GRADnet

Professional Development for Physicists

Your training programme 2017-18

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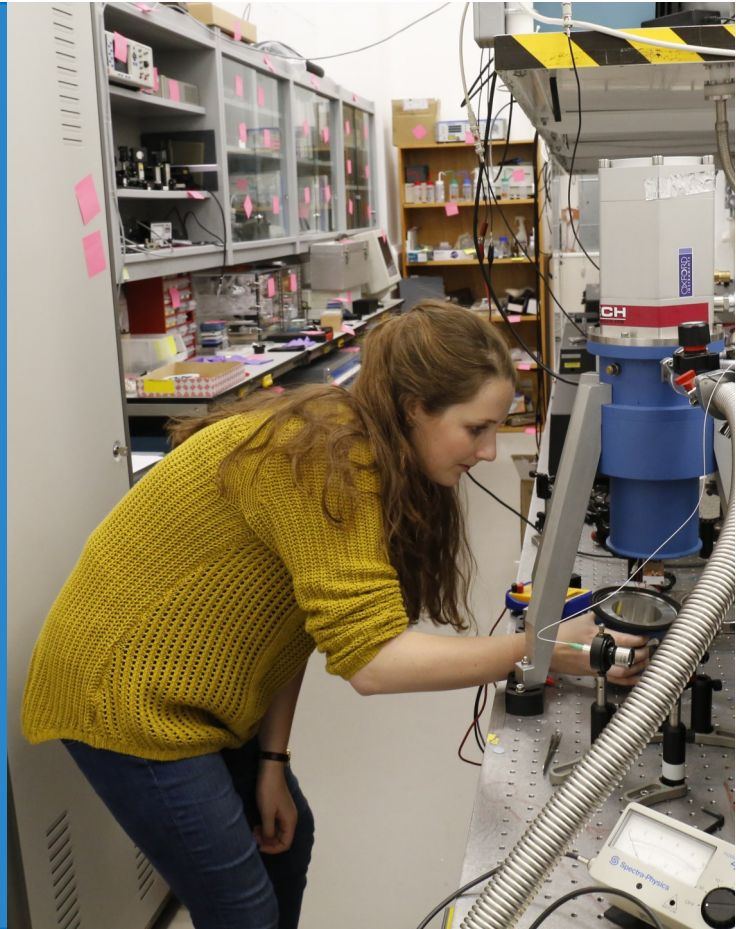
South East Physics Network

What is GRADnet?

Advanced physics training and development of professional skills are integral parts of any PhD research programme. The skills developed enable you to advance your research, but they are also the skills needed by future employers: both academic and industrial. Funding bodies and universities set minimum levels of training that you will be expected to undertake.

The training you require will depend very much on the topic of your research and on the skills you have already. That training will come from a diverse range of sources including your department, your university, and your supervisor's collaborative networks. It will be accessed as seminars and lectures, workshops, schools, and a range of other activities.

GRADnet is the collaborative graduate school of 10 South East England physics departments (SEPnet). It has been set up by the departments to offer you a wide range of advanced physics training from leading experts in their field. Moreover, it provides professional skills training made relevant to physicists with emphasis on those skills needed by physicists. Much of the training is offered in residential workshop format to ease delivery and timetabling alongside your other activities and to enable you to network with other researchers from other universities with similar interests.

This brochure sets out the GRADnet programme for 2017-18. You should meet with your supervisor and decide which activities are relevant to you and those that you must take this year. You will then be able to register and attend them.

PHYSICS TRAINING DIARY 2017-18

"Professional development and employability are increasingly important considerations for potential postgraduates." (Independent enquiry by the Higher Education Commission)

INTRODUCTION TO DATA INTENSIVE SCIENCE

Who: All DISCnet CDT students. Any GRADnet PhD student with an interest in data intensive science techniques.

What: A 3-day workshop will introduce the CDT and data intensive science, and will comprise lectures, tutorials, and examples of the benefits of data intensive science techniques as applied to current research projects.

When: 18-20 September 2017

Where: Old Thorns Manor Hotel, Liphook, Hampshire.

Numbers: 30-35 delegates

The Data Intensive Science Centre in SEPnet (DISCnet) is a new STFC-funded Centre for Doctoral Training (CDT), with 22 core PhD students over two initial cohorts.

Introduction and induction into the DISCnet Centre for Doctoral Training: What is DISCnet? What kind of training is offered? What industry placements are available? This session gives an overview of the centre and provides information on how you can get involved.

Lunch and networking reception on 18 September: This is a great networking opportunity. DISCnet students, GRADnet students, supervisory teams, and the DISCnet coordinators will get to know each other in an informal setting.

Examples in data intensive science: How does data science give the edge in your PhD? Current PhD students from several SEPnet universities will demonstrate how data intensive science techniques have helped shape their PhD research. Topics will range from astronomical surveys, to numerical simulations and particle physics accelerator data.

Tools for data intensive science in particle physics and astronomy: This session will introduce you to important packages and tools that are in use in the various research fields. We will provide help installing software and guide you through the first steps.

Requirements: A laptop computer is essential for this workshop.

"Data intensive science has a huge, and rapidly growing, potential. It is exciting to collaborate with GRADnet to deliver a mix of interdisciplinary, data intensive science skills, domain-specific knowledge, and professional/personal development skills to our postgraduate researchers." (DISCnet CDT Lead)

MOVING FORWARD FOR SECOND YEARS

Who: 2nd Year Physics PhD students. All SEPnet Departments expect all 2nd year students to attend.

What: An opportunity to network with fellow researchers from across the network and to participate in two from five short workshops designed to enhance your research skills and / or career prospects.

- **Creating impact.** Thinking about how to commercialise your research, or an idea, and turn it into an exploitable product or service? Perhaps you are interested in a career in business or knowing how businesses are created. Would you like to start thinking like an entrepreneur, or as someone that wants to change the world through innovation?

- **How to write a successful Fellowship Application.** This workshop is aimed at those students who are considering an academic career. Most often this starts with a period of post doctoral study during which the researcher is supported by a Fellowship. The workshop focusses on what is required to prepare a successful research council or similar fellowship application.

- **Research data management.** Research data management is increasingly important in all fields of research. Presented by research council and university experts, this workshop asks what is required for good data management and examines some of the common problems and issues that researchers face.

- **Unconscious Bias.** Almost no-one thinks that they are unconsciously biased. Yet white males and many non-white students perform less well in their degrees than white females - it could be due to bias in assessment systems - while females rarely get to the top of their profession - is this bias in the promotion systems? Something is going wrong if we don't appoint and promote the best person for the job.

- **Writing better software for research.** Whether you have 10 lines of shell script, 100 lines of R, or 10,000 lines of C, the quality of your research, and reproducibility of your results, depends upon the quality of your code. In this course, Mike Jackson from the EPCC (formerly Edinburgh Parallel Computing Centre) explores the qualities of good code, discusses blockers, and presents practical tools and techniques that help you to write better code, in less time, and with less effort.

When: 18 October 2017

Where: Park Crescent Conference Centre, Great Portland Street, London.

Numbers: This event is *strongly* recommended by all SEPnet partner Departments. Circa 80 delegates are expected to attend.

INDUCTION WORKSHOPS FOR FIRST YEARS

Who: 1st Year Physics PhD students. All SEPnet Departments expect all new students to attend.

What: A one day introduction to GRADnet to learn more about opportunities, to meet fellow researchers from across the network and to participate in two from five short workshops designed to get you started in key areas of activity.

- **LaTeX.** LaTeX is a document preparation system widely used by physical scientists for the creation of scientific papers, reports and theses. Indeed many key journals require paper submission in LaTeX. You will learn to create a simple document covering the key components — title, abstract, sections, tables, equations, figures, and references.

- **MATLAB.** Matlab is a high-level technical computing language and interactive environment for algorithm development, data analysis and visualization, and numerical computation. MATLAB can solve technical computing problems faster and more easily than with traditional programming languages, such as C, C++, and FORTRAN.

- **Python.** Python is a powerful, high-level scripting language that is widely used in scientific research for a huge range of data analysis and visualisation applications. In this workshop you will learn how to use Python, starting from basic scripts to explore syntax and data types, working up to more complicated 'real world' examples.

- **Getting your research published**. This workshop will explain the steps necessary to take the results of your research through to a published paper. Led by "insiders" from IOP Publishing, it will explain what makes a good paper and why some authors succeed while others do not.

- **Meetings and conferences.** A major part of many students' PhD is organising meetings: meetings with supervisors; collaborators; sponsors; and broader workshops and conferences. This is a practical workshop designed to help you organise conferences, meetings and events from start to finish, without compromising your research.

When: 25 October 2017

Where: Park Crescent Conference Centre, Great Portland Street, London.

Numbers: This event is *mandatory* at all SEPnet partner Departments for new PGRs. Circa 100 students are expected to attend.

CONNECTING INDUSTRY & PHYSICS RESEARCHERS

Who: All Physics PhD students and post doctoral researchers.

What: A careers and networking event aimed at PGRs and post doctoral researchers

When: 8 November 2017
16:30-20:30

Where: Hallam Conference Centre, London W1.

Numbers: 80-100 delegates

The Institute of Physics and SEPnet are organising a joint special careers event for postgraduate researchers. This event will give an insight into the broad range of career paths open to PhD graduates.

This event aims to help, inspire and motivate you to explore the careers options open to you in a welcoming and friendly environment. You will hear from a range of panellists, all holders of PhDs in physics-related fields, including condensed matter, theoretical nuclear physics, astronomy and particle physics, who have gone on to pursue interesting, successful careers in diverse areas – both in and outside academia.

Following the panel session, you will have time to question our panellists in groups and then to network informally with them and other students over refreshments.

Before the panel session, Vishanti Fox, IOP Careers and CPD Manager, will run a short workshop on CV and interview skills and Veronica Benson, SEPnet Employer Engagement Director, will run a short workshop on networking.

What past attendees have learned from previous employer networking events: *'the large number of different fields of industry that actively recruit PhD students in physics'; 'which skills are important to employers'; 'physicists are valued outside academia'.*

"There is a wide range of employment/career opportunities for PGRs. One should be flexible/open to all of them." (SEPnet PGR)

NUMERICAL MODELLING IN CONDENSED MATTER

Who: Physics postgraduate researchers seeking an introduction to different methods of numerical modelling in condensed matter physics.

What: A 3-day residential workshop led by senior researchers in the SEPnet region comprising lectures, tutorials, seminars and other activities.

When: 14-16 January 2018

**Where:** Old Thorns Manor Hotel, Liphook, Hampshire.

Numbers: Circa 20-25 delegates

This interactive residential school is designed for PhD students who would benefit from an introduction to different methods of numerical modelling in condensed matter physics: Monte Carlo, molecular dynamics, and first-principles quantum mechanical simulation. These fundamental and widely-used simulation techniques could support theoretical, computational or experimental PhD projects. The sessions comprise lectures on principles followed by an opportunity for hands-on practice.

Molecular dynamics is used to model molecular configurations, molecular interactions and the dynamics of molecules at nano time and length scales. The school will introduce some of the key software packages available and offer students hands-on experience in one of them.

The key to success with molecular dynamics is to have good, validated interatomic potentials. These are obtained through density functional theory and quantum mechanical calculations. The workshop will include an introduction to these methods.

Molecular dynamics is too computationally expensive in both time and memory to model large ensembles of atoms and molecules over longer timescales. This is where Monte Carlo methods take over. The school will explore some of the varied applications of Monte Carlo simulations in Physics and to put some into practice.
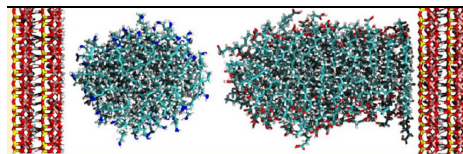
Underwood *et al.*, *J. Phys. Chem. C* (2016), **120**, 11423

Numerical Modelling and Simulations Workshop 2015: "I really enjoyed this workshop and learnt a lot about simulation which I haven't used before. It would be even perfect if the time was extended for each topic so that we have more time to practise. Thanks for organising this!" (SEPnet PGR)

GRADNET WINTER SCHOOL

Who: All postgraduate researchers who want to develop their leadership and team-building skills

What: This 3-day residential school will focus on the skills required for effective leadership and team-working. Different leadership styles will be presented and discussed. Each student attendee will be given the opportunity to have their preferred team-working style evaluated using the Belbin model.

When: 14-16 February 2018

Where: Cumberland Lodge, The Great Park, Windsor, Berkshire.

Numbers: Circa 25-30 delegates

Core activity: Columbia's Final Mission

This multi-media case tracks the Columbia Space Shuttle mission from launch as NASA engineers and leaders sought to understand the nature and threat associated with an anomaly that occurred on launch. Over the course of the mission, managers and engineers at NASA analysed the damage, assessed the risks, and decided what to do. Members of the NASA team had different perspectives, opinions and views about the damage, its effects and therefore the actions that would need to be taken. Leadership, organisational culture, communication, personality characteristics, formal systems and job positions are amongst many complex issues that affected the course of the decision-making process. In the event, at the end of the mission, the shuttle disintegrated as it re-entered the Earth's atmosphere, killing the seven astronauts. Participants will analyse the case using materials supplied by NASA under the guidance of a consultant. As the mission unfolds, they will work in teams, each team taking the role of one of the key NASA managers or engineers. A team experiences only those events and has access only to information that that person had at the time of the mission. This adds a rich dimension to the case experience as participants recognise how perceptions of the same event can vary. With a combination of team working and plenary discussion, key principles and applications of leadership, management and communication unfold as the workshop progresses.

GRADnet Winter School 2017: "I think SEPnet events are vibrant, engaging and fun. A great way to network with fellow physicists while learning useful employability skills and personal growth." (SEPnet PGR QMUL)

OBSERVATIONAL ASTROPHYSICS

Who: Physics postgraduate researchers in observational astronomy. It should also be of interest to theoretical astronomers wanting an introduction to data analysis.

What: A 3-day residential workshop led by senior researchers in the SEPnet region comprising lectures, tutorials, seminars and other activities.

When: 5-7 March 2018

Where: Old Thorns Manor Hotel, Liphook, Hampshire.

Numbers: Circa 20-30 delegates

The aim of this workshop is to give a broad overview and hands-on experience of different techniques in observational astrophysics. The emphasis will be on practical skills training sessions with plenty of opportunity for student/staff interaction.

Exercises will be graded to match students' experience and abilities.

Data mining - in other words doing astronomy using existing data in public repositories: examples from galactic and extragalactic astrophysics; an introduction to TopCat from its author (Mark Taylor); practical exercises.

Citizen science - how to get the general public to do your data analysis for you: examples and exercises.

Telescope proposals: the techniques and tools required to write an observing proposal; how the evaluation procedure works; practical exercises in both writing and reviewing. Much of what is learnt will be transferable to other types of proposal, e.g. applying for HPC time, grant funding, etc.

Using the OU robotic telescope: we will make remote observations on the OU PIRATE telescope on Tenerife (weather permitting).

Analysing observational data - an introduction to the main concepts: examples and practical exercises of source extraction, photometry, spectroscopy, SED fitting, etc.

Standalone lectures: introduction to X-ray/HE astronomy; Introduction to radio astronomy & interferometry; Current & planned telescopes/satellites/instruments.

Picture credit: "ESO" under Creative Commons Licence version 4.0.Commons Licence version 4.0.

Cosmology and Gravitation School 2016: "A good mix of talks - technical and involved, and talks which gave more of a broad overview on research in the field." (SEPnet PGR)

STUDENT-LED RESEARCH CONFERENCES

Who: Postgraduate and postdoctoral researchers from the SEPnet region with research interests in this year's conference topics. A limited number of places are available to early stage researchers beyond the region.

What: Two parallel research conferences proposed and organised by students wanting to advance their research and extend their collaborations. The conferences include talks by invited speakers and students as well as poster and recreational sessions.

When: 21-23 March 2018

Where: University of Southampton.

Numbers: Circa 40-50 delegates

Looking ahead: There will be a call for 2018 conference topics in March 2018.

From Micrometres to Megaparsecs

This conference aims to bring together students from all areas of astronomy research. From micrometeorites at Kent, to cosmological surveys at Portsmouth, the GRADnet astronomy groups and departments cover all sizes and scales of the Universe. Students will gain knowledge of a wide range of research techniques applied to the various size scales, and see where such techniques may cross over and enhance their own research. Organisers: Sam Billington, Justyn Campbell-White, University of Kent, and Ben Mawdsley, University of Portsmouth.

Advances in High Energy Physics and Cosmology

Students from all GRADnet nodes are invited to view high quality lectures from experts in the fields over a variety of topics.

Attendees will learn from a wide range of topics, which include dark matter, gravitational waves and other cosmological topics. There will also be sessions for students to present their own research in addition to learning from accomplished lecturers. Organisers: Simon King University of Southampton, Sonali Mohapatra and Jack Setford University of Sussex.

There will be cross-over lectures which are relevant to students of both particle physics and astronomy.

Student-led Conference 2017: "Herts postgrads who were attending the meeting were very pleased with it." (Professor Janet Drew, University of Hertfordshire); "Many thanks for organising a school about planetary science. Similar events in the future would be great." (SEPnet PGR)

STRONG CORRELATIONS

Who: 1st and 2nd Year Physics post-graduate researchers working in condensed matter physics.

What: A 2.5-day residential workshop that describes the background science of strongly correlated systems and experiments to probe them.

When: 11-13 April 2018

Where: Old Thorns Manor Hotel, Liphook, Hampshire.

Numbers: Circa 25-30 delegates

No two researchers would ever completely agree on the definition of a strongly correlated system; however they may very roughly be described as materials where the correlations between electrons induced by interactions make the behaviour of the material 'interesting'.

This interactive two-and-a-half day residential workshop is designed for PhD students who would benefit from learning more about this subject. The course will consist of three short lecture courses of three lectures each, covering both the theoretical concepts necessary to understand strongly correlated systems, as well as how one would probe them experimentally. The course will be self-contained, assuming only a knowledge of quantum mechanics and undergraduate level solid state physics. It should therefore be beneficial to students working on both theoretical and/or experimental projects.

In addition to the lectures, the workshop will have tutorials that pose and discuss problems related to the lectures. This will also offer an opportunity to ask many questions and continue further discussions with all of the lecturers. There will also be a poster session, some evening seminars, and a skills session focussing on scientific communication.

Strong Correlations Workshop 2016: "Topics they spoke on complemented each other well." ((SEPnet PGR)

SCIENCE COMMUNICATION SKILLS WORSKHOP

Who: PhD students who have little to no experience in informal science presentations and/or writing.

What: The day is split in two, choose to come to one session or both! Both are hands-on sessions from professional physics communicators. One will be on writing about you research for blogs and articles; the other on presenting your research in an informal setting.

When: 24 April 2018

Where: Queen Mary University of London.

Numbers: 20 delegates

Want to explore ways of sharing your research with many different audiences? It is now more important than ever to be able to communicate with non-specialist groups.

Whether it's a public talk in a pub, writing in your department blog, doing some stand-up comedy, writing a popular science article or simply standing on a box in a street corner, this session will get you started.

As a future researcher you will be expected to engage with many different publics throughout the research process; science communication is an invaluable tool for this process. Outside research the ability to clearly communicate technical details to all sorts of partners will be an asset on any CV.

The skills you learn on the day can be put in practice through the many science communication opportunities offered in your department and across the region.

Come along for a practical and friendly introduction that, with practice, will be beneficial for all sorts of future careers.

Introduction to Public Engagement 2017: "Useful in getting some tips on how to communicate ideas and work to different audiences. The hands on approach was nice and some techniques will definitely be handy to me."
(SEPnet PGR)

VIIIth NExT PhD WORKSHOP

Who: This event is open to NExT PDRAs and PhD students as well as staff and other participants from across the UK with interest in particle physics beyond the region.

What: A 4-day residential workshop that consists of a series of extensive review talks/lectures, research presentations by participants, a student-led talk session.

**When: 25-28 June 2018**

Where: Queen Mary University of London.

Numbers: Circa 30-40 delegates

Website: https://indico.cern.ch/event/653899/

The workshop provides advanced training for students and stimulates work from all participants as it acts as an incubator of collaborative research across SEPnet.

There will be plenty of time for informal conversations and a formal workshop dinner. This event will be centred around the latest results from Run 2 of the Large Hadron Collider at CERN as well as other ground and space facilities. The workshop will also feature SEPnet delivered sessions on Diversity, Careers, Employability and Outreach.

The meeting is supported by GRADnet and STFC. Full funding is provided for 20 PhD students from SEPnet institutions and a similar number of PhD students from external STFC groups from both the theory and experiment communities.
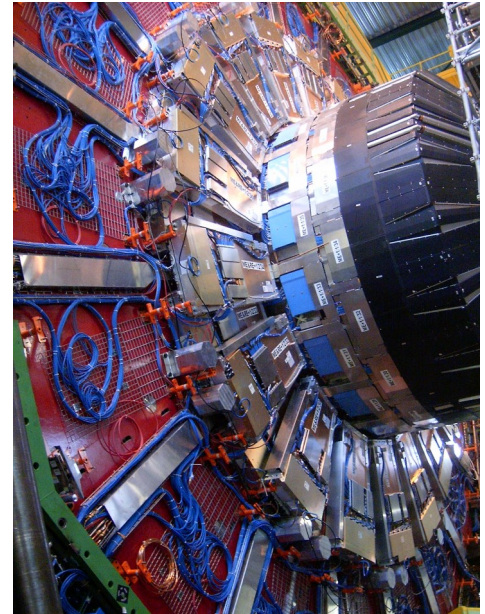
"A very enjoyable event, both academically and socially, where students always play an active part and feel empowered to release their full potential by broadening their horizons above and beyond daily routine." (SEPnet Academic)

GRADNET SUMMER SCHOOL

Who: Physics, and physics related, post-graduate researchers.

What: A 4-day residential school that explores the wide range of opportunities open to PhD physicists.

When: 2-5 July 2018

Where: Herstmonceux Castle, East Sussex.

Numbers: Circa 50–60 delegates

2016 Summer School, Herstmonceux

This intensive school comprises a broad menu of workshops and challenges led by different employers designed to offer students an insight into opportunities beyond their PhD.

A wide range of employers join the school to offer workshops designed to show what life in a given industry sector type is like and what kind of work is involved. Students choose to take four of these over two days.

A consultancy challenge is run another day. High-tech companies come with real science problems and invite students, working in teams, to create solutions using the skills they have learnt in their PhD.

The whole event is threaded through with short sessions led by expert speakers looking at some of the issues that confront those working in science: Outreach, Impact, IPR, Ethics and the like.

Employers participating in recent summer schools include: Airbus Defence and Space; AkzoNobel; Amec Foster Wheeler; AWE;Centre for Applied Science and Technology (Gov't forensics); Centre for Integrated Photonics (Huawei); Chomko & Rosier; Culham Centre for Fusion Energy; Dstl, Fourth State Medicine; IBM; InSync Technology; Magnox; the Met Office; MR Solutions; Observatory Science Centre; Oxford Instruments; Petroleum Geo-services; RBA Acoustics; Rolls Royce; Starcount; Surrey Satellite Technology Ltd; and WP Thompson.

"I have now attended two of SEPnet's 'Where Will My Physics Take Me' summer schools and both have been extremely valuable. They have provided me with fantastic opportunities to meet employers and work on real challenges that they face through the consultancy challenges. It is also a great chance to meet and talk to ex-PhD students about their transition from their PhD to current career." (University of Kent PGR)

OTHER OPPORTUNITIES

- **Mentoring**
  Students frequently benefit from the support and guidance of a mentor: someone who went through the system just a few years before them. GRADnet maintains a pool of physicists ready to act as mentors and is able to put students **in** touch with them for anything from "quick advice" to a longer term relationship.

- **Placements for researchers**
  Physics research students can benefit from our employer engagement programme which includes short placements. Popular options include a short spell undertaking industry projects with an organisation where they can develop their employability skills and where their PhD research may have real impact. Students can carry out a placement at any time, for example, after submitting their thesis and while waiting for their viva - just as they start to think about what to do next.

- **Organise your own conference**
  Many students welcome the chance to share their research at a conference that is just right for them and their colleagues. GRADnet provides practical support and training as well as funding to help you make your dream conference a reality. Details of the 2018 conferences are on page 11. We anticipate making a call in March 2018 for conferences in 2019.

- **Online learning resources**
  There are a set of modules created by PhD students in response to the prompt "I wish I had known that.." on the VRE to assist PGRs with their training. See: http://www.sepnet.ac.uk/gradnet-online-learning. Students are invited to submit further modules.

- **Entrepreneurship**
  We anticipate running an entrepreneurship event in 2018, inviting teams of PGRs from the SEPnet partners to put up ideas to commercialise outputs from their research in a "Dragon's Den" format.

"Work experience can help students make contacts and build up a portfolio of evidence to support their applications. It can also help students figure out which occupations and industries they do not want to work in."
*(HECSU)*

GETTING STARTED WITH THE VRE

The VRE

The VRE (Virtual Research Environment) is your portal to all GRADnet events. The full programme for 2017-18 can be found on the VRE as well as archives of previous activities. It is also home to student developed online learning resources developed by those just a year or so ahead of you in response to the question: "I wish I had known that when I started my PhD".

Visit the Training pages on the VRE to register for a workshop or residential school. All events and courses offered are free to students and count towards your training requirement.

Training Requirement

PhD research students registered in SEPnet partner Departments are normally expected to undertake a minimum of 80 hours of advanced physics training relevant to their research and a further 40 hours of professional skills training within the first two years of their PhD registration taken from their University, from GRADnet and from other places as appropriate.
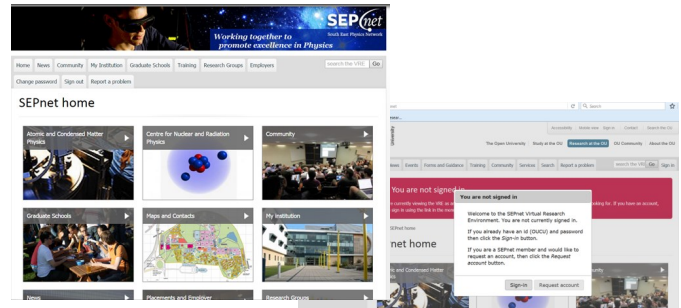
Getting started on the VRE

- Log on to the VRE at **www.sepnet.ac.uk/vre**

- Request an account.

- Fill in the request form and remember to submit it.

- Following authorisation from your institution's GRADnet Administrator, you will receive an id (OUCU) and password from the Open University who host the site. Keep this email safe.

- For further assistance contact your GRADnet administrator or look at **www.sepnet.ac.uk/vrefaqs**

"I wish I had known that when I started my PhD"

On line learning resources on the VRE created by SEPnet PhD students.

GRADnet CONTACTS

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"A PhD project and all that comes with it can be so involving that one tends to forget that there are things to come after the thesis has been submitted and the viva done. I left that day thinking about future career prospects and what I have to do to pursue them." (SEPnet PGR)

YOUR PERSONAL TRAINING DIARY

All students should meet with their supervisors during their first few weeks to plan their training requirements for the year. You may keep a record of that discussion here.

WHAT	WHEN & WHERE	NOTES
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For further information about postgraduate research projects, physics and professional skills courses, graduate schools and workshops and employer networking events, contact:

gradnetadmin@sepnet.ac.uk. Telephone: 01483 682270

or visit www.sepnet.ac.uk and www.sepnet.ac.uk/vre.
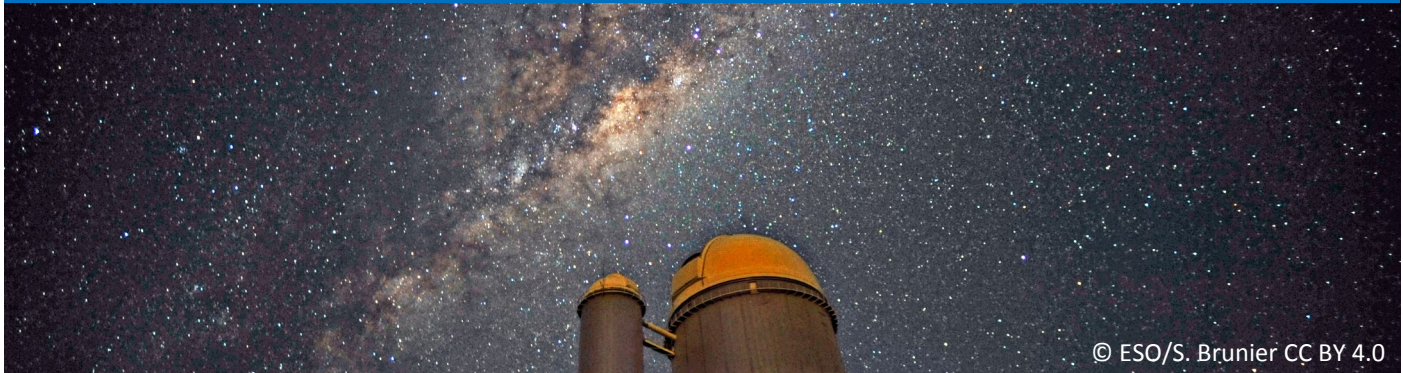
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GRAD*net*
South East Physics Network

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