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GRADnet

Professional Development for Physicists

Your training programme 2019-20
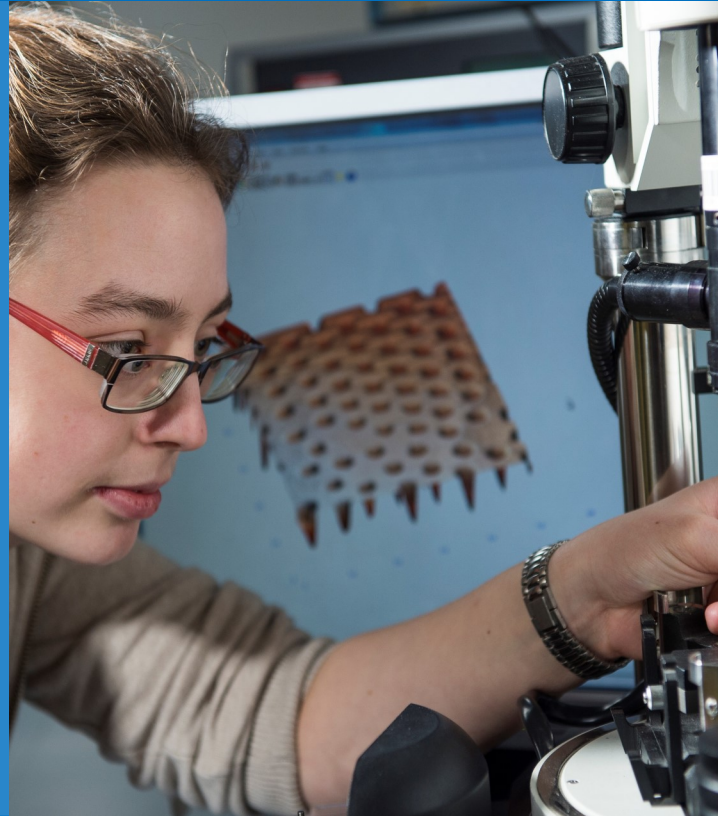
GRAD(net

South East Physics Network

WHAT IS GRADNET?

GRADnet is the collaborative graduate school of SEPnet, the South-East Physics network comprising nine South-East England physics departments. It has been set up to offer you a wide range of advanced physics training and professional skills training relevant to physicists, with emphasis on the skills physicists need. Much of the training is offered in residential workshops to enable you to network with other physics researchers.

Why does SEPnet provide graduate-level training? 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 undertake will come from a range of sources including your department, your university, your supervisor's collaborative networks, SEPnet and other professional bodies. It will take the form of seminars, lectures, workshops, schools, and a range of other activities. This brochure sets out the GRADnet programme for 2019-20. You should meet with your supervisor and decide which activities you will undertake this year; you will then be able to register and attend them.

PHYSICS TRAINING DIARY 2019-20

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

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 out of four short workshops designed to get you started in key areas of activity.

- **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.

- **Python:** Python is a widely used and highly versatile scripting language. It can be used in many capacities within science, especially data analysis/processing, plotting, statistics and simulation and is used extensively throughout science and industry. Furthermore, the skills and abilities acquired through learning any programming language are applicable to other languages, making subsequent transitions easier. Python acts as an ideal starting point, balancing difficulty, utility and widely applicable concepts.

- **Science communications skills:** 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 on a street corner, this session will get you started. 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.

- **Understanding software for research:** This workshop introduces computing concepts necessary to support your research. You can find out more about different programming languages and the types of national computing facilities available to undertake quality research. The workshop offers a general understanding of computing with an introduction to parallel computing along with practical tools and techniques that will help you write and maintain better code more efficiently.

When: 23 October 2019

Where: One Park Crescent, International Students House, 229 Great Portland Street, London W1W 5PN.

Numbers: This event is ***mandatory*** for new PGRs in all SEPnet physics departments. Circa 100 students are expected to attend.

MEASUREMENT SCIENCE CONFERENCE

Who: All Physics PhD students and postdoctoral researchers.

What: A 2-day measurement science conference aimed at PGRs and postdoctoral researchers.

When: 6-7 November 2019

Where: National Physical Laboratory, Teddington, Middx

Numbers: 10 places available for SEPnet PhD students

This year NPL will deliver its 4th Annual NPL Postgraduate Institute (PGI) Measurement Science Conference supported by SEPnet.

This conference brings together experts and practitioners in many fields of science and innovation as well as industry partners and influencers from across the UK. It showcases some of the amazing work of the PGI — future physicists of the workforce — and provides insight into the operations of the UK's National Measurement Institute.

This event provides an excellent opportunity to meet potential employers and engage with measurement experts operating at the interface of industry and academia. The conference will include keynote speakers, a career panel session and a conference dinner. The event is sponsored by the Institute of Physics, M-Solv and National Instruments.

This year's themes demonstrate the breadth of the PGI and showcase how measurement science is pivotal in:

- creating impact on health through research into effective diagnosis and therapy with common or novel health-based practices;

- sustaining our environment by illustrating how research can combat current global environmental and energy challenges;

- making a difference to society through better living, by improving or monitoring communications, economic performance and general quality of life.

Measurement Science Conference 2018: *"I found the talks insightful and appreciated the chance to converse with industry." (PGI PGR)*

ASTROBIOLOGY AND PLANETARY SCIENCE

Who: Principally 1st and 2nd year physics postgraduate researchers with an interest in space exploration, astrobiology or planetary science.

What: A 2-day residential workshop that describes the background science and current advances in the fields of astrobiology and planetary science, with a focus on the exploration and search for life on Mars.

When: 27-28 November 2019

Where: The Open University, Milton Keynes

Numbers: Circa 25-30 delegates

Astrobiology has gained great momentum in the 21st century prompted in part by discoveries of large numbers of extrasolar planets, while closer to home Mars exploration is in a golden era: two NASA missions are operating on the surface, and orbiting missions from several agencies are ongoing. Two further NASA and ESA Rover missions will launch in 2020.
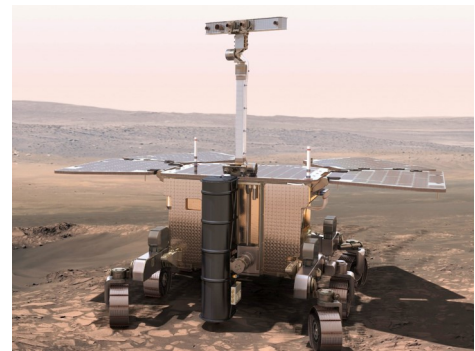
This workshop will focus on new data from the latest NASA and ESA missions — Mars Science Laboratory, InSight and ExoMars Trace Gas Orbiter — and the preparations that are being made for the 2020 ESA ExoMars Rover mission.

It will cover geophysics, geology, atmospheric physics and astrobiology and why interdisciplinarity is vital for exploration and the search for life on Mars.

The workshop provides advanced training for students and will stimulate work by all participants, acting as an incubator of collaborative research across SEPnet.

There will be plenty of time for informal conversations and a workshop dinner.

Planetary Science Workshop 2016: *"Very interesting intro to planetary science as a whole."*
"Great for beginners." (SEPnet PGRs)

TURNING SCIENCE INTO BUSINESS

Who: All Physics PhD students and postdoctoral researchers, especially those with an interest in commercialising their science.

What: A 2-day case study-based residential workshop, aimed at PhD students and postdoctoral researchers.

When: 2-3 December 2019

Where: National Physical Laboratory, Teddington, Middx

Numbers: 12 places available for SEPnet participants and 12 places available for NPL PGI participants.

Are you thinking about how to commercialise your research? Perhaps you wonder how to turn an idea into a commercial product or service? Fancy yourself as an innovator? Or just want a better understanding of business in practice?

The workshop will be run by Julia Shalet, a highly experienced product innovation practitioner and coach who has run numerous workshops for SEPnet and worked with thousands of innovators, from students to large corporates.

Working in teams, with real-life case studies (you may work on your own ideas), you will examine how to:

- create a proposition that provides value to those who need it
- identify risky assumptions early on
- run your own research to gather evidence to reduce those risks and then draft a business model.

The event is offered jointly by SEPnet and the National Physical Laboratory Postgraduate Institute (PGI).

SEPnet Workshop 2018: *"Fun, engaging, informative and hands on—great for people who have business ideas and don't know where to start." (SEPnet PGR)*

IOP/SEPNET CAREERS PANEL EVENT

Who: A careers and networking event aimed at physics students and postdoctoral researchers.

What: A careers and networking event aimed at PGRs and postdoctoral researchers.

When: 4 December 2019

15:00-18:00

Where: Institute of Physics,
37 Caledonian Road,
London N1 9BU

Numbers: Circa 50-80

The Institute of Physics and SEPnet will run a joint career networking event for physics students and postdocs. This event will give an insight into the broad range of career paths open to physics graduates including 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.

The event will begin with a short career and networking activity followed by a panel session where you will hear from physics and PhD graduates from physics-related fields who have gone on to pursue interesting and successful careers in diverse areas, both in and outside academia.

You will then have time to question our panellists in small groups and to network informally with them and other participants over refreshments.

What past attendees said about the last career networking event:

It was a fresh and exciting look into my career options, which is something I consider extremely important.

I enjoyed the networking workshop, helped make networking less of an effort and the roundtable session with panellists was great!

Nice to have some time with the panellists on the table. More informative than just talks with Q&A. Very enjoyable.

IOP/SEPnet Careers Panel Event 2018: *"I enjoyed the variety of employers that were available. I felt this was the most genuine insight into how to apply my physics skills to future careers." (SEPnet PGR)*

MACHINE LEARNING AND AI

Who: PhD students and postdoctoral researchers interested in modern data science and AI and how this is applied to physics and astronomy.

What: A 2-day workshop that consists of presentations and tutorials to ensure delegates get the chance to learn about modern methods and have the opportunity to get some hands on experience.
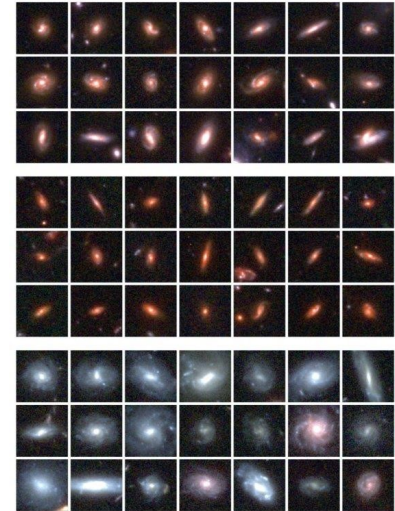
When: 15-16 January 2020

Where: Queen Mary University of London, Mile End Road, London

Numbers: Circa 30-40 delegates

This machine learning and AI workshop provides an overview of the use of modern data science and AI methods in the context of physics and related problems. It comprises lectures, practical tutorials and discussion sessions to allow participants to explore methods and help develop an understanding of what tools and methods work well under different circumstances.

The workshop will be beneficial to researchers working on data-rich theoretical and experimental projects, not just in astronomy and particle physics but also more general topics reflecting the pervasive nature of data science in society today. This will better equip graduates for their life after their PhD, in both academia and industry.

Requirements: A laptop computer is essential to follow the tutorial parts of this workshop.

An automatic taxonomy of galaxy morphology. (J. Geach)

The interface between observation and theory in astrophysics workshop 2019: *"The section on machine learning was helpful...and now I have a better working knowledge of it." (SEPnet PGR)*

TEAMS, COMMUNICATION AND LEADERSHIP - WINTER SCHOOL

Who: All postgraduate and postdoctoral researchers.

What: A 3 day residential course focusing on soft skill development such as: the complexities of teams, effective communication and how you best perform in a team, with the chance to develop leadership qualities and skills. You will experience non-technical challenges that are common in a technical environment, whether in research or industry, where collaboration is key to success.

When: **17-19 February 2020**

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

Numbers: Circa 25-30 delegates

This 3-day residential course is designed to develop essential skills for successful collaboration including motivation and management of both self and others.

Attendees will explore the benefits of, and opportunities for, improved social awareness; gain an understanding of one's strengths and areas for support; look at how one's working style impacts on co-workers; develop the experience, skills and qualities needed for future leadership.

Working in teams, attendees will develop an understanding of team dynamics and the factors essential to project success within their research or in a future workplace. The course will provide opportunities for reflection, coaching and feedback.

Attendees will learn how to communicate effectively with others including non-specialists and acquire skills including convincing, pitching and presenting in the context of both research and future employment in academia, commerce or industry.

Teams will be given real challenges to exercise their problem-solving skills in this practical workshop environment developing skills and capabilities they will value throughout their careers.

"I signed up for the Winter School to improve my understanding and capabilities of team working, cooperation and leadership." (SEPnet PGR 2019)

STUDENT-LED RESEARCH CONFERENCES

Who: Postgraduate and postdoctoral researchers with research interests in this year's conference topics (see at right). A limited number of places are available to early stage researchers outside SEPnet.

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

When: 25-27 March 2020

Where: University of Southampton.

Numbers: Circa 40-50 delegates

Looking ahead: There will be a call for 2021 conference topics in March 2020.

Soft Matter: the unseen science all around us

This conference aims to bring together students from all areas of soft matter physics to network and share ideas. Soft matter encompasses a large number of fields including experimental and theoretical physics, covering anything from biophysics at a nanoscale through to polymers and porous media and wider areas of physics. Participants will get the chance to learn about practical and analytical tools taught by experts in the field.

Lead organisers: Virginia Apostolopoulou (Surrey) and Rhiannon Harries (Sussex)

The Big Data Era in Astronomy

This conference will focus on all areas of astronomy research benefitting from the big data era which brings new ways of analysing information and collaborating with other researchers including computer scientists. Attendees will gain knowledge of their specific field and a variety of other topics boosting their careers as researchers.

Lead organisers: Tomás Müller (Southampton) and Tracy Garratt (Hertfordshire).

Both conferences will include research talks by students and invited experts and there will be an evening poster session. There will be a call for abstracts of contributions in the autumn.

Student-led Research Conference 2019: *"Great conference, really enjoyed the talks and poster and pizza session - the relaxed format was great for networking and encouraged very interesting discussions." (SEPnet PGR)*

QUANTUM COMPUTING

Who: Principally 1st and 2nd year physics postgraduate researchers working in quantum computing.

What: A 2-day residential workshop which is designed to give an introduction to quantum computing and its near term prospects.
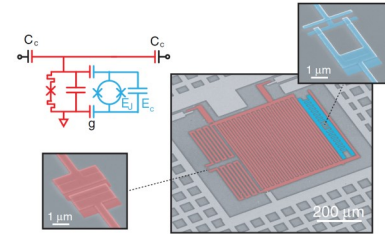
When: 27-28 April 2020

Where: University of Surrey, Guildford.

Numbers: Circa 40 delegates

For research students with a background in this field, this workshop will strengthen their theoretical understanding of quantum computing and its physical implementations, and give an overview of current research problems.

Through lectures and tutorials, postgraduate researchers will be given a theoretical introduction to quantum computing and physical modelling of its implementation in state-of-the-art superconducting circuits, trapped ions and other architectures.

Attendees will focus on goals being pursued internationally to demonstrate the quantum advantage and realise noisy intermediate-scale quantum computing (NISQ). There will be time dedicated to informal discussions, a poster session and activities to highlight individual research.

A Superconducting qubit.
Adapted from Much et al., PRB 86, 220503 (2012)

Quantum Technology Workshop 2017: *"A great use… of my time. A great impact… and a wonderful exposure for a newbie in the world of quantum technology". (SEPnet PGR)*

OPPORTUNITIES BEYOND YOUR PHD - SUMMER SCHOOL

Who: Physics, and physics related, postgraduate researchers.

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

When: 6-9 July 2020

Where: Herstmonceux Castle, East Sussex

Numbers: Circa 40-50 delegates

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 take four of these over two days.

A consultancy challenge is run another day. Companies put forward 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: career paths in academia and industry, science communication and intellectual property rights.

Employers participating in recent summer schools include: Adaptix Ltd; AgFE Ltd; Airbus Defence and Space; AkzoNobel; AWE; BlueOptima; Centre for Applied Science and Technology; Centronic Ltd; Deloitte; Dstl; Fourth State Medicine; GlaxoSmithKline; Huawei; IBM; Kindred Group Plc; Magnox; the Met Office; MR Solutions; NVIDIA, QinetiQ; Royal Surrey County Hospital; Observatory Science Centre; Oxford Instruments; Rutherford Appleton Laboratory; RBA Acoustics; Santander; Surrey Satellite Technology Ltd; UKAEA and WP Thompson.

"Attending the summer school in 2018 I learned that physics graduates can be employed in various ways. Knowledge in physics can be of use in many different jobs even though it might not seem so at a first glance." (SEPnet PGR)

Xᵀᴴ NEXT PHD WORKSHOP

Who: SEPnet PhD students interested in particle physics experiments and theory, alongside NExT PDRAs, PhDs and other national participants.

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

When: 13-16 July 2020

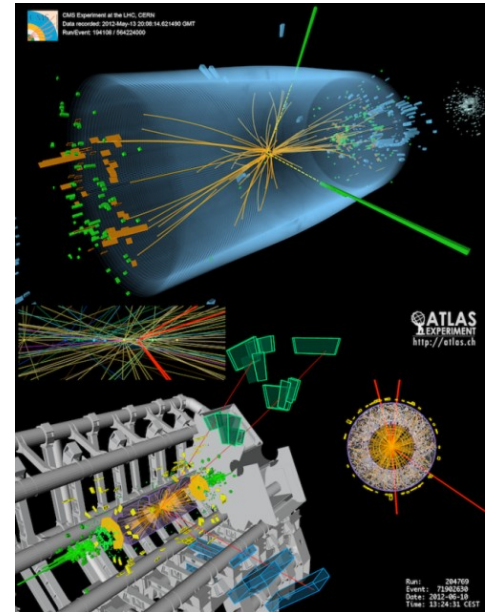**Where:** Cosener's House, Abingdon, Oxfordshire

Numbers: Circa 30-40 delegates

Website: https://indico.cern.ch/e/nextphd2020

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 workshop dinner. This event will include topics in collider and astro-particle physics focusing on the interplay between experiment and theory. The workshop will also feature SEPnet delivered sessions on Diversity, Careers, Employability and Outreach.

The meeting is supported by GRADnet and STFC. Workshop funding and accommodation 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.

IX NExT PhD Workshop 2019: "The workshop was perfectly pitched at those who have an interest in both theoretical and experimental particle physics, which is a welcome inter-disciplinary element often missing in advanced PhD Schools." (SEPnet 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 mentoring relationship. Contact employerengagement@sepnet.ac.uk.

- **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 various times, for example, after submitting their thesis and while waiting for their viva. Contact employerengagement@sepnet.ac.uk.

- **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 2020 conferences are on page 11. We anticipate making a call in March 2020 for conferences in 2021.

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

"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)

For further information about postgraduate research projects, physics and professional skills courses, graduate schools, workshops and employer networking events, contact: gradnetadmin@sepnet.ac.uk. Telephone: 01483 682270. To register for GRADnet events visit www.sepnet.ac.uk

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