work you plan to do. If there is similar work happening in other groups be clear on why your approach is different and worth funding.

5. Think about the evidence you can present that will convince the reviewers that you have the skills and qualities to benefit from the funding. Demonstrate previous successes and remember that your track record will be judged – a great project AND a great scientist is the combination that funders will be looking for.

One person who successfully persuaded a funding body of her potential is Laura Russell, who was awarded a short-term travel fellowship by Science Foundation Ireland (SFI) to work in a laboratory in Germany.

“My supervisor first suggested a placement in Bonn, Germany, during the summer of 2009. She asked me if I would like to apply for the short-term travel fellowship that SFI offered.

She also guided me through the application, which was quite formal and something I had not seen before. I prepared a comprehensive curriculum vitae, which focused on my academic achievements, my PhD funding from IRCSET [the Irish Research Council for Science, Engineering and Technology], conference participation, presentations, and publications. The research group I was applying to work for had a very good reputation and were doing exciting research in an area related to mine.

The experience was extremely positive for many reasons. All my previous lab experience had been in Ireland and to see how things work in a European lab was very enlightening. The research group was different in their attitude to work and experiments, and I had extremely valuable discussions with other students and postdocs about my own work while I was there. I arrived back after the 12 weeks feeling much more motivated. I also made some extremely useful contacts with whom I still interact.”

Laura’s profile in researchers’ portal at www.iop.org/careers also describes her other interests and achievements.

If you are interested in trying to secure additional funding during your PhD it is vital to get advice from the experts in your institution, such as your careers service and research office.

The IOP’s website also includes useful information on awards and other funding opportunities: www.iop.org/careers/university/funding/awards/page_39428.html.

If you intend to continue in academia and eventually build your own research group, the importance of funding cannot be underestimated – it will be critical to your success.
Public engagement

“The pursuit of knowledge for knowledge’s sake, the driving force behind all fundamental research, is largely funded by the public purse. Hence, all scientists should feel the responsibility to give something back to society. At the very least, the taxpayer is entitled to know what he spent his money on.”

This opinion hasn’t been expressed by a politician or a funding provider – it comes from Dr Bjoern Seitz, a senior lecturer in the nuclear physics group at the University of Glasgow. Seitz is a STEM ambassador and brings physics into classrooms, giving interactive lessons on topics that few primary teachers would have the confidence to introduce. Working in partnership with these teachers, Seitz has given hundreds, if not thousands, of children the chance to understand and engage with his work through workshops on rockets, space and energy.

Seitz’s motivation to get involved was prompted by concerns about scientific literacy. The benefits of his involvement in public engagement are not just for the schoolchildren though.

“Like many things in life, it is a two-way process. All of us who are engaged in public outreach activities benefit from the interaction with the wider public, be it from discussion of our ideas and a non-expert point of view, practising public speaking and providing succinct arguments, or just having fun with an interested audience. I tend to point all my PhD students towards science outreach in one form or another, from Lab in a Lorry and school visits to staffing science festivals. All have benefited personally and in their professional career from enhanced self-esteem and better communication skills – and we all enjoyed it very much.”

One of these students, Rachel Montgomery, is also a science ambassador and sees huge personal benefits from her involvement in outreach.

“Since very early on in my PhD studies I have enjoyed getting involved in a variety of public engagement activities, and I look forward to continuing this. I regularly take part in outreach as open days, research stands and science fairs within the university, interacting with members of the public and discussing a variety of physics topics. I also help out with work-placement students coming to the university and I am a STEM science ambassador, which provides opportunities to visit schools and inspire the pupils through creative and fun science activities. I have been involved in several IOP-organised events aimed at creating stronger links between universities and schools, where I have presented my research field of interest to both pupils and teachers.

To learn more about Rachel’s outreach experiences and how she got involved, please visit the researchers’ portal at www.iop.org/careers.

Bjoern Seitz sees his work with schools as just one way that physicists can interact with society.

“There are various ways that scientists can deliver to society at large. The two most tangible routes are through applying recent scientific findings and technological advances to common problems (such as applying nuclear-physics detector technology to healthcare problems), and through public outreach activities.”

There are also other areas of wider engagement where it is vital for physicists to be involved in. These include being part of science policy development, which has such an impact on researchers in all sectors.

The IOP plays a significant role in presenting the value of physics to politicians and government departments, but there are many ways for individual researchers to get involved in this process and contribute their views to the debate.

One mechanism for contributing to wider debates is to seek membership of committees and panels that provide advice and insight for policymakers or produce reports and informed opinions to add to public discussions. One of these is the new Young Academy established by the Royal Society of Edinburgh. The first of its kind in the UK, the academy is made up of 68 young professionals from academia, business and other sectors. Seven of these are physicists, including Dr Job Thijsen, a postdoctoral research fellow at the University of Edinburgh, who explains why he was drawn to the opportunity to be involved:

“The Royal Society of Edinburgh’s new Young Academy of Scotland will provide a unique platform for tackling complex issues that require an interdisciplinary effort, for example the energy challenge and climate change. I am very much looking forward to the new collaborations that it will encourage and to becoming more active in science policy and public engagement.”

From an employability standpoint, there are wider benefits to this type of involvement than just being involved in securing the future of UK science – important as that is! There is huge value in getting involved in committees and networks because of the people you will meet and the insight you will gain. Having the confidence to voice your opinions on these issues will give you something unusual to present on your CV and discuss at interview.

Prof. Cait MacPhee, from the University of Edinburgh School of Physics and Astronomy, says:

“There are a number of ways to get involved in committees and networks. First, join your professional body and your subject group, as well as any other subject groups that interest you (for example, the IOP’s Women in Physics group). These provide opportunities to attend events that enable you to meet some of the great and good in your field,
as well as practise your networking skills. Some groups have students or early-career researchers on their committees, and you always have the option to put yourself forward for committee membership – don't be shy! This gives you an insight into how such committees operate, how the professional body works, and is a mechanism for contacting people that you might not otherwise meet. You also have the opportunity to influence the events that the group holds."

**Additional projects and industrial experience**

During a PhD your focus will be on the project agreed between you and your supervisor and your priority will be to produce a coherent contribution to knowledge in this area. Although your priority should always be the successful completion of your PhD, there is some flexibility and you may be able to get involved in other projects with the support of your supervisor. Some of these might be short-term informal “secondments” where you help another member of your group or work with another academic in your department. Others can involve working in a different university, company or even country!

Some of these opportunities can be through formal programmes that provide funding to help you with travel or living costs. In some cases you will be able to liaise with your funding body and institution and arrange to defer part of your PhD for the duration of your placement. Careful planning is needed to ensure that all the necessary administration is handled properly.

The Midlands Physics Alliance (MPA) has a postgraduate industrial placement programme aimed at giving PhD students and postdoctoral researchers experience of working in a company for around three months. Prof. David Leadley of Warwick University, director of MPA Graduate School explains more about the scheme and the value he hopes it will bring:

“The scheme is one way of helping MPA students and researchers to start thinking about their future careers before the end of their PhD or contract. We know that a PhD in physics gives you a wide range of skills and opens up a range of possible careers, but we often see students struggle with the transition to work. Some get to the end of their projects and don’t have a clue what to do next. Some can’t promote themselves to employers because they haven’t thought about the skills they have developed while doing research. Others simply don’t understand what employers want, so they can’t put together compelling applications for jobs.

The industrial placement scheme helps to address all of these problems. Students spend around three months working for a company on a specific project that doesn’t have to be related to their thesis work. In that time they can see how their academic experience can be applied in a different area, giving them more confidence when they are ready to leave. More importantly, they start to see how unusual and important some of their skills are. When you are in the midst of a PhD, the process of making a unique contribution to a research field seems normal because everyone around you is doing the same thing, but actually it develops critical judgment, problem solving, and an ability to develop and justify opinions that few other environments can foster.

Whatever your research topic, as a physicist you can have real value in the commercial environment.”
Volker Keinhorst, a PhD student in the Microscopy Group in the Department of Physics at Warwick University, is one of the first students to take part in the scheme.

“I was attracted to the placement scheme by both the valuable industrial experience and contacts I would be gaining and the chance to learn and apply novel analytical techniques to solve current problems in an industrial/business environment. I also hoped that these techniques would aid my PhD project in the future.

I have been involved in paint defect analysis using the University of Warwick-based scanning electron microscopy (SEM) and focused ion beam/SEM systems, as well as smaller projects based at the Paintbox site in Banbury. My current project involves preparing a report and presentation on plasma treatment systems for members of the executive board.

I have gained some very important experiences from the placement about how work is done in an industrial environment and made some good contacts inside the company I worked for. Both of these things will no doubt come in very handy at later points in my career. On top of that, I have been able to learn and apply an analytical technique that will aid in the furthering of my PhD project, as well as gaining a thorough knowledge in some fields that I would have not encountered otherwise.

The placement has already had a significant impact on my career simply by allowing me a glimpse into the world of employment, affecting my choice of whether to stay in academia or go into industry. In combination with the above-mentioned learning experiences, I believe I walk away from this great opportunity with better skills, a better understanding of the market and a very much stronger background for future employment, all the while having had a great time during the placement.”

To learn more about the MPA programme, visit www2.warwick.ac.uk/fac/sci/physics/postgraduate/current/regs/mpags/mpags_internships.pdf.

Although the MPA programme is one of few such schemes currently operating, links between universities and industry are developing all the time and some funding bodies have targeted resources through various schemes to foster these relationships. If you are interested in gaining some industrial experience and there isn’t a scheme already established in your institution, talk to your supervisor or head of school about your interest. They have connections with companies or may be able to connect you with local experts in the university research development office, careers service or researcher training unit.

Using social media

If you have never engaged in using social media for professional purposes you might feel that this section is going to be all about the “don’ts” of online life – don’t post embarrassing photographs, don’t be negative about your boss or colleagues, or simply don’t do it.

Although it is obviously important not to undermine your professionalism with unfortunate social media exposure, the focus here is on the good that a strong online presence can do your career.

The first advantage of getting involved with social media and building you own website is that you will be in control of the content on these sites. When someone searches for you online at the moment, what do they find? Is there a coherent story that clearly tells them about the skills you have and your achievements? Or an empty university website containing your name and room number?

The second advantage is that you can begin to demonstrate your potential value to an employer. If you regularly engage in online discussions or contribute to virtual meetings, the quality of your contributions gives an employer a great insight into what they might gain from employing you.

The third advantage is what you gain from being part of the online community. If you are selective about whom you connect with and follow, you will build a tailored community that you know shares your interests. On some sites (Facebook and LinkedIn), you can only connect with people if they approve you. On others (Twitter and Academia.edu), you can usually follow people’s work and postings without knowing them. Either way, once connected you will receive their contributions, which can include links to relevant papers and reports, commentaries on conferences and meetings, opinions and advice.

However, perhaps the most compelling reason to get involved is the fact that employers are increasingly looking online to find potential employees or to research applicants.

Ian Hopkinson, research scientist at Unilever, secured his current employment as a direct result of having his own webpage. While working as a lecturer in biological physics at UMIST, a recruitment agency contacted him regarding a position at Unilever because of information they had found on his orphan webpage at Cambridge University (where he had worked before his appointment at UMIST). On this webpage he described his work and included links to his publications and links with industry.

Hopkinson is an enthusiastic advocate of using social media as a researcher:

“I think it’s a fantastic resource for anyone, but I wish I’d had access to sites like Twitter when I first became a lecturer. There would have been huge benefits to being able to connect with people in the same situation as me, being able to share resources and ask for advice.”

The barriers to getting online have all but disappeared, with out-of-the-box functionality in anyone’s reach. For physicists, who are usually very comfortable with technology and programming,
a really professional-looking site can be designed and published without many headaches. Hopkinson now has his own website (www.ianhopkinson.org.uk), something that he feels is within easy reach of any physicist.

"With the computing power that most of us have daily access to, it is possible for anyone to produce a professional, well-designed site these days. This then gives you a great platform for a wider commentary about your work. My blog posts have attracted hundreds (and very occasionally thousands) of readers, but most peer-reviewed papers reach a tiny fraction of that audience."

You can read more about Ian and his transition from working in academia to industry by visiting the researchers’ portal at www.iop.org/careers.

Senior physicists and academics from around the world are also keen users of sites like Twitter. Getting involved provides a great way to tap into discussions in networks that you might not have access to by other means. For example, you can follow the feeds of science policymakers, politicians, and other communities, gaining a real-time insight into decisions and reactions relating to research funding and agendas.

Dr David McGloin from the University of Dundee regularly contributes to Twitter as @DundeePhysics, with insight from his research into optical manipulation and his opinions on a range of topics.

"In terms of being a researcher, social media lets me interact with people really quickly and easily. Assuming that you’ve built up a community of followers, it’s a good way to disseminate your research messages. Your community will grow if you start to interact – as well as posting your own new material you’ll become more visible by posting opinions and reactions to other people’s ideas. Although you can remain ‘invisible’ and use these sites passively, you’ll be missing one of their key benefits."

David has seen students use other social media sites to great effect.

“I’ve seen students post videos describing their experiments on YouTube, and the Optical Society of America has a Facebook page that I know has helped academics find potential research students as they have an on-going discussion between people looking for PhD opportunities."

Jobseekers can also find real benefits in building up an information network based around social media:

“The National Physical Laboratory, Diamond, and Research Councils all post jobs as part of their social media strategy, and LinkedIn is often used by people looking for work as they can immediately inform their network of their availability and career interests."

Getting started on social media can be intimidating and initially, time-consuming, but there are some easy ways to begin:

1. Ensure you have an up-to-date page on your institution’s website. Include a photograph, your description of your work, any publications, conferences you have attended and will attend, links and to any other social media presence (LinkedIn, Twitter or Academia.edu). Include a brief CV and keep the page updated.


3. Talk to other researchers about their favourite sites and personal strategies for using them – they will be able to help you shorten the “tuning in” time that social media needs before it starts to deliver useful information.

Taking control of your own development

Attitudes in academia towards personal development have changed dramatically in the last 10 years or so, with the development of the Concordat, skills programmes for researchers, and a better awareness that more researchers are employed outside academia than in secure academic positions. This gives the individual researcher access to resources to manage their own development and then tailor this to improve their employability.

As well as helping to develop specific skills such as project management or presentation skills, attendance at training workshops can bring much wider benefits, as Dr Elizabeth Adams, researcher development officer at the University of Glasgow, explains:

“As a researcher, you never know where you’ll get your next ideas from, whether that’s for your research or for your future career. We run a range of courses, including our GRADschool – an intensive residential course that gives you the chance to take a step back from your research project, think about the bigger picture and share ideas with other students. The mix of students, research staff and course leaders that you’ll meet and work with is also an advantage – you will improve your network and gain from hearing fresh perspectives. Students tell us that they return to their PhD projects feeling more motivated and with the realisation that they are ‘more than just their PhD thesis’, with a greater awareness of their own skills and how they can use these in different environments.”
The insight that you can gain into your own performance (and therefore the elements you can improve upon) is one of the best outcomes of any training course. If you can enrich this with feedback from your supervisor and colleagues you will be able to work out where to focus your development efforts.

Prof. Jim Hough, chief executive officer of the Scottish Universities’ Physics Alliance (SUPA), believes that understanding what is expected of you is a fundamental part of being effective, whatever your career plans are:

“This is a universal message for physicists in all walks of life. If you are applying for anything or wish to excel at anything, you MUST know what the assessment conditions are that you will be judged under.”

In recruitment this means understanding what is on the employer’s wish list (something discussed in the IOP careers booklets on CVs and interviews). As a researcher it means knowing what is expected of you not just in terms of your research, but also your approach – how you work with others, how you manage priorities and make decisions.

Many institutions now offer appraisals to research staff, but sadly they are often viewed as a tedious box-ticking exercise. A good appraisal will help you to be a better researcher as well as helping with your longer-term employability, but if they are not being run effectively, take control and devise your own process. Asking for this kind of information can be difficult, but with a little planning and by using a tiny bit of psychology, you should be able to design your own performance review.

There are five simple steps you can take to get the best from your supervisor and their feedback:

1. Understand what you are getting involved in. An appraisal can help you to...
   - review your progress and highlight achievements;
   - receive feedback and suggestions on your performance;
   - understand what challenges are ahead and discuss how to tackle them;
   - discuss your career aspirations with someone who can support them;
   - identify gaps in your skills and find ways to address them;
   - see the bigger picture and understand the environment you are operating in.

Understanding what can be achieved will help you to plan the meeting more effectively. If you are a member of research staff, your human resources department might run training courses to help you get the most from your appraisal. Alternatively, the IOP has an online course on “Being appraised” in the professional development section of its website.

Good questions to ask yourself to help prepare for an appraisal are:

- What have been my main achievements this year?
- Could I have done more?
- What have been the main challenges I have faced?
- Am I happy with the way I tackled these?
- How has the training I have taken helped me to be a more effective researcher?
- What would help me continue to develop?

If you are applying for anything or wish to excel at anything, you MUST know what the assessment conditions are that you will be judged under.”

Prof. Jim Hough, chief executive officer of the Scottish Universities’ Physics Alliance (SUPA)
2. Detoxify the appraisal process. Don’t ask your supervisor for an appraisal if it’s a dirty word in your department; ask them if they would be able to help you to understand if you are on the right track with the way you are doing your research or if they have any suggestions for things you could be doing to help you do it better. If you want to have a discussion about your future career and are concerned that they might not be interested in you doing anything other than more academic research, describe it as “plan B”. You also want to be sure that your supervisor understands that the conversation is about you, not about your research. Don’t meet in their office (where they could be easily distracted, disturbed or immersed in research). Instead, invest the price of a coffee (and probably a muffin) in your career and take them out of the department and preferably off campus for the meeting.

3. Go in with clear ideas. Try to articulate the objective of the meeting in simple terms. If your supervisor has not been involved in development reviews before, you need to keep control of the meeting and ensure that they are not diverted into talking about research. Say things like:

- “I need help making contact with people in the optics industry.”
- “I want to improve my presentation skills.”
- “I am going to start writing my thesis in the next month and want to know what you expect and when.”
- “My contract ends in six months and I would benefit from your thoughts on the different options I am considering.”
- “I think I could work more collaboratively within the group and I am interested in looking into how I could achieve that.”

4. No bombshells. To get the best from them, give your supervisor fair warning about what you want to discuss. If they know in advance that you are interested in industrial research they might have done some thinking about former students they can connect you with. If you want to know if your writing skills are improving, they might spend some time looking over examples of your work. You will give them a chance to talk to others in the group and around the department if you want to know about how effectively you work as part of a team. You will also give them time to come to terms with anything they might be uncomfortable or unhappy with – such as the fact that you want to leave academic research – rather than wasting the meeting trying to defend or justify this.

5. Set some deadlines and involve others. Once you have had a meeting and come up with some action points, spend a little time identifying when these will be done and what resources you need to move forward. If your supervisor promises anything, find out when they will be able to deliver, but try to take on as much responsibility as possible – remember it is your career, not theirs! A great tool to keep you on track is the futureme.org website. Here you can send yourself an e-mail in the future; a three-month reminder from yourself to get your webpage up to date or visit the careers service will stop you from letting your development slide down your priority list.

Your supervisor is not the only person who can comment on your performance or give advice on your career. If another member of staff has links in specific industrial areas, ask them if they would be willing to talk to you. Your colleagues can give you feedback on your working style, and previous bosses will also have valuable insight.

Sometimes, though, the most valuable perspective is from someone who is not involved with you on a day-to-day basis. Many professionals benefit hugely from being mentored and the IOP’s guide to mentoring, Working together, has been written to help members understand the value of mentoring and prepare effectively for meetings.

Most importantly, the IOP will also help you find a mentor who is matched to your career needs. Find out more about the service and read the guide at www.iop.org/careers/mentoring/. Imagine the value that this connection could add to your career development – the opportunity to talk to someone who understands the needs of employers in an area you want to move into, or who has well informed opinions on the future challenges in your field. Think about the edge you would have if you knew someone who shared their insight into recruitment processes or acted as a sounding board or role model on wider issues such as the work–life balance.
The benefits of chartered status

An effective way to formally present the many skills and qualities that have been described in this guide is to work towards chartered physicist (CPhys) or chartered engineer (Ceng) status. These are widely recognised peer-assessed qualifications, which show that you have a breadth of underpinning knowledge and competence, are working at a responsible professional level, and have a commitment to high ethical standards. Chartered designations can enhance your professional status, provide increased networking opportunities, and aid your career development. In some fields, chartered status can be a condition of employment.

Chartered Physicist is the Institute’s own designation; it is held by members working in all areas of academia and industry, from patent attorneys to heads of research facilities. Chartered Engineer is awarded under license from the Engineering Council to those working at a responsible level in engineering – a relatively common career path for those with a physics background. Both designations require managerial competence, problem solving, interpersonal and communication skills as well as technical knowledge. You can find all the information you need about getting chartered on the IOP website www.iop.org/membership/prof-des/chartership/page_51450.html.

Darren Groombridge, senior consultant at AREVA Risk Management Consulting, has worked in a number of industrial sectors, but his CPhys designation has been consistently valuable.

“I actually gained chartered physicist status within a year of starting my first job in industry. All my employers have said that chartered status is preferable in the job description. It could therefore set you apart from someone who doesn’t have professional status.”

To find out more about Darren’s career and his transition from academic research to industry, visit the researchers’ portal at www.iop.org/careers.

“\[I actually gained chartered physicist status within a year of starting my first job in industry.\]\n
Darren Groombridge, senior consultant at AREVA Risk Management Consulting
The main reason for boosting your skills and employability is of course to help you find a job, whether that’s in academia, elsewhere in the public sector or in private industry. But where do you start, what are your job prospects like and how can you get ahead of the competition?

Where do you start?

The good news for PhD students is that the IOP’s regular member surveys show that a PhD pays a real dividend in salary terms – postdocs, on average, earn more than graduates with first degrees. When you consider that physicists receive higher than average salaries anyway, the financial benefit of having a PhD is clear.

As Prof. Jim Hough confirms, a background in physics research is a really attractive thing to offer the job market:

“I’ve seen PhDs and postdocs move from academia into all kinds of positions. If they have the right attitude and are able to explain with confidence to employers why they will be valuable additions, there are many opportunities for them. However, your attitude is key and you must be positive about the job and sector you are moving into.”

Lauren McNicol is with the policy executive for CBI Scotland (Confederation of British Industry) and she also paints a bright picture for researchers:

“The outlook for physicists moving into industry should be good – we survey our members each year and 43% currently report difficulty in recruiting people with science and technology skills. Over 50% expected to have difficulty in the future, so there is great potential for transitions from academia.”

The survey that Lauren refers to is the Annual Education and Skills Survey (online at http://www.cbi.org.uk/media/1051530/cbi__edi_education___skills_survey_2011.pdf).

Throughout the guide you have heard directly from physicists who are using the skills gained during their PhD and postdoctoral experiences in a range of jobs. You can read their full profiles in the researcher portal of the IOP careers webpages.

Here are 10 key messages and suggestions to help you move in your career:

1. Understand the different career paths that are open to you – so you can make a positive choice about other directions to take.

2. Understand what your skills are – reflect on the skills you are developing as a researcher, perhaps using some of the resources in the final section of this guide.
3. Your research skills will have value in different careers and can often lead to interesting opportunities in the future — think about which research skills you particularly enjoy using and think about career directions that would benefit from them.

4. Use training and careers support in your institution — the academic sector is unique in providing free careers advice and support to its staff. Most institutions also have extensive training programmes that are tailored for researchers.

5. It is essential to demonstrate how effectively you can work with others — teamwork and collaboration are critical skills, so ensure that you have a professional approach and can describe this along with examples of the difference your management or support of others has made.

6. Develop an online presence — ensure that the information on your university website is up to date and reflects the skills, knowledge, and achievements that you want to market to employers.

7. Approach employers directly — if you find a company that you feel you could add value to, contact them with a brief CV and explain how you could contribute to their success. Also register with relevant agencies — ask employers which agencies they tend to use and look for those who advertise regularly in the sector you are interested in.

8. Read announcements and reports in general science publications as they can give you early warning of vacancies — a company that is reporting on growing markets, an academic who has been awarded a huge grant, or a move to new premises can all be signs of growth and future recruitment.

9. Practise and develop your communication skills at every opportunity — these will be your passport to a new career.

10. Network, network, network — use conferences as opportunities to explore different careers and talk to any industrial physicists you meet; ask your supervisor to connect you with their former students and staff if they are working in relevant jobs; keep in touch with former colleagues and let them know of your career plans; get involved in networks in your research area and through the IOP’s specialist groups.

Boosting your academic career chances

The academic career path is one that appeals to many research students and postdocs, but the competition for permanent academic positions is fierce. As a postdoctoral researcher, just as with a PhD, as described throughout this guide, you can improve your employability during a postdoctoral contract. This short section looks at the key skills and achievements you need to develop as a researcher if you are aiming for a lectureship.

If you have your heart set on an academic career, you’ll have to make sure that you can stand up to the competition. To make sure you have a chance, you will need to gain suitable experience as a postdoctoral researcher. Just as with a PhD, as described throughout this guide, you can improve your employability during a postdoctoral contract. This short section looks at the key skills and achievements you need to develop as a researcher if you are aiming for a lectureship.

You can develop these general ideas into specific advice for your area of physics by talking to academics and senior staff in your department and institution. Start tracking job adverts and try to identify the successful applicants as their profiles appear on school websites. Here are some common features of successful applicants for lectureships:

- **International experience** — aim to work in one of the most prestigious groups in your field. You will have access to the most talented colleagues, best resources and develop personal connections with leading scientists. A great tactic is to work in an area that has the capacity to grow in the UK, as you can bring back the skills and knowledge and be able to move into an emerging area. If you prefer to remain in the UK, it is a good idea to move to a new university where you can broaden your experience.

- **Strong publication record** — publications are the main measure of your scientific impact and will be one of the first things a potential employer will review in your CV. Aim to publish in the highest-impact publications, particularly when your personal research makes the principal contribution to the paper. In some fields of physics most work is collaborative, so also try to contribute to a range of projects and ensure that you are included on published work — this can be an efficient way of boosting your publication profile.

- **Fellowship funding** — when recruiting new staff, the university must have confidence in your ability to bring in as much funding as possible. As a postdoctoral researcher on a fixed-term contract you will not be eligible to act as the principal investigator on some grants even if they are based on your ideas, although this can be a good way to develop your grant-writing skills (provided you get credit for your ideas). Most large funding bodies, including the STFC, Royal Society, EPSRC and Leverhulme Trust have schemes aimed at senior postdoctoral researchers called “fellowships”. These are aimed at outstanding individuals who can give evidence of their independence, impact and exciting ideas. They can be even more competitive to secure than lectureships! However, once successful you will have an extended period of personal funding (up to 10 years for some schemes), which will allow you to develop your research, build a group and apply for further funding. If you hold a fellowship, you should be negotiating with your department for a permanent position — although you might be headhunted by another university.

- **Visibility and recognition in their field** — successful researchers are proactive and work hard to build their profiles. They give presentations at conferences, ask interesting questions, visit leading labs and look for opportunities to collaborate. They get to know the key people in their field and develop strong relationships that have the potential to lead to future collaborations.

- **Independence** — securing an academic position depends on your independence. If you have only worked with one senior academic during your career and your work is completely intertwined with theirs, it will be difficult to convince a new department that you will be able to come up with fresh ideas and develop your own group.
Successful applicants will be able to demonstrate their ownership of ideas and be able to communicate their future research strategy. The quality of your vision and evidence that you are equipped to achieve it is as much a part of the recruitment process as your former achievements.

The recruiting department will also be looking for exciting research that complements their existing strengths and evidence of strategic thinking – they will want new staff to be aware of academic issues, such as research assessment, funding trends and the impact of governmental science policy. Keep up to date with changes in these areas by talking to senior colleagues, reading the Times Higher Education Supplement and Physics World. By joining the IOP you will have access to events, special interest groups, and the expertise to improve your insight into academia and physics.

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For a lecturing position, they will also want to see evidence that you can teach a class well and will be able to develop your own courses in time. Although teaching experience is unlikely to be the principal selection factor for a lectureship, evidence of good teaching skills will appeal to physics departments as they will need you to contribute to teaching as soon as possible. Excellent presentation skills are essential.

Although great science is the bedrock of an academic career, it isn’t enough to secure a permanent post. Focus on developing your career and use the advice and expertise around you to develop a winning profile.

**Damien McGrouther** is a research fellow and manager at the Kelvin Nanocharacterisation Centre, University of Glasgow. He believes that it is important to have a broader perspective on your research to develop your career prospects:

“My advice to researchers is not to focus solely on doing the research tasks you are good at and enjoy during your PhD and postdoc work. Attempt to work in areas in which you are weaker. Also, as a PhD/postdoc you don’t worry much about the budget – but, try and gain an understanding of the different costs incurred by you performing your research on a daily basis. It really helps to get an understanding of the economics if you want to make that next step on the academic career ladder.”

To find out more about Damien’s career and his research position at Glasgow University, visit the researchers’ portal at www.iop.org/careers.

Take advantage of any postdoctoral training programmes offered to you by your institution. These should be specifically tailored to meet the needs of postdoctoral researchers and will help you gain vital experience in areas such as teaching, building research collaborations, and securing research income.

The IOP’s mentoring programme could also be an excellent resource – giving you access to experienced academics who are keen to develop the next generation of scientists. Membership of the IOP and regular reading of bulletins, newsletters, and Physics World will help you to keep abreast of developments in the wider physics arena, as will attendance at departmental seminars and plenary conference presentations. A wider understanding and appreciation of important issues and current topics will help you to relate your research interests to the objectives of funding bodies and help you to develop collaborations.
4 Useful resources to move your career forward

This booklet has been written to inspire you to take control of your own career development and get involved in many of the events, activities and networks that will help you to stand out from the crowd. In this final section there are links to websites that will help you to take these ideas further.

Advice on CV writing and interviews

The IOP produces a range of resources to help you market yourself effectively – including advice on CVs, interviews and recruitment. Whatever direction you are moving in, the skill of writing a decent CV will be critical. Set out clearly why you will be valuable to the employer and get involved in experiences as a researcher that will give you confidence in explaining the value of what you are doing. We make our students give presentations and constantly stress this in our feedback – don’t just focus on what you are doing, be able to articulate why it is important and how your work adds value. Prof. Jim Hough, SUPA.

Visit www.iop.org/careers where you will find a huge resource to help you develop your career.

Your university careers service is full of experts who can give you individual feedback and advice – take your CV to them for review and suggestions.
If you are interested in finding a mentor:

The mentoring guide – *Working together*
www.iop.org/careers/mentoring/index.html

If you want to learn more about CPhys:

Get chartered
Recognise your achievements, enhance your status

Guide to chartered status – *Get chartered*

If you want to read more career stories from physicists:

New Directions – with more profiles and advice on mid-career transition guides to CV writing, interviews and raising your professional profile www.iop.org/careers/

IOP in Ireland – 28 days, 28 physicists
www.iopireland.org/publications/iopi/page_49138.html
If you are keen to get involved in public outreach events:

The IOP has produced *A Guide to Good Practice in Public Engagement with Physics* to help you work through the steps for developing and delivering high-quality and effective public-engagement activities.

If you are ready to engage in social media:

**Social Media:**
A guide for researchers

February 2011

[RIN Social Media: A guide for researchers](www.rin.ac.uk)
If you want to learn more about the wider academic environment and careers in this sector:

Academia is increasingly accountable to funding bodies, government, and other stakeholders. To learn more about the ways in which academic output is monitored, visit one of the national sites:

REF website [www.hefce.ac.uk/research/ref/](http://www.hefce.ac.uk/research/ref/)

Forfas [www.forfas.ie/](http://www.forfas.ie/)

The key funding providers have a huge influence on the research that is conducted in universities as they provide the money. To learn more about their agendas and priorities:

Research Councils UK – particularly the STFC and EPSRC for physics funding [www.rcuk.ac.uk](http://www.rcuk.ac.uk)

Science Foundation Ireland (SFI) [www.sfi.ie/](http://www.sfi.ie/)

The newspaper of UK academic life is the *Times Higher Education Supplement* [www.timeshighereducation.co.uk](http://www.timeshighereducation.co.uk)

Many jobs in academia are advertised through Jobs.ac.uk and the website also publishes careers advice and articles on academic life [www.jobs.ac.uk](http://www.jobs.ac.uk). brightrecruits advertises jobs in both academia and industry [www.brightrecruits.com](http://www.brightrecruits.com)

If you are interested in an academic career, the *Manchester University Academic Career* website is a fantastic resource, including advice on jobs and applications, and insight from academics [www.academiccareer.manchester.ac.uk/](http://www.academiccareer.manchester.ac.uk/)

If you need careers resources tailored to researchers:

*Fourth Level Ireland* is the website for graduate education in Ireland. Their website includes a report on the skills developed by PhD graduate [www.4thlevelireland.ie/publications/Graduate_Skills_Statement.pdf](http://www.4thlevelireland.ie/publications/Graduate_Skills_Statement.pdf)

*Prospects* is the national graduate careers website in the UK and includes many resources that, although not tailored to researchers, provide information on a range of careers. They have also produced a guide for PhD researchers entitled *Your PhD...what next?* [www.prospects.ac.uk/your_phd_what_next.htm](http://www.prospects.ac.uk/your_phd_what_next.htm)

*Vitae* is the UK organisation championing the personal, professional, and career development of doctoral researchers and research staff in higher-education institutions and research institutes [www.vitae.ac.uk/](http://www.vitae.ac.uk/)

Their website includes:

- The researchers’ portal, with advice on managing research, careers, and news of training opportunities [www.vitae.ac.uk/researchers](http://www.vitae.ac.uk/researchers)
- The Researcher Development Framework, which articulates the knowledge, behaviours and attributes of successful researchers, and encourages them to aspire to excellence through achieving higher levels of development [www.vitae.ac.uk/rdf](http://www.vitae.ac.uk/rdf)
- Digital researcher resources [www.vitae.ac.uk/dr11](http://www.vitae.ac.uk/dr11)
If you are interested in the role of physics in society and the economy:

The IOP produces a range of publications each year that demonstrate the importance of physics. You can browse these from the publications section of the website at www.iop.org/publications/.

A number of reports have been produced to articulate the value of physics to the national economies of the UK and Ireland. These are great resources for understanding the many sectors in which physics (and therefore physicists) are relevant:

Wales: www.iopcymru.org/publications/file_49831.pdf

If you want to take control of your own development:

The IOP offers members a full range of support to enable them to kick-start their professional development and sustain momentum over the course of their careers.

In the professional development section of the IOP website you can find information about events, helpsheets, a unique career planner (MyPath), and articles on professional development: www.iop.org/membership/prof-dev/tools/page_51437.html

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Prof. Peter Main, IOP, for his invaluable discussions on academic career development

Moving on:
The Physics Researcher’s Guide to Boosting Employability

Written by Dr Sara Shinton
Brightrecruits.com
the jobs site for physics and engineering

- Join us on LinkedIn and Twitter
- Graduate opportunities available
- Comprehensive careers advice
- Over 17 specialisms to choose from
- Powerful search function
- Tailored e-mail alerts

Free online registration brightrecruits.com/register