

IOP | Institute of Physics **Women in Physics Group**

Newsletter 21

Summer 22

News from the Chair

Hello and welcome to the Women in Physics Group newsletter.

We've not done a newsletter for a while and I hope you are interested in the things we've done over the past year, and will join us at some events in the future.

We've had an active 12 months, making the most of having some hybrid and face to face events and we're looking forward to the next 12 months and getting to know more of the people in our community. The Women in Physics Group is the largest of the IOP Special Interest Groups and in conjunction with the other IOP initiatives such as the limitless campaign are working to improve the inclusion and diversity in the physics community. If you want any more information on the work we do please go to the website, and I hope you will keep an eye out for events in the future.

Happy reading!

Dawn

WIPG Contacts and social media

Chair

Miss Dawn Watson, CPhys FInstP

Secretary

Dr Josie Coltman, CPhys MInstP

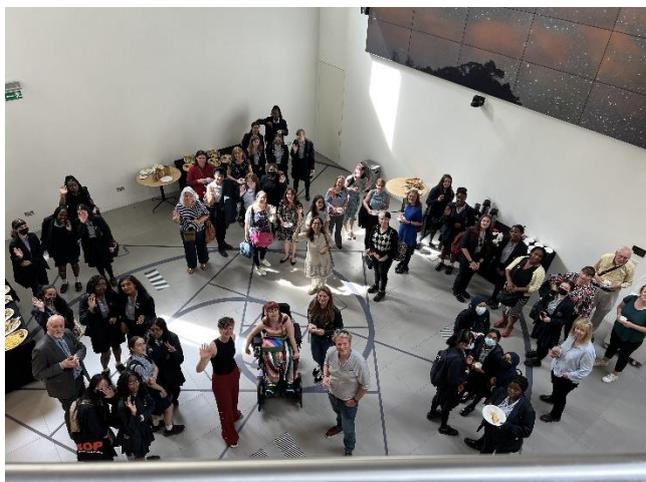
Treasurer

Miss Elizabeth Fitzpatrick, MInstP



An afternoon fest of knowledge for young and old

By Riz Shelley (member of the IOP Women in Physics Group committee).



On 18th May 2022, a near capacity gathering at the Institute of Physics headquarters enjoyed a substantial buffet lunch and learned about the interrelationship between different branches of physics and the careers that a series of speakers had pursued.

The event was organised by the Women in Physics Group and entitled, "Networking with leading physicists within the physics community". Four of the platform speakers were women and a significant proportion of the audience were schoolgirls, who seemed suitably impressed by what they heard and

the discussions they were able to have with the speakers after the presentations.

The platform speakers were: Professor Andrew Randewich (Executive Director Science at AWE), Caroline Bull (Principal Engineer and Technical Outreach Lead for Product Engineering at AWE), Professor Val Gibson (Head of the High Energy Physics Research Group at the Cavendish Laboratory), Professor David Riley (Queen's University Belfast), Dr Claire Burke (Head of science at Climate X) and Reneth McKenzie-Schoetz (a self-employed Chartered Senior Mechanical Engineer who works in the Construction Sector).

The presentations were about the career paths the physicists had followed, and how knowledge and discoveries in one branch of physics are often equally relevant in other branches, particularly with regard to understanding what is happening to the Earth's climate. When asked, the speakers made it clear that this is still not fully understood.



An IOP deliberation on measurement standards and inclusivity: The Culture of and naming of SI Units

By John T Bruun (Chair of the IOP Physics Communicators Group and Co-Opted member of the IOP Women in Physics Group committee) with contributions from National Physical Laboratory: Dr Stephen Giblin and Andrew Hanson; IOP Nonlinear and Complexity Physics Group: Dr Jean Boulton. IOP Women in Physics Group: Dawn Watson; IOP History of Physics Group: Dr Jim Grozier, Dr Peter Ford, Dr Vincent Smith and Professor Andrew Whitaker.

Have you ever thought about why measuring standards are useful? We have units of measure that are convenient (the teaspoon, a pint, the cm), fundamental constants (the speed of light, Planck's constant and many others) and measurement standards that are now called SI units. Would we have been able to make the discoveries in physics without this process of standardization? Have these units of

measure been fairly attributed to the discovery teams and how do differing cultures see this? Are we missing anything? Four IOP special interest groups and the National Physical Laboratory held an open IOP deliberation: *The Culture of and naming of SI Units* on this topic on the 25th April 2022. This was a blended meeting with in-person at the IOP Kings Cross, London and an active on-line participation. You can find the recording of the event here [JB to insert link once received].

Over our one-day event, we had contributed talks and thought provocations from our contributors (specific details on our contributors is given below). From the National Physical Laboratory Stephen Giblin and Andrew Hanson shared the state-of-the art on how and why the SI unit system is important. We discussed subtleties of how our visual perception is sometimes different to actual measurement. The History of Physics group collectively shared cameo and pen portraits of the named inventors (Volt, Watt, Becquerel, Faraday, Coulomb to name but a few). This included explaining moments from these scientists' lives where they gained insight from friends, family that – we believe – inspired the knowledge inventions that led to the unit standards. Dawn Watson from the Women in Physics Group discussed in this forum how the use of standards is useful, especially in her work practice in the nuclear industry. She also expanded on the wider need to make STEM and physics careers more inclusive. There is, she noted, the need for our professional practice to reflect wider role models and team-based thinking to enable this. During our morning conversation, it was interesting to note how deeper universal physics concepts have become important in how standards have become developed, such as using the universality properties of the Quantum Hall effect. Also, in the 1800's industrial development of steam power essentially used the water PVT phase-diagram property. Water has a large latent heat aspect, from which no doubt helped to derive the thermodynamic process concepts. The measurement of radioactive decay (the becquerel (Bq): the number of decays per second, or activity, from a sample of radioactive nuclei is measured) also marks a distinct use of random process properties as a signature of a measurable physical process.

The adoption of such probabilistic interpretations in physics was developed further in our afternoon conversations. Jean Boulton (from the Nonlinear and Complexity Physics Group) shared an approach articulated in her book 'Embracing Complexity'. Her ideas are informed by Prigogine's work in nonequilibrium thermodynamics and how he related that to evolution. Jean explained how complexity theory, with its focus on path dependency, particularity, and indeterminism, implies when thinking about universal concepts such as standards. We discussed together that by standing back and exploring other (than Western European traditions) philosophical traditions, such as 5th Century BC Daoist thinking we can re-envisage the distinctions that are reflected in the terms determinism and indeterminism. It was articulated together that perhaps Western European thought, with its divine purpose and celestial laws historical focus, could be seen as limiting in terms of the intrinsic nature of universal physics standards. John Bruun, from the Physics Communicators Group, continued the deliberation with a perspective on where our national practice of physics is currently. This included explain the IOP strategy focus on Limit Less (a campaign to enable more to practice physics) and university and industry standards around Equality, Diversity and Inclusivity. He also contributed an example from the 1800's how we can perceive the transformation from Newtonian to Leibniz calculus for mechanics though the lens of decolonising the topic.

We continued our conversation with two breakout groups: one on-line and one in-person. The adoption of stochastic and probabilistic properties for physics and setting standards is thought to be a key conceptual part of this. It enables the distinction and separation of purely random effects. The concept of probability is also very ancient Phoenician trading, gaming so the framing has been present for a long time. We discussed Chaos and forms of determinism such as the logistic map/attractor. Whilst this is more in a deterministic framing, interesting it does also represent ecosystem predator-prey systems and the idea that predators are more responsive to momentum than position (uncertainty principle) was pointed out. Perhaps there is a standard link (Feigenbaum constants, sub-harmonic resonance features, Eigen value-level repulsion) that can be further developed in the terms

of standards and ecosystem type processes here. The EDI concept was recognised to be a contemporary filter that standards are going to need to be looked through, and this IOP deliberation is part of this. Widening our viewpoints to recognise diversity of thinking, allowing much more neurodiversity and disability participation was said to be important. We should also be careful of ageism creeping into young/early career narratives. We also discussed how the decolonising concept could present challenges, as the term almost indicates active political intent was part of the development of physics, as opposed to being engaged and an active part of the framing of the time. We agreed that it is important to remove culture bias from our experimentation and their analysis evaluations. This helps to avoid non-adoption of revised physical process values that challenge the prevailing, current norms. Double blind processes are routinely used at NPL and IOP publishing, and this is helping to mitigate such socially based evaluation biases.

Overall – an entertaining and thought-provoking day. The transformations in our current society discussed in our deliberation it was thought will be helpful to our STEM culture. This helps make the access into physics more attractive to the early and practicing physics career community. Importantly – this deliberation – helps set a framing from where standards such as those set by SI units can be viewed from the point of view of their intrinsic and universal properties. We concluded remarking it will be interesting to think how a future society will view these standards in 50- and 100-years' time – what will stand the test of time?

Participation info. and speaker bio's:

All the participants from an EDI perspective (in total we were 37 registered and 24 participants on the day). Online participation had gender parity by numbers (10 attendees, 5 F / 5 M), and in-person was 14 with 2 Female (so 13%, one of which switched to on-line due to covid). So overall 30% F, 70% M.

Dr Jean Boulton FInstP is a founding member of the Nonlinear and Complex Physics Group. She researches, writes, and teaches complexity theory and its implications for the social world. Her ideas are informed by Prigogine's work in nonequilibrium thermodynamics and how he related that to evolution. She is lead author of *'Embracing Complexity'* (OUP: 2015) and is a visiting academic with the Universities of Bath and Cranfield. In this talk she will be considering what complexity theory, with its focus on path dependency, particularity and indeterminism, implies when thinking about universal concepts such as standards. Jean talked about *Science and Indeterminism*.

Dr John T Bruun MInstP CPhys, Lecturer in Mathematics, University of Exeter. John is a Climate Physicist who specialises in Climate Dynamics and Data Analytics and is also College Diversity Champion with a focus on EDI aspects of STEM culture. He is Chair of the IOP Physics Communicators Group. John talked about *Cross-disciplinary science and the current inclusive culture themes of society* including an example of how decolonising STEM has become relevant.

Dr Stephen Giblin joined the National Physical Laboratory in 1997, and since then he has worked on primary standards for electrical measurement, principally single-electron current standards for realising the base SI unit ampere. His career has spanned the full spectrum of metrology activity, from basic physics research, through the development of instrumentation, to practical calibrations for industrial customers. Stephen shared points about the history, reasons, definitions and realisations of base SI: with theme: *What does a measurement really mean? A ramble through the SI system*.

Andrew Hanson was an Optical Metrologist who transferred to be full-time Outreach Manager at NPL. He now organises activities to explain NPL's measurement science (including the SI) to people from all walks of life. Andrew shared, with hands on games, very thought provoking examples of how our perception of measurement can be different to actuality.

Dr Vincent Smith MBE FInstP, Honorary Senior Research Fellow in Physics, University of Bristol; former Chair of IOP History of Physics Group and current Chair of IOP SW Branch. Although retired, he is still active as an

experimental elementary particle physicist, working on the CMS experiment at CERN. Vincent shared pen portraits.

Dawn Watson, Head of Strategy & Technical, Analytical Services, Sellafield Ltd. Dawn has been working in the nuclear industry since graduating from UMIST with a BSc (Hons) in Physics in 1996. She currently leads a team of technical staff at the Sellafield site who work closely with the analytical laboratories, trouble shooting and looking at forward strategies to support the site in delivery of its decommissioning and remediation mission. She was made a Fellow of the IOP in 2017. She leads the Women in Nuclear (Cumbria) mentoring programme and is Chair of the Women in Physics Group at the IOP, and has a keen interest in inclusivity and opportunities for all. Dawn shared thoughts on how inclusive practice is important for our physics culture and gave examples on standards from the nuclear industry.

Peter Ford is a Fellow of the Institute of Physics and has been Chairman of both the History of Physics Group and the South Western Branch. Peter shared pen portraits.

Dr Jim Grozier is a former railway engineer and has worked in experimental particle physics research and as a laboratory demonstrator. He was a co-editor and author on the IOP e-book *Precise Dimensions: A History of Units from 1791-2018*. He is interested in the philosophy of measurement, and how it impacts on the realism/antirealism debate in the philosophy of science. Jim shared standards ideas and pen portraits.

Professor Andrew Whitaker has been Professor of Physics at Queen's University Belfast and is a former chair of the History of Physics Group of the IOP. He has written extensively on the foundations of quantum theory, and has recently published a biography of John Stewart Bell. Andrew shared pen portraits (via poster).

CUWiP 2022

By Josie Coltman (Secretary of the IOP Women in Physics Group committee) with details on CUWiP taken from the [IOP](#), [twitter](#) and [Glasgow University](#).

The Conference for Undergraduate Women in Physics UK and Ireland (CUWiP UK and Ireland) is a three-day conference bringing together undergraduates who identify as women or non-binary. The goal is to encourage undergraduates to continue in physics by focusing on their development as a scientist and showcasing options for their educational and professional futures. This year's conference was held from 7-10th April 2022 in Glasgow, Scotland and was hosted by the Universities of Glasgow and Strathclyde. The conference included presentations by distinguished physicists on their cutting-edge research and personal career paths; expert panels answering questions on graduate study and career opportunities in academia; a workshop on imposter syndrome and assertiveness; a job fair and industry careers panel; a panel on intersectionality; and social networking opportunities. There were over 14 companies, learned societies and organisations represented at the conference, and Professor Dame Jocelyn Bell gave the after-dinner speech with several participants having the pleasure of meeting and having dinner with her.

CUWiP 2023 will be at the University of Liverpool in March and the University of Limerick will be hosting CUWiP 2024.

Jocelyn Bell Burnell Award Ceremony and Winner 2021

By Josie Coltman (Secretary of the IOP Women in Physics Group committee).

The Jocelyn Bell Burnell Award is an IOP Bronze Award for women at the start of their careers who have made a substantial contribution to physics and who support and encourage others in the field. The prize is £1,000 and the winner also receives a bronze medal and a certificate. This award originally started as an early career group prize called the Very Early Career Female Physicist of the Year back in 2007 before being renamed the Jocelyn Bell Burnell Award and becoming part of the IOP Bronze awards in 2016. The award winner is announced each year as part of a ceremony organised by the IOP Women in Physics Group committee, which includes presentations from the finalists as well as usually a talk from another speaker.



Last year's event was on 26th October 2021 and was held online due to COVID restrictions. The finalists were Gemma Howarth and Sara Motaghian who both gave impressive presentations on their work and the outreach they do. There were also talks from Professor David Riley (QUB), Dr Jessica Boland (previous Award winner) and Dr Lisa Jardine-Wright (University of Cambridge). The overall winner was Sara Motaghian from the Natural History Museum, London for developing spectral mission software for ExoMars to expedite analysis and maximise scientific mission return, for her equity work leading Roving with Rosalind, and for inspiring thousands of children with ExoMars. Both finalists received a hamper of goodies with Sara also receiving the £1000 and Bronze

Award from the IOP. Congratulations Sara!

This year's event will be in-person in Edinburgh on 12th October. Further details to follow.

Future Events

12th October: Jocelyn Bell Burnell Award Ceremony at the Royal Society Scotland, Edinburgh

March 2023: CUWiP at the University of Liverpool