

GRADnet

Professional Development for Physicists

Your training programme

GRAD*net*
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 2016-17. 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, free of any charge to you or your project funding.



PHYSICS TRAINING DIARY 2016-17

Course	When	Where	Page
GRADnet Induction	26 October 2016	Park Crescent Conference Centre London	4
Effective Physics Researcher	1 & 29 November 2016	Open University, Camden, London	5
Planetary Science School	14-15 November 2016	NPL, Teddington, Middlesex	6
Cosmology & Gravitation School	16-18 January 2017	Old Thorns Manor Hotel, Liphook, Hampshire	7
GRADnet Winter School	13-15 February 2017	Cumberland Lodge, Berkshire	8
Introduction to Public Engagement	21 February 2017	Queen Mary University of London	9
Experimental Condensed Matter School	5-7 March 2017	Old Thorns Manor Hotel, Liphook, Hampshire	10
Student-led Conferences	30-31 March 2017	University of Southampton	11
Quantum Technologies School	24-26 April 2017	Old Thorns Manor Hotel, Liphook, Hampshire	12
Professional Skills Day	18 May 2017	TBC, Central London	13
VII NExT (Particle Physics) PhD School	26-29 June 2017	Cosener's House, Abingdon, Oxford	14
GRADnet Summer School	3-6 July 2017	NPL, Teddington, Middlesex	15
Online Learning <i>Call for Ideas</i>	November 2016	Online	16
Conferences 2018 <i>Call for Ideas</i>	March 2017	Online	16
Connecting Industry with Physics Researchers	19 October 2016	University of Hertfordshire	16
	TBC May 2017	University of Sussex	16

“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 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: 26 October 2016

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

Numbers: This event is *strongly* recommended by all SEPnet partner Departments. Circa 100 students are expected to attend.

EFFECTIVE PHYSICS RESEARCHER

Who: 1st and 2nd Year Physics PhD researchers.

What: An interactive two-day course designed to develop the skills necessary for you to start your PhD research off on the right foot. Throughout the two days you will participate in activities and discussions that help you develop plans and strategies which will enable you to succeed now and that will provide you with a solid foundation for the future after your doctorate.

When: 1 & 29 November 2016 Attendance is required on both dates.

Where: The Open University, Camden, London.

Numbers: 25-35 students

Day One: Starting Strong

A varied series of interactive sessions that explore:

- What is an effective researcher
- Different research approaches
- Critical thinking and reading
- Understanding expectations and supervisors
- Your path to completion
- Research project planning
- What you need to know
- Your next 100 days!

Day Two: Succeeding Now and in the Future

- Building your resources
- What will this doctorate do for me?
- The academic horizon
- Employer panel: What do employers want from physics doctoral graduates?
- Researcher spotlight: Presenting your research plans.



“By the end of the two days I had met some lovely people and taken contact details from other attending students and I left feeling confident and inspired to make my PhD a success. I will be keeping an eye out for future events and would completely recommend it to others.”

(SEPnet PhD student commenting on the Effective Physics Researcher Workshop in 2014)

PLANETARY SCIENCE SCHOOL

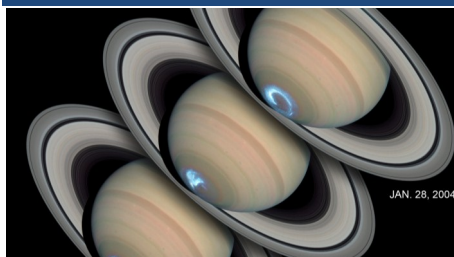
Who: Physics postgraduate researchers in planetary science.

What: A 2-day residential workshop led by senior researchers in the SEPnet region comprising lectures, tutorials, seminars, and other activities.

When: 14-15 November 2016

Where: National Physical Laboratory, Teddington, Middlesex.

Numbers: 25-30 students



The workshop comprises four sessions exploring different aspects of planetary science through a mix of lectures, seminars and tutorials. There will be a poster opportunity for students to present their own plans and research.

Measuring geology on distant worlds

Led by researchers from the Open University, this session explores how rocks and minerals that form distant worlds are formed, destroyed, and rebuilt during geologic processes. The contrasting examples of Mercury and Mars will be described.

Planetary magnetospheres

Led by researchers from the University of Southampton, this session explores how solar system bodies interact with the solar wind, the extension of the Sun's outer atmosphere that flows outward through the solar system.

Asteroids and Comets

Led by researchers from the University of Kent, this session focuses on the exploration of asteroids and comets that recently achieved fame through Rosetta's Philae probe first-ever landing on a comet; 67P/Churyumov-Gerasimenko.

Deep space communication and navigation

Getting probes to distant worlds and getting quality data back is a key aspect of any mission in planetary science. Led by researchers at NPL this session discusses the technical and intellectual challenges involved.

This school is one of a number of events that GRADnet organises in collaboration with NPL, the UK National Physical Laboratory, and the NPL Postgraduate Institute.

COSMOLOGY AND GRAVITATION SCHOOL

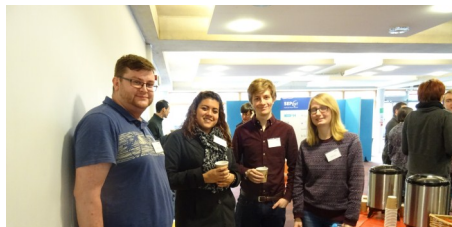
Who: Physics postgraduate researchers in cosmology and gravitation.

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

When: 16-18 January 2017

Where: Old Thorns Manor Hotel, Liphook, Hampshire.

Numbers: circa 35 students



The workshop led by researchers from the Universities of Portsmouth, Southampton, Sussex, Hertfordshire and Surrey, comprises five pedagogic sessions exploring different aspects of cosmology and gravitation through a mix of lectures, seminars and tutorials. There will be a poster opportunity for students to present their own plans and research.

Theory Overview

This session asks what we can expect to learn in the decade 2020-2030. It provides a context to explain how concrete measurements might get turned into knowledge about the underlying physics. It explains the framework used to interpret cosmological measurements. Topics covered include modified gravity, structure formation measurements, inflationary initial conditions and the cosmological constant problem.

Low Red Shift Universe

This session spans supernovae, weak lensing and large-scale structure

Gravitational waves

The newly-emerging field of gravitational wave astronomy will be discussed in the context of detectors, sources and cosmology.

Universe of Galaxies

This session will focus on how galaxies can be used to place constraints on cosmology, specifically the use of galaxies to measure dark energy through baryonic acoustic oscillations and supernovae, gravitational lensing to probe the distribution of dark matter, and 'near field' cosmology to explore the conditions of star formation in the early Universe.

Cosmic Microwave Background

This session will cover the CMB power spectra, polarisation and B modes, and CMB lensing.

“Bringing together researchers from across SEPnet to explore areas of common interest for collaboration is one of the strengths of belonging to the network.” (SEPnet Executive Director)

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: 13-15 February 2017

Where: Cumberland Lodge, Great Windsor Park, Berkshire.

Numbers: 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 2016: "I learnt that there are more jobs available in industry that I could apply for than I previously realised." (SEPnet PGR)

INTRODUCTION TO PUBLIC ENGAGEMENT

Who: PhD students who have little to no experience of working with general audiences.

What: In the morning there will be ideas aplenty for what you can do with the public, based on what other SEPnet physicists have done in the past. In the afternoon we are offering hands-on sessions from professional physics communicators on writing about your research for blogs and articles, and talking about your research in an informal setting.

When: 21 February 2017

Where: Queen Mary, University of London

Numbers: 20 delegates

Do you want to explore ways of sharing your research with many different audiences? Whether it's public talks, writing in our blog, running art / science collaborations, doing some stand-up comedy or simply standing on a box in a street corner, this session will help you get started.

Do you want to involve the public in your research? The session will also look at how

different audiences can help you carry out your research through citizen science or research in schools projects.

Finally find out how doing all this can help with career progression alongside information on funding available for you to turn your public engagement ideas into reality.



“Taking part in public engagement projects improved our team’s ability to communicate our research with people from a wide range of backgrounds and interests. It also improved our confidence in public speaking.”

(SEPnet PGR, Southampton)

EXPERIMENTAL METHODS FOR CONDENSED MATTER

Who: 1st and 2nd Year Physics post-graduate researchers working in experimental condensed matter physics, and theorists wanting to learn what experimenters can do!

What: A 3-day residential workshop that describes the background science, the methodology, the capability and some dos and don'ts of a range of common spectroscopy, microscopy and characterisation techniques.

When: 5-7 March 2017

Where: Old Thorns Manor Hotel, Liphook, Hampshire.

Numbers: 25-30

This residential school has the joint objectives of reinforcing understanding for students already working with some of the methods discussed and showing what other methods might offer. It will include lectures, tutorials, seminars and other activity sessions on:

- X-ray and neutron scattering.
- Optical spectroscopies. A discussion of the basics of optical spectroscopy, spectrometers and spectrographs will be followed by examples of their use in characterising materials by photoluminescence, Raman spectroscopy, absorption spectroscopy, etc.
- Nuclear magnetic resonance. An introduction to how physicists use NMR to measure molecular dynamics and microstructure.
- Electron and atomic force microscopies and surface analysis

techniques. These methods enable the imaging of (i) the topography of materials surfaces, (ii) the microstructure of a material, (iii) the defects, such as dislocations, within a material and (iv) chemical analysis. Two sessions explore how these goals are achieved.



Strong Correlations Workshop 2016:

“It would be nice to have two more days with three more courses.” (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: 30-31 March 2017

Where: University of Southampton

Numbers: Circa 90 delegates

Looking ahead: There will be a call for 2018 conference topics in March 2017

A wider context for astronomers. This meeting will take a broadband look at astrophysical processes across the electromagnetic spectrum. By introducing different features of the electromagnetic spectrum in an astrophysical context, it will create a foundation for broadband study at different wavebands.

Organisers: Peter Boorman, Bella Boulderstone and Chris Frohmaier (Southampton)

Functional scanning probe microscopy techniques. This meeting is for those interested in surface analysis and nanotechnology characterisation. Basic concepts and different techniques used by students working on a wide range of topics, from nanomaterials, soft matter, biomedicine, to polymers, surface analysis, and magnetism will be explored.

Organisers: Héctor Corte-León (RHUL)
Alex Browning (Surrey)



“The three conferences in 2016 were amongst the most successful and enjoyable events of the year. The organising students did a great job.” (GRADnet Coordinator)

QUANTUM TECHNOLOGIES SCHOOL

Who: Physics PhD and post-doctoral researchers working in the area of quantum technologies.

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

When: 24-26 April 2017

Where: Old Thorns Manor Hotel, Liphook, Hampshire.

Numbers: 30-35 delegates

This school aims to expose PhD students to new and exciting applications of physics which directly rely on the properties of quantum mechanics to perform a function beyond current technological capability.

Sometimes such a device is described as a "machine" whose dynamical degrees of freedom obey Schrodinger's equations, thereby employing the principles of superposition and entanglement to achieve its task.

The School will be taught by senior researchers from within SEPnet and by invited speakers from beyond. A total of six sessions are planned that will span different directions in which quantum technology is progressing, including:

- Quantum computation
- Quantum simulation
- Quantum sensing / metrology
- Quantum communications.

In addition, the School will explore key enabling technologies.



Numerical Modelling Workshop 2015: “Engaging speakers, appreciated availability for questions throughout the event, not just during scheduled sessions.” (SEPnet PGR)

PROFESSIONAL SKILLS WORKSHOPS

Who: All postgraduate researchers in SEPnet.

What: A one-day event led by professional skills trainers comprising a series of workshops designed to help you as you come to the end of your PhD or postdoc contract. Delegates will have a choice of two from five options.

When: 18 May 2017

Where: Central London venue

Numbers: circa 60 delegates

Workshops:

- **CV Writing:** If you have not refreshed your CV since you started then this workshop will help you tailor it for a range of job types and offer feedback.
- **Unconscious bias:** This session will examine unconscious bias that leads to a lack of diversity and what practical steps you can take both to manage your own biases and to avoid being the victim of unconscious bias when applying for new posts, funding or promotions.
- **Negotiation/Persuasion/Assertiveness:** Convincing and influencing others requires both skill and confidence. This workshop aims to support you in developing both for your future study and work.
- **Writing:** This workshop is targeted at students finding difficulty in

getting pen to paper and starting writing their thesis or a research paper. It will offer practical tips and one-on-one help.

- **How to prepare a fellowship application:** Many students and postdocs go on to fellowships as the first rung on the ladder to an academic career. This workshop looks at good practice in writing fellowship applications and what to expect at interview.



Succeeding after your Doctorate 2015: “Exactly what the title of the workshop stated—that there is light at the end of the tunnel, life after the PhD”. (SEPnet PGR)

VIIth 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 3-day residential workshop that consists of a series of extensive review talks/lectures, research presentations by participants, a student-led talk session.

When: 26-29 June 2017

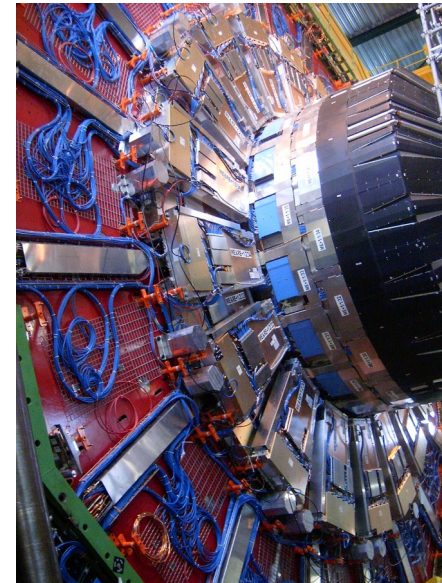
Where: The STFC Cosener's House, Abingdon, Oxford.

Numbers: Circa 30-40 delegates

Website: <http://www.next-institute.ac.uk/>

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: 3-6 July 2017

Where: National Physical Laboratory

Numbers: 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 consultancy challenge runs throughout the 4 days. High-tech companies come with real problems and invite students, working in teams, to create solutions using the skills they have learnt in their PhD.

Other companies come and offer workshops designed to show what life in a given industry sector type is like and what kind of work is involved.

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 GRADnet summer schools include: Airbus Defence and Space; AkzoNobel; Amec Foster Wheeler; AWE, Centre for Applied Science and Technology (Gov't forensics); Chomko & Rosier; Culham Centre for Fusion Energy; IBM; InSync Technology; the Met Office; MR Solutions; Observatory Science Centre; Oxford Instruments; Petroleum Geo-services, RBA Acoustics; Rolls Royce; and Starcount.

*GRADnet Summer School 2014 at NPL: "There are many applications of physics within my own research interest! There is a lot of interesting research going on at the SEPnet institutions."
(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 relationship.
- **Placements for researchers**
Physics research students can benefit from a placement at any time. Popular options include a short spell undertaking research with an organisation where they can apply their skills and knowledge and where their PhD research may have real impact or after submitting their thesis and while waiting for their viva - just as they start to think about what to do next.
- **Connecting Industry with Physics Researchers**
An evening event where PGRs and industry meet to explore research and business ideas and discuss potential career opportunities. Next event: 19 October 2016, University of Hertfordshire.
- **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.
- **Develop online learning resources**
As their PhD nears completion, students reflect on what they wish they had known up-front and the skills that they have acquired that will be lost as they move on. GRADnet provides the means to make a permanent legacy through on-line student created learning modules for those that come next. Existing modules are on the VRE. Next call: March 2017.
- **Entrepreneurship**
We anticipate running a second entrepreneurship competition in 2017, 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

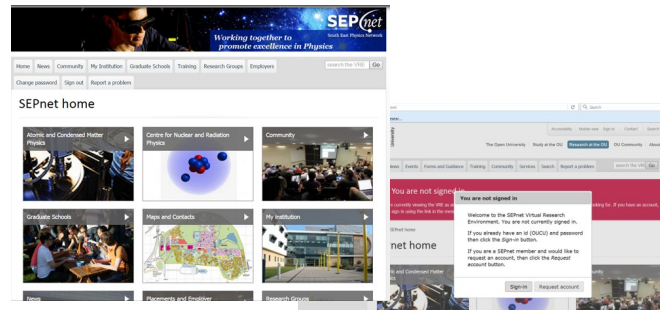
The VRE

The VRE (Virtual Research Environment) is your portal to all GRADnet events. The full programme for 2016-17 can be found on the VRE as well as news pages and 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.

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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.



Blanco Telescope (centre), Milky Way (left), Large Magellanic Cloud (top) (Reidar Hahn,

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