

IOP Institute of Physics

HIGHER EDUCATION GROUP

NEWSLETTER August 2019

UPCOMING EVENTS

Register for **VICE/PHEC** on the
22 & 23 August 2019 in Bristol.

The HEG has an accompanying
satellite meeting and AGM on
21 August 2019 #vicephec19

Save the date for the

**Physics PhD Supervisor
Network meeting**

21 November, IOP London

FROM THE CHAIR

Welcome to this second edition of the newsletter of the Higher Education Group! We're delighted to send this out in summer as there are many exciting events taking place. We had a joint meeting with the Space Universities Network, a joint meeting with the European Physics Society's Education Division, and our Annual General Meeting is coming up preceding VicePHEC in Bristol. It is a busy summer for the HEG.

Bring on Summer!

We hope that you had or will be able to attend some or all of these events to network with colleagues and spread the word about good practice in the Physics Higher Education world. This newsletter is also a good opportunity to look at what's been happening recently in our community (not least our now regular community meetings) and to "meet" one of our Committee members (Emily Brunsden). I hope you'll enjoy reading this. We're happy to receive any feedback on this newsletter, so please contact us if you can, send us ideas for contributions for the next issue, and above all, forward it to colleagues and friends!

VICE PHEC AND SATELLITE MEETING

Don't forget to register for VICE/PHEC 2019 in Bristol on August 22nd and 23rd 2019. Registration and programme details can be found at <https://vicephec2019.wordpress.com>.

The IoP Higher Education Group will be holding a Satellite meeting, before the main VICE/PHEC conference, asking "How can we help physics students flourish?" This will be held on the afternoon of August 21st. There will be a keynote address from Fabienne Vailes author of "The Flourishing Student: every tutor's guide to promoting mental health, well-being and resilience in Higher Education". If you would like to contribute a presentation or activity to the meeting please contact the IoP HE group secretary (helen.heath@bristol.ac.uk). The meeting is free and you do not need to be a member of the IoP or the HE group to attend so please pass on to interested colleagues.

The AGM of the IoP Higher Education group will be held at the University of Bristol on Wednesday August 21st directly following the VICE/PHEC satellite meeting. The meeting will last no more than 45 minutes and all Group members are encouraged to attend. If group members have items they would like to raise please contact the IoP HE group secretary (helen.heath@bristol.ac.uk).



FUNDING OPPORTUNITY FOR MEETINGS

The Institute of Physics Higher Education Group (HEG) Committee invites applications from the community to organise a Physics Higher Education meeting in 2020. Up to £500 support may be awarded to the bid. Enquiries can be sent to Dr Nicolas Labrosse (nicolas.labrosse@glasgow.ac.uk) or Dr Thomas Stallard (tss8@leicester.ac.uk).

THE IOP UNDERGRADUATE PHYSICS CHALLENGE PREPARES FOR ANOTHER YEAR



For the past 6 years, the IOP has organised an annual design and build challenge aimed at first-year undergraduates in the North of England, and next year's challenge is launching soon. The tasks they have been set have ranged from building a voltmeter from scratch to using the energy from a kilogram of boiling water to raise a weight - all using repurposed or homemade parts.

The competition requires groups of first-year undergraduates to design and build a piece of equipment within their own institutions over a period of 3 months and with a £30 budget, which they then take to compete against other teams from across the North at the final event held in March. The challenge is linked to industry in the region with local employers acting as judges for the presentation aspect of the challenge.



The challenge encourages a more open-ended discovery of physics than many prescribed lab courses can provide and allows students to experience early in their academic career the kind of research freedom and creativity that they may only get later on.

The challenge is going from strength-to-strength and has expanded from its initial remit of universities in the North West to now including institutions from across the North.

presentations as part of the Undergraduate Physics Challenge 2018/19.

If you would like to get involved or want further information about the challenge, then please email Katherine Platt (katherine.platt@iop.org).

THE INTERNATIONAL PHYSICISTS' TOURNAMENT: A PEEK INTO POSTGRADUATE RESEARCH

The International Physicists' Tournament (IPT) is a tournament for undergraduate physics students to test their physics prowess by spending up to 9 months solving as many of 17 pre-selected unreported problems in physics (previous examples of problems can be viewed at <http://iptnet.info/problems>), and defending their solution at a research-style conference. At the conference, teams representing their nations will defend, challenge and review their findings in a 'physics fight'. After each 'physics fights', teams are graded by a panel of academic researchers and teachers. Following a series of these 'fights', the top three ranking teams progress to a final where the winner will be announced as the 'world champion' in physics.

The tournament goes beyond just another competition between nations for a top-spot in physics. It also boasts unique and exceptional opportunities for the participants to gain a sneak peek into what postgraduate physics research may be like. From something as simple as travelling to another country and giving presentation on their research, to making an early first step on the research ladder by publishing work in a peer reviewed journal.

The unsolved and open-ended nature of the problems can result in a more independent investigation compared to typical undergraduate experimental modules, which may present students with experiments with an already well-understood and clear 'end'. Additionally, supervisors of the teams themselves may have a limited knowledge on the problem, provoking students to perform a more in-depth and independent literature review, with supervisors taking a

WE NEED YOU!

Do you have an interesting higher education project? Attracted some funding? Have examples of good practice to share? We need you to tell us! We would love to include your stories in the next edition of the newsletter later this year.

Submissions of around 400 words with images are encouraged. Please contact Emily Brunsdon (emily.brunsdon@york.ac.uk).

more step-back approach compared to the role they may usually take in typical final year experimental modules. The tournament also provokes students to be able to defend their solutions against rigorous questioning and arguments (akin to a PhD viva), which develops their verbal communications skills beyond the given presentation skills students may attain through the traditional curriculum. Furthermore, the marking criteria provided to the jury rewards participants who are able to pinpoint the essential physics and are able to see where a solution can be improved to converge to the true nature and solution of the problem. This pushes students to alter their view of simply 'winning' and 'scoring marks' and instead provokes students to build upon the solutions presented to them through the ensuing debate stage. Students also have the opportunity to trial their writing skills by publishing their work in an impactless spin-out journal called Emergent Scientist ([link to Em. Sci.](#))

In cases where solutions are particularly strong, participant's work has been published in impact-welding journals, such as a notable case in 2016 in Physical Review Letters ([link to paper](#)).

These are but a few of the opportunities and benefits students may gain through participating in the IPT. Anyone interested in joining the next edition or has more questions about the tournament is welcome to contact the IPT organizing team (<http://iptnet.info/contact>). *Mr David Collomb*

HIGHLIGHTS OF THE IOP HEG COMMUNITY MEETING

The May Community Meeting was held in the University of Bristol's HH Wills Physics Laboratory, with a wide range of topics discussed, highlighting the range of dedication and hard-work being put into developing and improving the teaching of physics in higher education.

To start, Mark Jones from the Open University discussed student engagement with online forums established to support project work at the OU. Their research through the Online Team Investigations in Science (OTIS) project looks at how effective online team investigations are to student participants. In his talk he considered how students interact across these forums and how this information can be used to inform the delivery of team investigations in a distance environment.

Following Mark, David Westwood from Cardiff University talked about developing lab modules to encourage a scientific attitude amongst students and combat shallow, process learning. David has changed several features of Cardiff's lab sessions to reduce the initial cognitive load, to enable students to focus on developing as scientists and becoming autonomous learners. David provided some excellent insight into a number of straightforward ways that a lab course can be made into a better learning environment.

Continuing in a theme, Craig McNeile from Plymouth University discussed the delivery of a physics lab module to students studying engineering. His talk described changes introduced to the range of investigations that students were previously asked to do, with the aim of reducing cognitive load and improving student understanding. Now included in the module are some PhET (Physics Education Technology) interactive simulations, and investigations using interrogable sensors within smartphones.

Wendy Sadler from Cardiff University's physics education group followed with 'Teaching science communication to physics students', which described a module designed to develop students' capabilities in disseminating their knowledge. Her talk discussed the need for physics students to be able to talk about their subject in an engaging way to



Snapshots from the May Community meeting showing presenters in action!

a variety of audiences, and so this module requires them to engage with a range of delivery methods such as: presenting a scientific topic to a public audience, producing a magazine article or blog, and pitching a proposal for grant money.

Following Wendy's talk on dissemination, Walther Schwarzacher from the University of Bristol discussed a teaching intervention in which undergraduates mentor a group of high school students in Pakistan through delivering self-developed materials via Skype. This mentoring scheme helps to develop both the high school students' understanding in physics, but also the undergraduates' communication skills and confidence. The close of the talk contained an offer of support for anyone interested in finding out more practical details in establishing international mentoring schemes.

Our final talk of the day was from Richard Lewis, who presented work that he and Paul Roche have been doing in developing the MSc programme at Bristol. Richard's talk described the development of a novel method of delivery of a level 7 undergraduate curriculum, mimicking a traditional research group setup. One of the main features of this development was the focus on co-locating the course tutors with the enrolled students. The work undertaken is problem based, with elements of presenting work alongside developing it. This novel delivery has produced a high proportion of graduates continuing on into PhDs and is now expanding.

The day provided an excellent range of topics describing developments in many areas of HE physics teaching, the slides for all the talks delivered on the day will be available. Please contact the HEG group if you would like any further information on any of the topics. *Dr Alex Crombie*

EPS MEETING BRIDGING THE SKILLS GAP 19 JULY 2019

As well as conveying an understanding of the subject, physics education in the modern Higher Education curriculum provides students with opportunities to develop and practice a host of physics-related skills (such as the ability to represent physical situations mathematically, build models, analyse data, or design experiments), and to acquire graduate-level attributes and capabilities (soft skills such as problem solving, dealing with complexity, and abstraction, as well as group work, communication, and other transferable skills necessary to succeed in diverse professional workplaces).

However, there is a gap between the skills that physics education aims to provide and those skills that are acquired by the students, the skills that are essential to the development of a modern economy and those that our graduates possess. How can we ensure that physics graduates are optimally prepared for work in industry and other workplaces? To what extent does a Physics degree meet the expectations and needs of employers?

This symposium, jointly organised by the Physics Education Division of the European Physical Society and the IOP Higher Education Group, examined some of the skills gaps that arise in modern physics education. Leading national and international education researchers led a range of discussions to explore the most effective ways in which the physics community can work together to bridge these gaps and to provide a modern and relevant educational experience to physics students.

HIGHLIGHTS OF MAKING THE INVISIBLE VISIBLE: ENHANCING LEARNING THROUGH VISUALISATION

The Higher Education Group organised the 2nd "Physics Education for the 21st Century" meeting on the topic "Making the invisible visible: Enhancing learning through visualisation" in London on 8-9 March. This meeting was co-sponsored by the Royal Society.

MEET THE COMMITTEE



I am Emily Brunsdon and I am a committee member of the Higher Education Group. I am based at the University of York where I am a Teaching and Scholarship Lecturer in the Department of Physics. I am an astronomer and particularly an asteroseismologist and I also look after the Astrocampus-our on-campus observatory. I am especially interested in topics in inclusive learning practice in higher education.

Evidence-based innovation in the physics classroom is an important step towards the development of our students as critical thinkers alongside creative and innovative citizens to meet the demands of a technologically and scientifically driven society. Visual representations help scientists to organise complex information efficiently and to discover new information encoded in otherwise hidden patterns. Educational research into such visualisations indicates that they can support problem-solving, enhance learning, and encourage student engagement. However, understanding visual information and linking it to mathematics or to an abstract formulation, or a problem, are challenging for novice learners.

In this conference, the physics community joined physics education researchers and cognitive psychologists to discuss how to bring effective visualisations into their teaching and how best to support learners in mastering visual representations as experts do. Over the two days of the conference, we heard fantastic talks by keynote speakers Andy diSessa and Katherine Perkins who both have led the field over many years of education research. There were many other interesting and useful discussions around the presentations of our invited speakers Nicholas Braithwaite, Caroline Clewley, Ton de Jong, Raimund Girwidz, and Antje Kohnle.

Many participants said in their feedback that this conference changed their vision on teaching and education. Some said that they will try to introduce interactive simulations in their teaching from now on. We are looking forward to organising the third conference in this series in 2021!

SPACE TEACHING PRACTICE WORKSHOP, IOP, LONDON, 8 JULY 2019

The Space Universities Network (SUN) and Higher Education group held the 2019 Space Teaching Practice Workshop at the IOP in London on Monday 8 July 2019.

The meeting explored examples of good practice of university teaching in Space topics. The presentations focused on the Case Studies in the SUN Resource Bank including Fly your thesis (Cranfield), Mars Rover simulation team project (Open University) and GMAT Astrodynamics Mission Simulation (Leicester).

We were also be joined by a representative from ESA to explore the opportunities with the ESA_Lab@Initiative which was established with the aim of intensifying collaboration with Universities. A detailed report will be presented in the next newsletter.

NOTICE OF ANNUAL GENERAL MEETING

Notice is hereby given that the Annual General Meeting of the Higher Education Group will be held at 16:45 on 21 August 2019 at the University of Bristol. The meeting is open to all members and free to attend. More information, including an agenda, can be found at [this link](#).

IOP HIGHER EDUCATION GROUP

Chair: Nicolas Labrosse (nicolas.labrosse@glasgow.ac.uk)

Secretary: Helen Heath (helen.heath@bristol.ac.uk)

Treasurer: Dr Thomas Stallard (tss8@leicester.ac.uk)

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Website: <http://www.iop.org/activity/groups/subject/hed/index.html> (please note this site is under deconstruction)

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For content submissions (news, upcoming events, research stories...) please email Emily Brunsten (emily.brunsten@york.ac.uk).