

Soundwaves, BBCFOUR

In Soundwaves, the Symphony of Physics, Dr Helen Czerski investigated the extraordinary science behind the sounds we're familiar with and the sounds that we normally can't hear. She begins by exploring the simplest of ideas: what is a sound? At the Palace of Westminster, Helen teams up with scientists from the University of Leicester to carry out state-of-the-art measurements using lasers to reveal how the most famous bell in the world - Big Ben - vibrates to create pressure waves in the air at particular frequencies. This is how Big Ben produces its distinct sound. It's the first time that these laser measurements have been done on Big Ben. [Watch Soundwaves here.](#)

**BBC Radio 4: Mars**

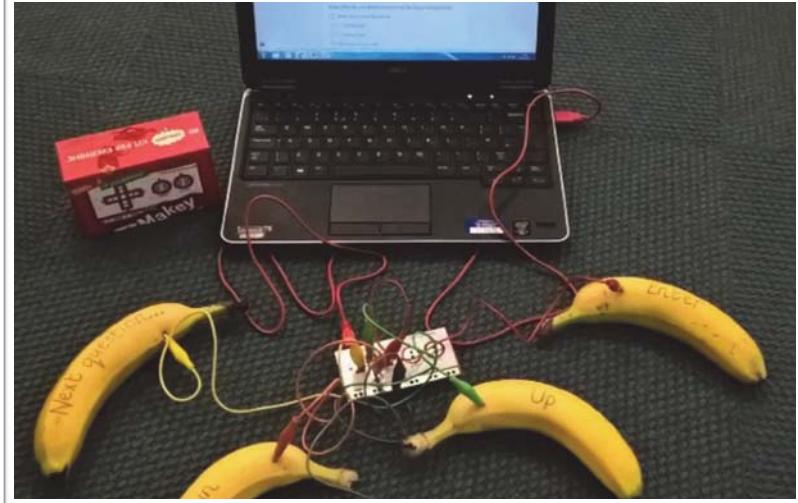
A season of programmes from Radio 4 and Radio 4 Extra exploring the Red Planet of our dreams and, maybe, our futures. [Find out more here.](#)

Women @ Imperial Week

[Women@Imperial](#) is an annual



celebration of the achievements of Imperial's female staff and students. The week is centred around International Women's Day (Wednesday 8 March 2017) and helps raise awareness of the support the College provides for women. For the last day, we invited 150 school girls from across London



Designing your evaluation tool around your audience, activity and location is an important skill covered in the Outreach Toolkit training. The event, "Gastrophysics" was an evening of food and drink themed demos and talks from physicists held with the Institute of Philosophy at the Being Human festival. By linking up food items with a [Makey Makey](#) board and using them as a keyboard to control input into a form, the evaluation became a popular activity at the event itself, with people queuing up to use it!

Launching the IOP Outreach Toolkit, [Hannah Renshall](#) [@HannahRenshall](#)

The beginning of March saw the launch of the Outreach Toolkit, an online resource full of activity ideas, risk assessments and guidance along with training sessions delivered by me, the relatively new IOP outreach officer.

I joined the IOP less than six months ago, having worked firstly as a medical physicist at the Christie NHS Foundation Trust and then two years running outreach & engagement activities for young homeless people as a support worker. I have also volunteered with ex-offenders and mental health charities and so for me, this job is the dream combination of physics and the skills I learnt working with hard-to-engage groups.

These skills are important because the IOP wants to increase participation in its outreach activities, with a greater focus on building science capital. That means engaging with groups that are traditionally harder to reach in science communication such as geographically isolated communities and those from lower socioeconomic backgrounds.

The Outreach Toolkit is the tool that the IOP aims to empower its membership with to deliver high quality outreach. The training session in particular focuses on how to reach and engage with different audiences through thoughtful venue and activity selection, as well as partnering with organisations that already work with the target audience. For example, we have an upcoming project with a community group near our new building in King's Cross called the Copenhagen Youth Project. This organisation works with young people aged 11-24 who are or are at risk of becoming NEET (not in education, employment or training). Along with colleagues in the IOP Education department who also have prior experience of working with this audience, the material in the Thinking on our feet: Football and physics resource, originally intended for teachers and students, has been heavily adapted and will be run in the organisation's existing football slot in their timetable of activities.



Amazing Science of Gravity

Professor Jim Al-Khalili and a team of physicists and volunteers will conduct a series of experiments and demonstrations to reveal how the laws of physics can tell us where to go in the country to weigh less, and how the rate at which you age is affected by gravity and the speed at which you move about.

The programme is accompanied by a special smart phone app called Time Warper, developed by scientists at the University of Surrey. The Surrey University app will show the different rates at which time flows across the country. Users will be able to see just how much their personal clock is affected by Albert Einstein's theories of special and general relativity, with the results being used to create a special time flow gravity map of Britain to be revealed during the show.

For the documentary, Professor Al-Khalili will visit the LIGO interferometer telescope in Louisiana where gravitational waves predicted by Einstein a century ago, were detected for the very first time earlier this year. Among the classic experiments repeated during the programme, there will also be a studio based demonstration with metal balls, ramps and water clocks to recreate Galileo's first ever experiments on gravity.

[Find out more here.](#)

Another great example of working in partnership with organisations is one of the projects funded through the IOP Public Engagement grant scheme where the BME Housing Consortium in Wolverhampton ran 10 workshops with a learning disabilities support group, a knit-and-knatter group, a mental health support group, and a south asian men's support group. The training includes guidance on how to apply for these grants, creative ways on evaluating projects as well as lots of other useful tips and tricks when it comes to event admin and managing volunteers.

The first Outreach Toolkit training session with students at Imperial College London was a great success, with everyone who attended stating that they were inspired to get involved with outreach and many signing up to run their own IOP stand at the Lambeth County Show in Brixton this July. The plan is now to offer the training to branches, student societies and groups of members so if you're interested in attending or coordinating your own session then please do get in touch by emailing engagement@iop.org

Hannah is the IOP Outreach Officer. She looks to empower membership to deliver high-quality and engaging outreach to promote physics and its value in our society to a wide range of audiences, by building on past experiences of working with marginalised groups such as young homeless people and ex-offenders. Hannah is beginning to organise a new annual national Outreach Conference specifically for those involved in physics outreach. She is also lead on the Volunteer Project which aims to improve the experience of volunteering at the IOP and increase the engagement of its membership through volunteering.

Young Scientists Journal, *Christina Astin* [@ChristinaAstin](#)

The Young Scientists Journal has been going for ten years, during which time 19 issues have been published. As the world's only peer-reviewed science journal written, edited and produced by 12-20 year olds, Young Scientists Journal allows students to enter into the world of scientific publishing and journalism like never before. Publishing teenagers' science research allows them to join the ranks of published scientists whilst still at school, and encourages others to undertake science research projects.

As a physics communicator you may have contact with school students in your work, perhaps as a research link or teacher? Don't worry if not: there are still plenty of ways you can support the work of the journal and help to inspire and motivate school students in physics and STEM.

Read Why not refer students to the Young Scientists Journal for reading and research, inspired by reading authors who are their own age? And we have a strong social media following on Twitter, Facebook and Instagram.

Write Students can submit original research or review articles for publication. These might have originated as a piece of research you are helping them with, coursework, a CREST award or just a good piece of homework. Writing and referencing skills benefit; being a published author enhances university applications. It's easy to upload articles online.

Join the Team Opportunities for talented students include editing, web development, marketing, design, news journalism, social media and much more. Working on a real journal with a team across the globe helps develop a unique skill set and looks great on a CV or university application. Your students should contact: jointheteam@ysjournal.com

Events Our fourth annual conference will be held on 12 October 2017 at Queens' College, Cambridge. Students and scientists come together for lectures and poster presentations. Find out more at events.ysjournal.com. Tickets are free for state schools. Would you like to help us run the event, or adjudicate posters?

Hubs Some schools and universities have become Young Scientists Journal hubs; places where students can meet together regularly to help run aspects of the journal, including editing, social media and more, with the guidance of an adult. Hubs help to ensure continuity across generations and enable students to achieve more by working together. Could your school/university/research institute bring students together in a YSJournal hub?

Ambassadors Teachers and professional scientists can support the journal by becoming

ambassadors. Ambassadors help spread the word of the journal, encouraging young people or other teachers to get involved. Some ambassadors are advisers or mentors, supporting us with expert reviewing, marketing, social media, web development and other areas. Could you give us a shout-out, advise on IT/fund-raising or mentor student editors?

Funding We rely entirely on sponsorship from businesses and educational grants. Let us know if you can help us access funding.

Please get in touch if you'd like to find out more or get involved. This film will give you a flavour of what we're about: www.ysjournal.com/about-us.



Digital Communication, Sam Illingworth, [@samillingworth](#)

I was recently asked to participate in a podcast for Digital Science, where I talked about my experience and research in Science Communication. It was a very enjoyable experience, and the podcast can be [listened to here](#). Digital Science are a technology company that serve the needs of the scientific research community by providing tools and support to researchers in many different disciplines. Their portfolio includes Altmetrics, Overleaf and figshare, and they also organise many different events to promote public engagement (including a regular podcast and several blogs). Participating in a podcast is an enjoyable and effective way of communicating to a potentially large and diverse audience, and the fact that they are not (usually) recorded live means that any slips-ups or embarrassing brain freezes can be edited out in post-production.

I would strongly encourage all researchers to try and get involved with this form of science communication, by either contributing their services to an existing podcast or setting up their own. It may seem like quite a daunting task, but the rewards – which include improved self-confidence, scientific synthesis skills, and even editing techniques – mean that it is definitely worth it! Even if you don't have the time to set up your own, then I would recommend listening to some of the excellent science podcasts that already exist. If you like what you hear then why not send a message into the producers / presenters offering your services, as a lot of them will be very happy to speak to new experts on a wide variety of research topics. Listed below are five alternative science podcasts (I have tried to avoid the podcasts that EVERYONE knows about) to get you started with, in addition to the Digital Science podcast:

• **The SciComm podcast with Dr Mike O'Grapher**- Mike presents a personable and informative podcast in which he speaks to a large number of scientists and public engagement experts about the science that they love.

• **The Jodcast**- A podcast about astronomy from the Jodrell Bank Observatory that includes the latest news, what you can see in the night sky, interviews with astronomers and more.

The Anthill - A podcast from The Conversation UK that unearths stories from the world of academia.

The Story Collider - Uplifting, passionate, funny, moving, and heart-breaking stories about science told by people from all backgrounds and all walks of life.

The Neutrinos Are Mutating - A podcast that explores the science fact behind your favourite science fiction (DISCLAIMER: This involves me!)

SAVE THE DATE!

Communicators Group Summer Meeting:

Physics & Politics

at the Institute of Physics, 76 Portland Place

Friday 9th June

13:00 - 17:30

Interview: Meriame Berboucha, [Meriame Berboucha, @MBerboucha](#)

(If you think you are exciting/ want to share your story, get in touch! We would love to interview you for our next newsletter: jessica.wade@imperial.ac.uk

What is your job?

I'm an MSci physics student at Imperial College that has a passion for science communication. I've caught the physics bug and I want others to catch it too!

As part of my masters project I am mimicking astrophysical scenarios in the laboratory. More specifically, I'm looking at the interaction of bow shocks in plasmas to find out more about their dynamics and explain what we see in Herbig-Haro objects (nebula associated with newly born stars).

Recently I've become a co-producer for the [Science Mixtape radio show](#). Every Saturday at 10am you can tune into Soho Radio where you'll be able to hear the story of a special STEMist!



What does this involve (in ten words or less)?

I recreate the conditions of space in the lab!

What is your physics background?

MSci Physics degree from Imperial College London.

What is your proudest physics-related achievement to date?

Being the first international undergraduate to intern at the Linac Coherent Light Source at the SLAC National Accelerator Laboratory in California - it was beyond awesome!

How important do you think outreach and public engagement are in your role?

I think it's very important to reach out to the public and inspire the younger generation into STEM. If we can get more people interested in STEM, we will be more likely to get more scientists solving real world problems like finding a solution to our energy problem.

What is the biggest challenge that physicists face in communicating their subject?

Trying to connect the physics that they do in their research/job to everyday objects or scenarios that will resonate with the audience.

Do you have advice for any physicists wanting to get more involved in outreach and public engagement?

Enthusiasm is contagious – don't be afraid to show how exciting science is for you! Start off small with something like a talk at a school, then go on to bigger things like volunteering for science events and then even hosting your own event!

Which social media platform do you find to be the most effective for communicating physics, and why?

I think Twitter is very strong for science communication, because sometimes just a simple hashtag can connect so many people together. For instance, the recent #ActualLivingScientist hashtag allowed for so many people to become aware of all the cool science jobs out there!

Where can people find out more about your work?

You can find out more about me and what I do on my website: www.meriameberboucha.weebly.com - you'll also find all my social media links there too where you can see live videos of me working in the lab and the articles I've written for magazines.

Who is your favourite physicist (living or dead), and why?

Richard Feynman because he broke down physics in such a simple and pictorial way which is ideal for science communication. He had an incredible passion for the subject that was contagious and he also played the bongos!

Physics For All

Niamh Kavanagh

Tyndall National Institute, UCC, Cork



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Abstract:

Science is our path to discovery, understanding and even survival. Society needs new scientists all the time, so we need to foster positive attitudes within society towards science. However, within science itself, I think there is a need to foster positive attitudes towards Physics. Physics suffers from the unfortunate stereotype that it is "boring, difficult and not relevant to real life". My goal is to give people a positive impression of Physics to counter that stereotype. More Physicists need show the public that Physics is interesting and improving their lives and to show young people, especially, that Physics is for all, if you're interested you can fit in and find a career, because society needs new Physicists too. So, what can we do?

Figure 1: Top 3 Influences Affecting College Course Selection

(Base: All undergraduate students – 2,000)

	Human Influences				Functional Influences			
	Sex	Not Sure	Male	Female	Sex	Not Sure	Male	Female
Felt I would fit in	62	61	63	59	65	65	49	60
Parents	20	19	21	17	22	28	27	30
Teachers/Guidance Counsellor	15	13	17	13	18	22	25	23
Friends advice	7	7	7	9	6	15	18	14
Careers talk at school	7	6	8	7	7	17	15	18
Social life	6	5	6	6	5	3	3	4
Famous person/role model	5	5	5	6	4	3	3	2
Friends were going	2	2	2	2	2	2	2	2

Source: SFI Discover, Smart Futures, STEM Research report (Dec. 2014) conducted by Amárach Research.

2000 students (mix of STEM/ Non-STEM/ Male/Female) were surveyed in nine universities & colleges across Ireland.

Students want to know they can fit in & find a career



Talk to students to inspire future physicists & improve your communication skills. If you are a part of a larger organisation that is looking to get involved in more Outreach, Smart Futures can come to you & train your volunteers!

As part of Smart Futures volunteers will:

- Receive training
- Visit students in their classroom
- Showcase their career pathway and involvement in the STEM sector in the classroom and online
- Get involved in career events during Science Week

How to get involved?

- Contact us at smartfutures@outlook.ie 01 801 3035
- Visit www.smartfutures.ie



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Take part in national competitions like Famelab & Thesis in 3 or inquire about local competitions. You'll get better at public speaking & you could win a cash prize!



Give people a positive impression of Physics by showing them that Physics is interesting and/or improving their lives.



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'As people use the internet more and more we need to keep a step ahead'

Niamh Kavanagh is a second year PhD student at Tyndall National Institute, University College Cork, and the Irish Photonics Integration Centre.

Science communication gives you more exposure & increases public awareness of your research. It can give you a great network & present lots of unique opportunities.

Research is supported by the Irish Research Council (under award number GOIPG/2014/637) and Science Foundation Ireland grants 10/CE/I/1853 (CTVR-II) and 12/RC/2276 (IPIC)

Peter & the Wolf: Music, Science and Ten Year Olds

@ICOOutreach

From robot wars to compulsory coding sessions, primary schools have become transfixed by technology. Imperial College is leading the way; working with Tig Tag World to develop a free primary CPD for STEM, and developing interdisciplinary partnerships under the guidance of artist Silje Andersen. The Peter and the Wolf project was developed in collaboration between the Imperial College London (IC), The Royal Albert Hall (RAH) and The Royal Veterinary College (RVC) to try new models for engaging primary school pupils with science and music.

As with all good experiments, we had aims:

1. Give insight and access to 3 world-leading institutions and the professionals who work in them, inspiring further curiosity in science and music.
2. Students to see Higher Education as being achievable and desirable by acquiring knowledge outside and across the school curriculum.
3. Sharing some of the wonder and expertise the institutions house, allowing students time to explore and experiment with their ability to analyse, interpret and communicate. These are key skills across each discipline of science and music.

Once a week during the spring term workshops will take place in school and at partner institutions. The first was held at the prestigious RAH Elgar Room in January, where Y5 pupils from St Thomas' CE Primary School in Ladbroke Grove were introduced to the music and story of Peter and the Wolf. This workshop was led by the RAH Education & Outreach ensemble, Albert's Band. The pupils then took part in a music workshop led by Mike Proyser (physicist and tuba player) where they were encouraged to experiment with sound and discover how rhythm, pitch and the quantity of instruments playing together can be used to create different expressions and tell stories.

The RVC and IC embedded their workshops with the school's science topics of 'Forces' and 'Heritage and Evolution' and delivered the workshops in collaboration with musicians from the Royal Albert Hall.

IC physicist Dr Jess Wade introduced the children to forces in music and encouraged discussion around 'What is a sound?', 'How does sound travel?', 'What does a sound look like?' The children also had a chance to make their own musical instruments and play with a professional bassoonist. Before the Easter Holidays, the students will visit IC, where they will further investigate the science of symphonies. In preparation for the final performance in their school assembly, they will also have the chance to make their own puppet theatre of Peter & the Wolf.

Dr Grace Sim from the RVC led workshops covering heritage and evolution. At their visit to the RVC, children found examples of herbivores and carnivores in the museum and compared the position of their eyes, the shape of their teeth, and the features of their legs. The students then related these observations to where they live, what they eat and how they move. Whilst IC may have a Rubens' tube, the RVC have live cattle: and the visiting year 5s listened to their heart rates and compared them to their own. This was in preparation for investigating the relationship between heart rate and music tempo back at school, trying to answer the question: is there a link between an animal's average heart rate and how it is presented as rhythm in Peter and the Wolf? The project will conclude with a performance at the school on 5 April 2017.

Some notes:

- This is a pilot project, funded from institutional (RAH, RVC and IC) support.
- Feedback from the school so far has been overwhelmingly positive with noted interest from nearby primary schools. Continuation depends on overall feedback, interest from the partners and the availability of continued funds.
- At the visit to the RVC some parents were able to attend. This was perceived as a positive initiative from the institutions' point of view and one which will be encouraged moving forward.

The school was selected based around the following criteria:

- The school should be considered a Widening Participation school. On primary level this is mainly assessed on the school's percentage of children on Free School Meals.
- The school should preferably be based in the White City area close to Imperial's new Maker Space.
- The school should preferably have existing links with one of the institutions, show a strong interest in the programme and with known ability to give frank but constructive feedback to enable the programme to fully develop.

Hypatia Hub

@sciencecentres

The UK Association for Science and Discovery Centres (ASDC) is leading Hypatia in the UK. A vibrant meeting took place on 8th March 2017, International Women's Day, inspired by the Hypatia vision of a European society that communicates science to young people in a gender inclusive way, in order to realise the full potential of both girls and boys. Over 60 organisations dedicated to making a difference came together on the day. Individuals included politicians and government, teachers, STEM industry professionals, science centres, media representatives, national activists and teenagers themselves. The motivation for the meeting was to bridge the research-practice gap for science educators working under limited time and resources and to work together towards a national strategy for improving gender inclusion across formal and informal STEM education settings.



Organisations shared current research and successful projects, discussed the influences of science educators, parents and role models in society and the media, and joined to debate which evidence based approaches are easy, practical and useful for STEM educators. Every individual pledged to make personal and organisational changes to improve gender inclusion. Those consenting will be contacted in 6 months' time to see whether the research presented and inspiration provided on the day can realistically translate into a change in practice.

For more information about the project, please contact the Hypatia UK Project Director Shaaron Leverment s.leverment@sciencecentres.org.uk.

Amazing Atmospheres

The Institute for Research in Schools (IRIS) allows secondary school students to contribute to authentic scientific research. In the past year, IRIS has worked with 282 schools, countless scientific researchers and at least two astronauts. Feynman once said, "The imagination of nature is far, far greater than the imagination of man"- at IRIS, we believe the imagination of young people is the greatest of them all. Through their connections with IRIS, school researchers across the country are collecting, analysing and interpreting data to answer the scientific mysteries of the world around them. Free from the constraints of the Research Excellence Framework, school students are bold, creative and prepared to take risks. IRIS supports teachers, who in-turn support their students to make their own discoveries. Through bespoke accredited CPD programmes, downloadable classroom material and dedicated staff we empower teachers across the UK. We are developing our opportunities across a number of programmes including space science, particle physics, material science, transport, marine science and biomedical science. As well as inspiring the scientists, engineers and scientifically aware citizens of the future, teachers can reconnect with their subject and rise above the constraints of teaching to the demands of exam boards. Professor Larry Pinsky from the University of Houston says that it is like the Institute for Research in Schools "are playing at being NASA or the European Space Agency; only they're not playing, they're doing the real thing".

The ExoMars Trace Gas Orbiter is currently searching for the signature of gases that make up the atmosphere of Mars. Before the robotic rover touches down in 2020, the trace gas orbiter will search for the presence of certain gases that could indicate biological or geological activity.

That is all good news for space scientists who want to understand more about Mars. But what is happening to our atmosphere on planet Earth? We are undergoing a population increase like never before, and by 2050 three quarters of the world will live in cities.

Amazing Atmospheres offers school students the chance to be part of the ExoMars Mission. Students are asked to evaluate the atmospheric gas content of sites across the UK, detecting seasonal changes in the composition and temperature. Data analysis from all of the schools and colleges involved in this programme will be collated with the aim of understanding the changing molecular make-up of our local environment. The composition of the atmosphere has implications on climate change, air quality and public health.



Film Stars: *Rebecca Middleton, @icfons*

Secondary school students, their teachers and parents will travel to South Kensington from across Greater London on 22 March to take part in the Imperial College Schools Science Competition Grand Final.

The competition, run by the Faculty of Natural Sciences and now in its third successful year, aims to motivate school students to engage with science and innovation, to encourage them to work together as part of a team and to engage them in a fun activity that is motivated by their curiosity and drive.

This year's challenge called on teams of students from secondary schools across London to identify an everyday problem that directly impacts society and to come up with a new and innovative scientific solution to tackle this problem.

More than 50 teams entered this year's competition, and 9 teams have now been shortlisted across three age categories and have been invited to come to Imperial for the showcase event to be held in March. At the event, the teams will present their projects to a panel of judges, including Professor Lord Robert Winston, Professor of Science and Society and Emeritus Professor of Fertility Studies; Dr Simon Foster, Outreach Officer from the Department of Physics; and Helen Sharman, from the Department of Chemistry and the first Briton in space.

XMaS Scientist Gala: (*Xray Material Science Facility, not the festive season!*)

Greycoats Hospital School @XMaSSchoolTrip

January saw two XMaS Scientist Galas: an evening extravaganzas highlighting inspiring careers and exciting science held at the University of Warwick and the University of Liverpool. Students explored hands-on demos, heard from professors, staff and students at the universities as well as going on a virtual tour of ATLAS at CERN. Students who went on a summer school to Grenoble shared their experiences of the visit and the inspirational scientists they met there.

Students from Greycoats Hospital School, Westminster, made the trip up from London. Here's what they had to stay

Our trip to Warwick University was an interesting one. Travelling on our own to outside London was definitely an interesting insight into what our university lives might be like. Upon arrival, we looked around to see the area surrounding the university, mentioning what was good and what was bad, and are keeping these in mind for when the time came for us to find a university.

At the university, we got a mini tour of the campus and got a feel of what student life was like, asking the students there questions. We also went to listen to some lectures about physics; learning more about the Hadron Collider, women in science, and many other fascinating things. However, we all noticed a lack of girls at the event, but this made us all more determined to go into the STEM field and change this.



Whilst there, we also went to many stalls that were set up by different companies and societies, and asked more questions not only about what we'd learnt in class, but also to broaden our knowledge; how do hand warmers work? We also got to see the planets, and see a mini show, inside an inflatable planetarium!

After a very long evening, we went back home, filled with inspiration and ideas for the future.

#GirlsInSTEM? Change the policy, not the physicists, *Dr Claire Murray, @drclairemurray*

As a chemist, I know I am on very dangerous ground reflecting on anything in relation to physics policy. I come from the science of crystallography where there is a long line of high profile women physicists, so I hope you will consider what I have to say on the issue of physics policy in relation to secondary education for girls. As a young girl in an all-girls secondary school in Ireland, I loved physics and chemistry- but was told that there were not enough girls to run a physics class.

Physics had a reputation of being ‘difficult’ and my ambitions to study the subject were further thwarted by the fact some of my science teachers were less confident teaching physics out of the three other sciences at Junior Certificate level (akin to GCSE). Move on a few decades and it is desperately sad to think that young girls are STILL turning off because their teacher isn’t comfortable with the subject, they think it is boring, they think they are not smart enough or they aren’t even being given the opportunity to study it. This is clearly evident in the fact “a shocking 46% of schools in England sent no girls on to study A-level physics in 2011”.(1)

The fact remains that only 21% of A-level physicists are female compared with 48% for chemistry and 39% for maths.(2) It is all very well philosophising on why and how this has happened to physics, but the critical thing is what next for physics. There are a lot of physics teachers and physics-centric science communicators doing amazing work, who are genuinely helping. However, I think the ‘what next’ needs to be more systematic- we should return to where this problem begins. This is where a radical overhaul of physics education policy could make huge changes. Confidence is the key, and there are two main groups of people that I think would be enable physics uptake for girls.

The first group is non-subject specialist science teachers at GCSE level, who need more support and confidence to deliver physics in a way that can capture a student’s attention. Before I go any further, I think it is vital to state that I am not suggesting that we pile more onto to the plates of secondary school teachers, who are doing amazing work already, even under their enormous workloads. However, support for these teachers to help them deliver the physics curriculum would greatly help both student and teacher alike. It is also well accepted that more physics-specialist teachers are urgently needed to ensure that students have access to physics at all levels. (3)

The second group of people who could majorly benefit from reworking physics policy are the parents and carers at home. They are often overlooked from outreach and support policies, yet they have an enormous impact on the decisions girls make. Many parents and carers have not studied science beyond GCSE and so they leave secondary education thinking physics is ‘difficult’ or too complex for them. The effect of low ‘science capital’ in the home,(4)(5) can lead to a very real danger that propagates the myth that physics isn’t fun, or physics is scary or physics is only for boys to their children. Despite great teachers, awesome outreach and celebrity scientists on television, the problem never goes away- it just continues in a bitter circle. What is worse is that some of these parents go on to be policy makers themselves, and if they don’t have fond memories of physics lessons, they are unlikely to make policies that will benefit physics. By no means should we ‘dumb down’ physics- but I do think the world would be a better place if more people were less scared of the subject. Studies show that “girls who maintain science or STEM-related aspirations over time tend to be from middle-class backgrounds and largely possess high or medium levels of science capital.” (4)(5)

The big challenge here is how we reach the parents and carers to engage them with physics and more generally in science. The IOP has some fantastic talks which are open to the public, but I do wonder how many of the not-already-interested section of society actually attend these talks? I think physics policy should target this group by finding new ways to engage them. Easy enough to suggest, but much harder to execute- funding that will not see results for a very long time and innovation in terms of event design. There are some fantastic examples such as the work of Think Physics North East (now NUSTEM) who give pupils a postcard with URLs and images to share at home after workshops. (6) Creating these ideas requires us to challenge ourselves as science communicators and it requires a step change in how physics outreach policy is developed. But if we build a society where all sections are engaged with the excitement of physics, then surely it is worth it? We will all be better off and future Claires aged 14 won’t have to choose to do another subject instead of physics?

(1) https://www.iop.org/education/teacher/support/girls_physics/file_58199.pdf

(2) https://www.wisecampaign.org.uk/uploads/wise/files/WISE_UK_Statistics_2014.pdf

(3) <http://www.gatsby.org.uk/uploads/education/reports/pdf/the-shortage-of-physic-teachers-an-infographic1.pdf>

(4) <https://www.kcl.ac.uk/sspp/departments/education/research/aspires/aspires-final-report-december-2013.pdf>

(5) Science capital is defined in the report as follows: ‘Science capital refers to science-related qualifications, understanding, knowledge (about science and ‘how it works’), interest and social contacts (e.g. knowing someone who works in a science-related job).’

(6) <https://nustem.uk/about/>

Sharing Best Practise, *Dr Weller, St Paul’s Boys School*

Science and science communication are not separate; science communication is a crucial part of science. The Research Councils UK recognise this in their Pathways to Impact [RCUK]; the Royal Society recognises this in their partnership grants, where they ask the question “Do you have a great idea for bringing research alive in school?” [RS]; and the IoP recognises this in the training they provide for members through Graphic Science and Science Made Simple, and their Science Communications group.

As teachers we recognise this, and at St Paul’s School (and many other schools) we are teaching science communication alongside our teaching of science. We often set homework with responses in the form of posters, journal articles, videos and talks, as well as study, reading, explanations and calculations. These all feed into our students ability to do science, and to communicate science.

Our course in physics is interwoven with science communication, but we also do a lot of outreach. Why? Let's take Tim Peake's comments about becoming an astronaut: "the best chances of success are to have a solid foundation in the core sciences... but there really is no single route to becoming an astronaut... it has more to do with being passionate about what you do and being as good as you can be". A solid foundation in the core sciences is delivered by a great science team. When they are supported and inspired they are passionate about what they do. This influences their students more than anything. Passion spreads and outreach is a great way for students to put their passion into practice doing science communication.

Interested to find out more? Here is a taster of what we do at SPS:

We regularly attend scicoms events with a team from the Natural History Museum. Thanks to them our students present our Atomic Force Microscope and our Scanning Electron Microscope at the annual Lyme Regis Science Festival and Science Uncovered. We run a residential summer school for 14-15 year olds called "The Magic of Materials" in partnership with the Institute of Materials, and the Worshipful Company of Armourers and Braziers, and Saturday schools in a similar vein. Our SPS Space group, developed by Steve Patterson, enter the ESERO CanSat competition, the BalloonSat competition, and some of our own students have developed their own high altitude balloon launch scheme. This year we hosted the International Science Conference for students, where one student was "blown away by the fascination of the topics discussed from students all around the world". Our Halley Research Community is an active society of students interested in research in schools, and they are involved in running the Institute for Research in Schools (IRIS) and the Young Scientists Journal (YSJ) as committee members and editors. We as teachers aim to run our science department like an academic department - and we are almost there.

In 2009 President Obama called for more scientist involvement in education. He challenged scientists to use their knowledge to think about creative ways to engage young people in science and engineering and to improve student achievement. That is why I became a teacher.

"to be truly successful at engaging children, scientists must be... trained to teach and communicate with the public" [Nature Editorial]. So when should we start training our scientists to communicate? NOW.

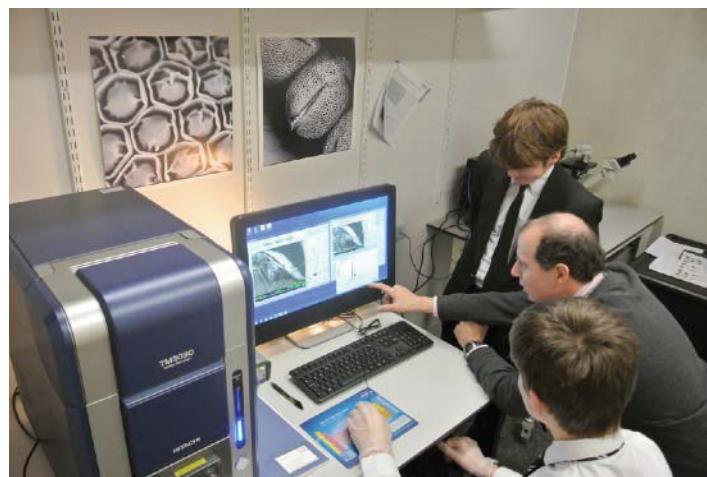
Ma Vie en France! *Niamh Kavanagh, @NiamhTalking90*

This story follows from the poster on page 5.

The week of international scientific young talents in Paris was created as a birthday celebration of two combined scientific institutions in Paris. Universcience brings together the Cité des sciences et de l'industrie (30 years old this year) and its big brother Palais de la Découverte (grand old 80 this year). The aim of Universcience is to spread knowledge and love of science today and to promote scientific and technical culture. To celebrate these fantastic institutions and promote them on an international level, 42 passionate young researchers and science communicators from 26 different countries were invited to come to Paris and take part in a jam-packed week-long programme of events. I was one of those lucky people, along with two other Irish people.

Our first event was on Sunday evening and I think it set the tone for the week very nicely; inside the 360° globe screen of the Geode we watched the fantastic film "Beautiful Planet" made by NASA about the International Space Station (ISS). As we saw the earth from the amazing vantage point of the ISS, we each got to see our countries as a small part of the relatively small planet carrying us all through the vastness of space. With awesome visuals and inspiring words from the astronauts, it conveyed the message that science is a global effort and by working together and supporting each other we can achieve truly amazing things.

On Monday, we got the opportunity to explore Universcience while it was closed to the public. I was absolutely astounded that they had such a large facility completely dedicated to science communication. It's so big that you could fit the Eiffel Tower lying down and it's full of fun science exhibitions, interesting information and interactive equipment explaining everything from rocket science to architecture of the middle ages. A massive solar powered plane with wing-span of 73m hangs from the roof. There's eye-catching things every way you turn. It really brings out your curious inner-child. It was brilliant then when we got the chance to really embrace that and explore the Cité des enfants which was packed with science disguised in so many fun forms for children aged



The SEM lab at St Paul's School. A dedicated lab including optical microscopy, a data analysis computer and SEM sample preparation equipment.





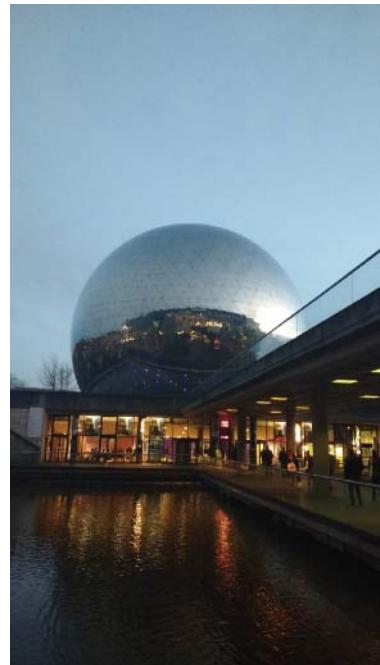
Irish representatives at the week of international scientific young talents in Paris (left) Niamh Kavanagh (myself) of Tyndall National Institute, UCC, Cork (centre) Fiona Freeman of Trinity College Dublin (right) Padraig Flattery of Maynooth University, Kildare

able to openly discuss these topics with other young people from all over the world, I was left feeling very hopeful for the future of women in science.

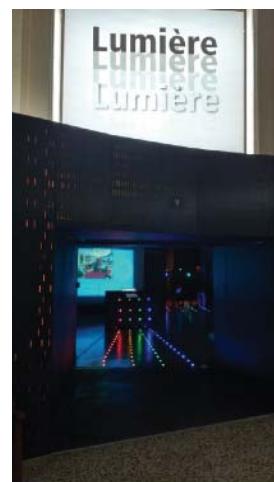
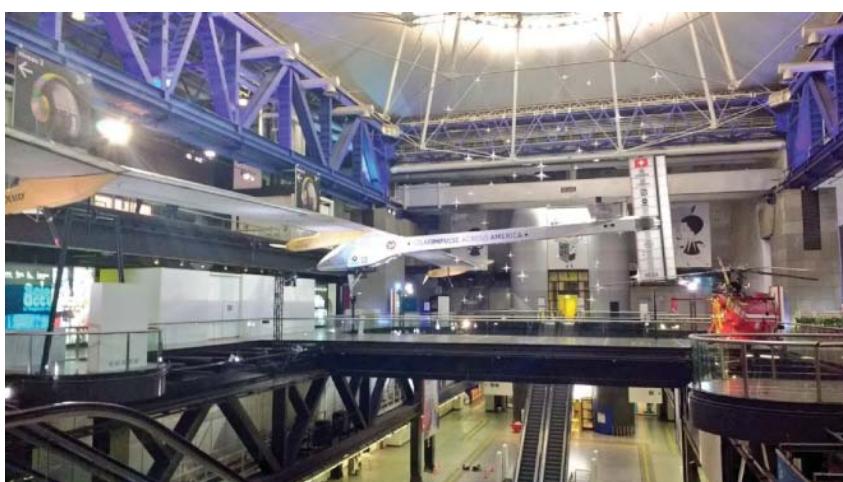
On Wednesday we were shown around the Palais de la Découverte, a proud promoter of Physics. Their exhibitions on Sound and Light were some of the best I've ever seen. We were then treated to a shocking electricity show by a very enthusiastic Physicist. That afternoon we each had three minutes to present our work to the attendees and French officials. I talked about my research into new types of hollow-core fibres that could carry more information, faster than we've ever seen! We closed the week by soaking up some French culture. We had dinner in the Petite Salon of the Musée d'Orsay which is home to various beautiful works by Monet and Van Gogh. We looked into the past, present and future of humanity at the Musée de l'Homme and the abstract shapes and random colours of the icons of modern art were translated to us at the Fondation Louis Vuitton where we got a private tour of the Shchukin collection which includes works by artists such as Picasso and Gauguin.

The week of international scientific young talents in Paris really was a once-in-a-lifetime experience for me. It was so encouraging to find out that there are so many other people all over the world that are passionate about communicating science and inspiring future scientists. There are talks among those of us who attended of continuing collaboration in the form of an online journal, so keep an eye on this space! Next time you visit Paris, I would highly recommend adding some of these places to your sight-seeing list, I will definitely be returning in the future as I feel as though I've only scratched the surface of what's on offer!

2-12. Everything was colourful and was designed to be pushed, pulled, taken apart, jumped on, turned around, rearranged and/or plugged in, anything to spark curiosity and inspire investigation. It was great to have a professional excuse to mess around and play with stuff! On Tuesday, we visited the L'Oréal labs, L'Oréal does so much work supporting women in STEM and promoting female talent, a cause very close to my heart. We started the day with some sobering statistics; for instance 67% of Europeans think that women do not have the necessary capacities to take on high-level scientific jobs. On top of that, people tend underestimate the problem in general, for example women are believed to hold 28% of highest academic offices in science subjects in the EU when, in reality, that number is 11%. We did workshops and talked about how we could tackle these issues. It was great to be



La Géode is a mirror-finished geodesic dome of 6000 steel triangles that holds an Omnimax theatre at the Cité des Sciences et de l'Industrie in Paris



The Solar Impulse plane is 73m long, weighs as much as a car and can fly day and night powered by the Sun. Palais de la Découverte exhibitions on the universe, light & electricity,



Presenting my research about optical communications, Le Petit Salon of Musée d'Orsay, venue for closing dinner of the week of international scientific young talents in Paris

STEM for Britain, National Physical Laboratory

The National Physical Laboratory's Nicholas Hillier and Sebastian Wood were selected from hundreds of applicants to present their work at the [STEM for Britain poster competition](#) hosted in the Houses of Parliament on Monday 13 March 2017. The competition allows early career scientists, engineers and mathematicians to exhibit their research in Westminster and engage with Members of Parliament. Nicholas presented [Additive Manufacture of Recycled Permanent Magnets: The Realisation of a Greener Future](#) in the Engineering section against 59 other very talented young engineers. The topics ranged from engineering stem cells to nuclear decommissioning to driverless cars. The poster covered the work NPL are delivering as part of the [H2020 project REProMag \(Resource Efficient Production of Magnets\)](#) which is looking to additively manufacture rare-earth permanent magnets from recycled materials. The work was greeted with interest from Professor Mary Ryan FREng of Imperial College and from a number of the other engineers.

Sebastian presented [Nanometrology: Underpinning the Future of Electronics](#) in the Physical Sciences session – highlighting the measurement challenges faced by the nanoelectronics industry and some specific ways that NPL is addressing these issues. There was particular interest in the use of Raman spectroscopy for measuring the orientation of molecules, which is a critical parameter for molecular sensors with medical applications.

#OutInSTEM: How to be an LGBT ally, *Joby Razzell-Hollis*

@Jobium

We are currently living through a [time of unparalleled acceptance](#) of lesbian, gay, bisexual, transgender (LGBT) people in the Western world, but has that progress been reflected in science, technology, engineering, mathematics (STEM)? For LGBT Pride Month this June, physicist/chemistry Joby will blog for Digital Science about being Out in STEM, but we physicists are an impatient bunch, and he has created us a great step-by-step guide. Please get in touch if you would like versions of this to use as posters in your labs or classrooms. Joby (or Dr Joseph Razzell Hollis) has represented the IOP at a number of events promoting inclusivity and diversity across all levels of STEM.



This newsletter is also available on the web and in larger print sizes.

The contents of this newsletter do not necessarily represent the views or policies of the Institute of Physics, except where explicitly stated. The Institute of Physics, 76 Portland Place, W1B 1NT, UK. Tel: 020 7470 4800. Fax: 020 7470 4848.

How to be an LGBT+ Ally

by Joby Razzell Hollis
@Jobium

More than 50% of LGBT+ scientists are still in the closet to most people they work with,¹ and that's not going to change unless there's a concerted effort to make science more inclusive at every level.

The fear of a negative reaction or an adverse impact on their career leads to LGBT+ people hiding personal relationships and screening behaviour. The stress involved can have a profound impact on mental health, and when LGBT+ scientists are out, they report being happier and more productive.

Even if you're not LGBT+, you can still make your lab a friendlier, more welcoming place by following our beginner's guide to being an ally

Learn about LGBT+

What does it stand for? Each letter is a community with its own issues.
Stonewall provide free resources about LGBT+ issues²

Think before you assume

Let people come out on their own terms
Use gender-neutral language until you know for sure

Be open about your support

If you're an ally, don't be afraid to show it!
Fly the flag, celebrate LGBT+ History Month, etc.

Challenge discrimination

If you hear or see something offensive, make it clear you find it offensive too

Look out for role models

Role models like Sally Ride, Tim Cook & Lynn Conway show that LGBT+ people can be successful in STEM. Talk about them!

Support networks

These networks provide specialist support for LGBT+ people
Find out which network covers your organisation³ and advertise it

Push for inclusivity

Change is rarely achieved without the support of the majority
Help us fight for more inclusive policies

Unconscious bias

Discrimination isn't always a conscious decision
Take an implicit association test to look at your own biases⁴

Accept your limitations

Understanding take time, you may not always get it right
Listen to what LGBT+ people have to say

1. Queer in STEM. DOI: 10.1080/00918369.2015.1078632

2. https://www.stonewall.org.uk/sites/default/files/straight_allies.pdf

3. http://www.iop.org/policy/diversity/lgbt-network/page_68474.html

4. <https://implicit.harvard.edu/implicit/uk/selectatest.jsp>