EPSRC Centre for Doctoral Training in

PHOTONIC INTEGRATION AND ADVANCED DATA STORAGE

PIADS CDT

Spotlight Report 2024

Engineering and Physical Sciences Research Council

QUEEN'S UNIVERSITY BELFAST

IPIC BRINGING PHOTONICS TO LIFE

University of Glasgow

Taighde Éireann Research Ireland

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Welcome
Colin Kirkbride
Chair of Doctoral Forum

Hello and welcome!

As Chair of the Doctoral Forum, it gives me great pleasure to introduce to you the 2024 PIADS Annual Research Report. This year the CDT has once again been a hive of activity, and our researchers have been involved in countless projects across the photonics and magnetic data storage landscape. The purpose of this report is to give you some valuable insight into exactly what we've all been getting up to and to showcase the successes of our researchers and industry partners.

Collaborations have been a huge part of the programme this year and building essential networks between our researchers, academic and industrial partners has been a running theme throughout much of our activity. We've had strong industrial engagement through projects such as Ruaridh's EngD placement with Fraunhofer alongside exciting site visits to Seagate Technologies and Vector Photonics. This has allowed our researchers to really see industry in action and recognise the importance of the work they do in the broader context of UK and international economic impact.

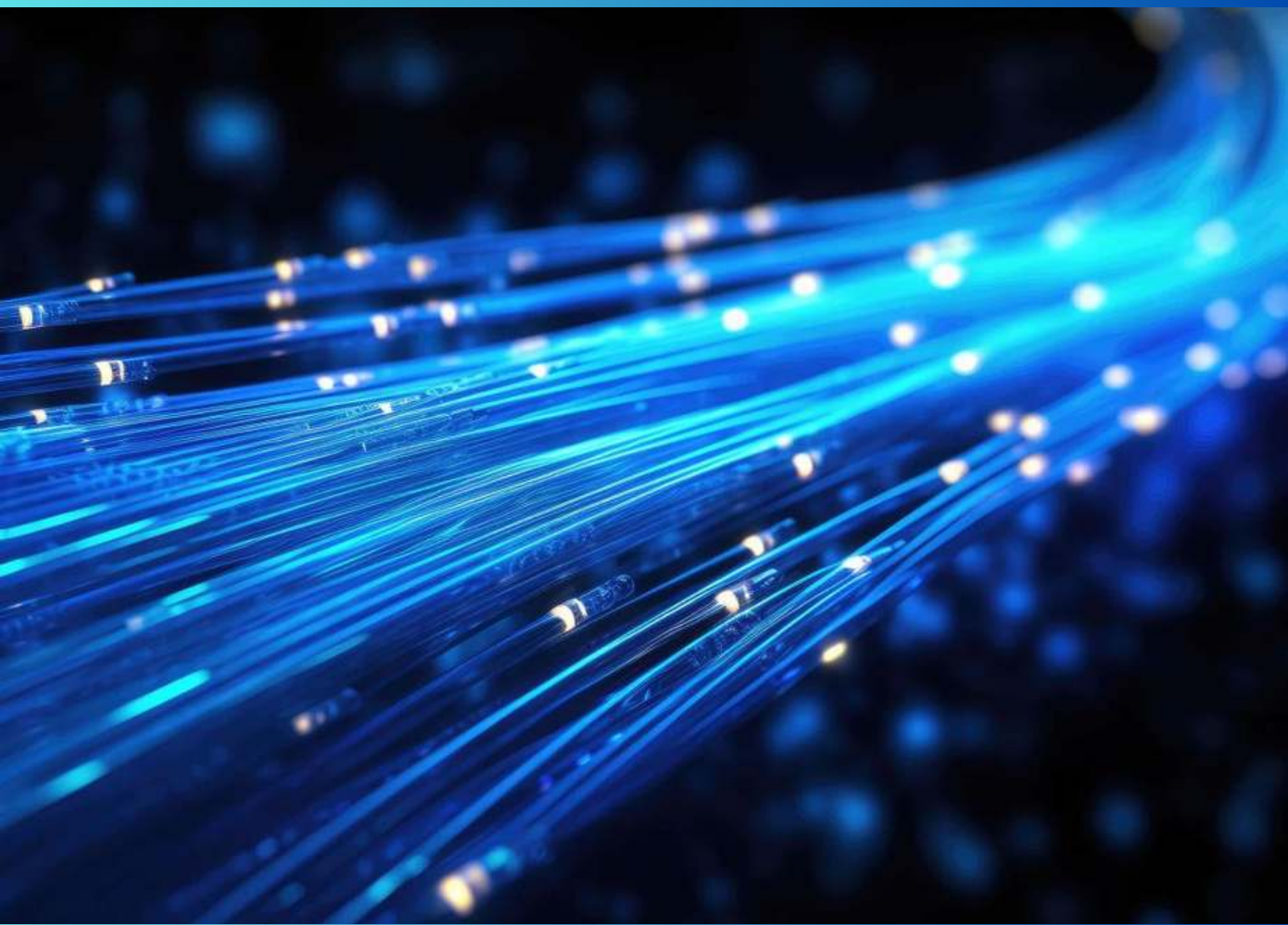
Training across a broad variety of practical skills has once again been at the heart of PIADS and we've been able to foster an environment which drives development and challenges our researchers to think about the context of their own research. Learning and listening to what our researchers want from their training has been essential and has particularly motivated our EDI agenda this year. Overall, the focus has been on striving to underpin all our activity with responsible research and innovation practices whilst building a deeper understanding of social issues in research. A particular highlight was a workshop delivered at the University of Glasgow by the wonderful charity Scottish Autism where our researchers explored ways of raising awareness and understanding of autism within research environments.

Our annual events were also a hit this year with a fantastic range of speakers covering the fundamental research that goes on within PIADS to interviews with alumni and industry giving their own insights into how they attained a strong foothold on their career pathways. This was supported later in the year through a targeted careers event held in September where skills such as CV creation and how to search for opportunities were developed. I know those who took part found this an extremely valuable experience and are using the skills they've learned to great use in their search for life beyond PIADS.

Now finally, before you dive into the pages that follow, I must give a massive shout out and thank you to everyone who has contributed to the report. As you all know, without you, we'd have nothing to show off so keep making the PIADS community such an exciting environment to be a part of and continue doing the world changing research you do!

I hope you enjoy reading the report and here's to even more success in 2025!

WHAT IS PIADS?



We are the Photonic Integration and Advanced Data Storage Centre for Doctoral Training

The Centre for Doctoral Training (CDT) in Photonic Integration and Advanced Data Storage is a partnership between Queen's University Belfast, the University of Glasgow, and the Irish Photonic Integration Centre. (IPIC). We aim to tackle some of the challenges created by the increasing quantities of data generated by today's society.

The Centre's focus is on developing highly-manufacturable photonic integration technologies related to the magnetic storage of digital information. However, the development of these technologies will be relevant to a wide spectrum of end-users - from telecommunications to biophotonics, in which optical technologies are applied to living organisms and health care.

Established in 2014 (PIADS 1.0) with substantial investment from the Engineering and Physical Sciences Research Council (EPSRC) and both universities and industrial partners, the centre was successfully renewed in 2019 (PIADS 2.0) with investment from Research Ireland, resulting in a vibrant joint EPSRC and Research Ireland funded centre.

It is our aim to provide excellence in postgraduate education and research, combined with industry experience to develop doctoral graduates with the confidence, knowledge and skills to lead and transform the future of photonics.

Our Technical Focus

CDT research students are engaged on a range of challenging doctoral research projects across the Centre's **five main research themes**, with some live projects under each theme detailed below. All students are jointly supervised by academic staff from the University of Glasgow, Queen's University Belfast and the Irish Photonic Integration Centre.

Themes (A-E)
Live Projects

A. Ultra-Reliable Semiconductor Lasers Operating in Hostile Environments

Dynamic Properties for InGaN/GaN-based Distributed Feedback Laser Diodes Junction Temperature characterisation of oxide aperture VCSELs Integrated photonic devices for smart gas sensors

B. Low Cost Planar Lightwave Circuit Platforms Suitable for Volume Manufacture

Integrated Quantum Photonic Sensors and Circuits Controlling heat flow at the nanoscale using ferroelectric-based thermal mirrors Temporal Dynamics of strongly coupled epsilon near-zero plasmonics

C. Novel Nanoplasmonic Devices Capable of Operating in Extreme Environments

Novel Materials synthesis for HAMR plasmonics Inter-metallic plasmonic antennas Bringing ab-initio design into the lab: design of new plasmonic materials

D. Atomic Scale Analysis Techniques

Characterising nanoscale thermal transport at functional interfaces Heat generation and tansport in nanostructured materials Reprogrammable micro-magnetic transport

E. Advanced Materials for Magnetic Recording

Molecule based magnets Novel magnetic states in 3D nano-magnetic systems Manipulation and exploitation of the dynamic processes of skyrmions

OUR EDI COMMITMENT

Our CDT's research mission is to tackle some of the challenges created by the increasing quantities of data generated by today's society. We believe that to achieve this it is crucial to bring together the talents and perspectives of people with different personal, cultural, and disciplinary backgrounds.

Fostering an inclusive research environment is an essential aspect of promoting diversity, equity, and inclusion (EDI). PIADS CDT's commitment to EDI ensures that all members of the academic and research community—regardless of background, identity, or personal circumstances—have an equal opportunity to thrive and contribute to groundbreaking research.

Fostering Inclusivity: Autism Awareness and Commitment to EDI

In partnership with Scottish Autism we delivered a session to our students and fellow Dive In CDT and Lifetime CDT students on autism awareness and understanding. For some of our PhD students, navigating academic life can be challenging, and for autistic students, these challenges can be even more pronounced.

The Path Forward: Moving Beyond Awareness to Action

An autism awareness session is just the starting point. To truly create a culture of inclusivity and support, there must be ongoing dialogue, active listening, and an institutional commitment to providing the necessary resources. We want to ensure that our activities are student- led and go beyond just creating awareness – with the aspiration that they should be translated into tangible actions that shape policies, teaching practices, and academic support systems.

Our goal is for PhD students to feel valued, understood, and equipped to succeed in academia. We will continue to deliver autism awareness sessions combined with an ongoing commitment to champion EDI in all aspects of our work, we hope that higher education is truly accessible and inclusive for everyone.

If you would like to learn more about our EDI vision, or to get involved, please contact our EDI Champion Dr Rair Macedo at Rair.Macedo@glasgow.ac.uk

For more information about Scottish Autism visit www.scottishautism.org and for Autism Northern Ireland, please visit www.autismni.org

The people in PIADS - Directors

We are proud to have a strong network of academic partners and students as part of our PIADS CDT Team, who regularly communicate their research, industrial outputs and collaborative ventures in brilliant ways. We are also aware that much of the activity of our centre would not be made possible without the dedication and creativity of our strong leadership and support team: the directors and people behind the scences. Below is a short bio on each of these key team members, and you should feel free to contact them at their email provided, should you have any questions, or wish to engage with the CDT PIADS programme.

Robert Bowman - PIADS CDT Director

Robert's current research is directed towards the development and evaluation of advanced materials for data storage technology in partnership with Seagate Technology. Topics being investigated include: rare earth magnetism, rare-earthferromagnetic coupling phenomena, synthetic magnetic multilayers and plasmonic materials to facilitate heat assisted magnetic recording sponsored by industry. He leads a team of 3 PDRAs and 7 PhDs. This is recognised through the award in 2017 of a Seagate Technology/ Royal Academy of Engineering Research Chair.

Welcome to Professor Marc Sorel - new CDT Co-director

Professor Marc Sorel, based at the University of Glasgow has previously chaired our Research and Training Committee and had a very active role within the PIADS Management Team. Marc has been engaged in research related to integrated optics, silicon photonics and semiconductor lasers for over 15 years. We are delighted Marc has agreed to take on this additional role and look forward to working with him.

Professor Paul Townsend - PIADS CDT Co-Director

Paul is Head of the Photonics Centre at Tyndall National Institute and Research Professor in the Department of Physics at University College Cork in Ireland. The Photonics Centre comprises nine internationally-recognised research teams (around 130 staff and PhD students in total) carrying out R&D and commercialisation activities spanning the areas of semiconductor materials and devices, photonic integration and packaging, through to advanced photonic systems for telecommunications and healthcare applications. Since June 2012 he is also Director of Research Ireland funded Irish Photonic Integration Centre (IPIC).

The people in PIADS - behind the scenes

Lynda Mahon

PIADS CDT Executive Manager - l.davison@qub.ac.uk

Lynda has worked at QUB for over 18 years. During this time, she has held various positions across the University. In the last seven years she has specialised in Post Graduate Research and Training and previously led the Doctoral Training Programmes within the Arts Humanities and Social Sciences Faculty at QUB (Northern Bridge AHRC and NINE ESRC). Lynda joined the PIADS team in November 2021 and looks forward to seeing the development of the programme.

Adam Barr

PIADS Clerical Officer - a.barr@qub.ac.uk

Adam is a new addition to our team, having joined in 2024 to provide administrative support for the PIADS CDT Programme. Adam first joined Queen's in 2023, previously providing remote support to the School of Pharmacy's CQC College with China Medical University in Shenyang, China. He is also a former student of the university, having completed his master's in history at Queen's in 2020. In his spare time, Adam enjoys travelling as much as he can and curling up with a good book!

Elisabeth Wintersteller

Training Programme Manager - elisabeth.wintersteller@tyndall.ie

Before moving to Ireland, Elisabeth worked in academia for 7 years, including positions at the European Molecular Biology Laboratory (EMBL) in Heidelberg, Germany and at Medical University Innsbruck, Austria. She is experienced in coordinating and administering national as well as EU grants and has coordinated the development of on line education and training programmes for PhD and postdoctoral students. Elisabeth coordinates the PIADS programme at IPIC.

Lisa Campbell

PIADS CDT External Engagement Manager -Lisa.Campbell@glasgow.ac.uk

Lisa is an accomplished marketing professional with experience gained in Higher Education, Local Government and Social Care. Lisa enjoys supporting the PIADS programme, promoting the research capability of our students and the Centre whilst developing lasting partnerships that meet the demands of industry.

In loving memory of dear friend and colleague Vicky Weir

In March 2024 we sadly lost Vicky Weir, the PIADS CDTAdministrator, after a short and sudden illness. Vicky had been an integral part of the PIADS team, joining back in 2019. Vicky enjoyed a wonderful relationship with the PIADS students, academics and industry partners. We will miss her support, good humour and sarcasm.

Our Industry- The Foundation of PIADS

The jointly funded EPSRC and Research Ireland CDT Photonic Integration and Advanced Data Storage (PIADS) centre addresses a unique technological opportunity - the intersection of photonic integration and data storage. The success of CDT PIADS 2.0 is contingent on the continuation and evolution of our unique anchor - tenant partnership model which brings together a range of strategic partners of different shapes and sizes, each making valued contributions to enrich the PIADS 2.0 training environment. The make-up of partner companies mirrors the photonics industry in the UK & Ireland.

The founding vision of CDT PIADS is to train cohorts of high calibre doctoral research students in the skillsets needed by the data storage and photonics partner base & the wider UK supply chain.

Students are trained in an interdisciplinary environment encompassing the five themes of robust semiconductor lasers, planar lightwave circuits, plasmonic devices, advanced characterisation and materials for high density storage.

The programme embeds a strong ethos of intellectual enquiry that empowers students to move between fundamental and applied research through the appropriate combination of high level technical, scientific and research training; courses in innovation, management, leadership and personal effectiveness; industrial seminars and placements; student-led activities such as conclaves, educational outreach and winter schools.

Spotlight

- Our Industry Partners -

Spotlight on our Industry Partners

Seagate Technology

Seagate Technology, a global leader in data storage solutions, has been a key industry partner for PIADS since the conception of the CDT in 2014. Seagate invest significantly in the programme and our students. Aidan Goggin, Director of RHT Design at Seagate Technology discusses some of the benefits of collaborating with the Photonic Integration and Advanced Data Storage Centre for Doctoral Training.

As a leading player in data storage technology, Seagate Technology's involvement with PIADS is crucial in shaping the future of data storage. Seagate's expertise in storage media, including hard drives, solid-state drives (SSDs), and advanced data management systems, complements the research being conducted at PIADS. The collaboration allows Seagate to stay at the forefront of photonic integration for data storage while providing PIADS EngD and PhD students with the practical industry knowledge and real-world application scenarios that are vital for developing innovative storage solutions.

The partnership between Seagate Technology and the Photonic Integration and Advanced Data Storage Centre represents an exciting convergence of storage and photonic research. As the demand for faster, larger, and more efficient data storage systems grows, advances in photonics offer promising solutions. The doctoral training program ensures that there will be a skilled workforce ready to tackle these challenges and continue pushing the boundaries of what is possible in data storage technology.

This collaboration also has implications for a wide range of industries, from cloud computing to artificial intelligence, where the need for fast and reliable data access is critical. Through PIADS, Seagate is not only contributing to the advancement of its own technology but is also fostering an ecosystem of innovation that will help shape the future of data storage systems worldwide.

Seagate's involvement helps bridge the gap between academia and industry, ensuring that doctoral candidates have access to state-of-the-art technologies and the latest research trends. Through this collaboration, Seagate not only contributes significantly financially to the PIADS programme but also sponsors, mentors and educates the next generation of experts in photonics and advanced data storage technologies. Furthermore PIADS students have opportunities to engage with the Seagate team at various outreach events and annual Conclave.

Working in partnership with Vector Photonics

As part of their hands-on learning experience, PIADS students visited Vector Photonics, a leading innovator in PCSEL (Photonic Crystal Surface Emitting Lasers) based semiconductor lasers – the most significant innovation in laser design and manufacture for 30 years. The company is also a spin-out from the University of Glasgow.

This site visit provided students with invaluable exposure to cutting-edge developments in laser systems. They had the opportunity to engage with industry professionals, learn about the latest advances in this technology, and see firsthand how academic knowledge is applied in real-world industrial settings.

Vector Photonics, known for its groundbreaking work, has long been a trusted partner of PIADS and also took part in our careers event that was hosted at the University of Glasgow in September. Through these collaborative engagements and visits, students gain insight into the complex challenges and opportunities within the photonics industry, while also fostering connections that may shape their future careers.

The visit emphasised the importance of industry-academic partnerships, providing students with a clear understanding of how research and innovation in the classroom can translate into practical, high-impact technologies. It also underscored the value of fostering strong relationships between educational institutions and industry leaders in driving the future of photonics.

Fraunhofer

My Industry Placement

Ruaridh Smith

What motivated you to pursue a career in photonics?

My interest in photonics was sparked by undergraduate courses in photonics where I was able to see the application of theory learned in class being used in everyday products and used to solve real world challenges. I then chose to complete honours and masters projects in photonics and enjoyed the mixture of hands-on lab work with strong theoretical underpinnings and real-world applications. I have continued to follow opportunities in photonics since, such as a year spent working in the Netherlands at the European Space Agency, before pursuing a doctorate with the CDT to increase my knowledge and experience in this field.

Can you tell me about the company or organisation where you're currently undertaking your industry placement?

I undertook a placement at my EngD partner institution, the Fraunhofer Centre for Applied Photonics (CAP) in Glasgow. Fraunhofer CAP works alongside academia and industry to conduct research and development into photonic technologies, such as the development of lasers, laser systems and a wide range of quantum technologies.

How did you find the process of securing this industry placement? Was it challenging or straightforward?

In my case this placement came about as the project I was working on at Fraunhofer finished and we had just received funding to continue this work in a follow-on project. I was keen to continue developing the technology from my previous project, but it would have outrun the time I had left on my studentship, so after discussing options with my industry supervisor I opted to pause the EngD and work on it full-time.

W**hat were your initial expectations when you started the placement, and how do they compare to your experience so far?**

Having learnt a lot of optical lab techniques and underpinning theory during EngD, I was keen to apply my skills to this new project. The project finished in April last year and I was able to build on my previous experience and develop the technology further. This also allowed me to take more ownership of the project, such as presenting in quarterly review meetings with the funding body and organising a final project demonstration at our partner's site in Bristol.

What projects or tasks are you currently working on during your placement?
I worked on a project to develop a laser system for greenhouse gas sensing - specifically for detecting gas leaks in industrial settings. We were looking at targeting greenhouse gases with absorption lines in the infrared by sending out infrared light and detecting backscattered light with a single photon detector. The current technology is limited by the detection efficiency of the single photon detector, so our method aimed to improve this by using a nonlinear waveguide to convert the frequency of the infrared light to a shorter wavelength (where the detection efficiency of the single photon detector is higher). This project involved working with several industry partners to develop and test the waveguides, construct a detection module and combine this with an imaging module. My tasks involved waveguide testing and the design and construction of the detection module.

What specific photonics-related skills have you been applying during your placement? Are there any new skills you've had to learn?
Throughout the course of the project, I have developed existing optical laboratory skills and learned many new ones. This includes specific optics lab techniques such as free-space optical alignment and fibre coupling – which is the art of aligning light into an optical fibre through the selection the correct lens and fine adjustment of alignment stages. I have also characterised laser sources, single photon detectors and tested newly fabricated waveguides for this project. So there has been a lot of new equipment to familiarise myself with!

How has your theoretical knowledge from university been applicable in your placement?
The key component of this project is the nonlinear frequency conversion waveguide. Getting these devices to work efficiently requires an understanding of theory relating to nonlinear optics, waveguides and lasers so this is always being applied to the project. Maybe surprisingly, a lot of theory and concepts introduced in high school are also used daily, such as lens equations to work out the correct beam sizes for coupling light into a fibre or waveguide.

How does the work you're doing in the industry differ from academic work in photonics?
As I have been working on early-stage technology development, I believe this project is very closely related to academic work but with a slight shift in focus. A traditional view of academia may be one of trying to answer a very specific research question, whereas this work is aiming to develop new technology which will hopefully one day be a product. This means that the focus of the project is to develop and understand what works (and often why it doesn’t!) so that we are able to deliver a working system by the end.

Have you been involved in any product development or prototyping during your placement?
The system developed during this project was an early-stage demonstrator of the technology, so this involved working with our in-house engineering team to design the appropriate packaging for the system. This meant that we had to think about the size and portability of the system during the design phase and construct an enclosure that ensured the system was robust for transport and operational outside the lab.

How has your communication and teamwork improved since starting the placement?
This placement has given me more experience of teamworking in a professional environment. This has included working alongside colleagues to discuss work and problem solve, reporting to external project partners and presenting in review meetings to funding bodies. Through this I have been able to practice describing and recapping work to different levels of detail and complexity depending on the audience.

Do you think your industry placement has given you insights into the future career opportunities in photonics?
Through this placement I have a wider appreciation of the companies working in photonics, the technologies they are developing and the challenges they face. By working closely with these companies on my placement I have a gained a valuable insight into the kinds of roles available in industry, what these jobs entail and the kind of role I want in the future.

How has this industry placement helped you clarify your career goals within the field of photonics?
This placement has confirmed to me that there are a lot of exciting opportunities in photonics. It has also helped me understand where my skill set could fit into an industry role and an given me an idea of the kind of direction a career in industry could take.

What is the most valuable thing you've learned so far during your placement, either professionally or personally?
Professionally, I think the most valuable thing I've learned is how to approach tasks in an industry setting and how planning ahead and testing things quickly ensures that the project progresses towards the end goal. On a personal level, I think as you gain experience in a role you find out which parts you enjoy and for me I know that I enjoy working as part of team to solve problems rather than long periods of solo work.

What advice would you give to other students considering a career in photonics or looking for an industry placement?
My placement came about through a well-timed follow-on project getting funded. So my advice would be to try and spot opportunities when they arise and to make the most of them. I would also encourage students to get in touch with people from industry directly to see if there are any placement opportunities coming up or even to just ask for advice. You might get lucky if your timing is right!

What kind of support or additional learning do you think would benefit you in advancing your skills in the photonics industry?
It can be hard to know at an early career stage what skills employers and companies are really looking out for, so I think any training which involves industry engagement about what they value and how to develop into leadership roles is valuable.

Simon Andrews, Executive Director, Fraunhofer UK Research Ltd.

"It is great when students can be part of a CDT like PIADS, where they have lots of fellow students in other environments to compare notes with and we are really pleased to work with PIADS."

Spotlight
- Our Students -

National Institute of Standards and Technology visit

Daniel Kuznesof

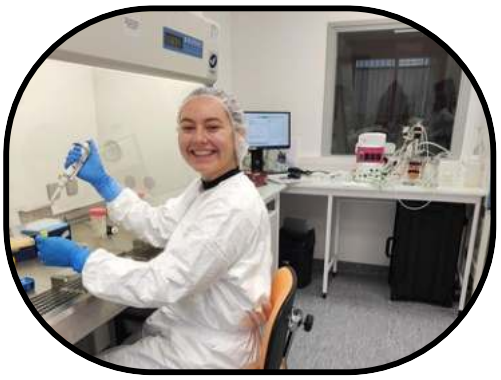
This summer I visited the Boulder, Colorado to take part in single photonics short course providing an overview of single photon sources, detectors and practical measurement and application with the opportunity for hands on laboratory work sponsored by industry. Alongside meeting some great people and taking in the breathtaking views of the Rocky Mountains.

In the field of single photonics Superconducting Nanowire Single Photon Detectors (SNSPDs) are one of the best performing single photon detectors and a large part of my PhD. So far, I have worked upon the construction of Superconducting Nanowire Single Photon Detector(s) (SNSPDs) systems alongside characterisation of prototype mid-infrared devices and application of them. Alongside use of them in conjunction with integrated photonic circuits for Quantum applications, made possible thanks to their excellent SNSPD performance characteristics. Operation within the single photon limit can drastically enhance sensing and metrology techniques alongside new medical techniques for cancer treatment such as photodynamic therapy requiring single photon sensing. And this course helped provide a fantastic introduction to new practical and analytical techniques such as autocorrelation, optical beam walking, optical fiber splicing and was a great opportunity to meet some of the most prominent researchers in my field who work at the National Institute of Standards and Technology (NIST) in Boulder.

The federal agency NIST is one of leading metrology institutes focusing on development of standards and technology for measurement science backed by rigorous traceability. NIST is a federal agency part of the U.S Department of Commerce originally formed to improve measurement infrastructure in support of developing scientific and engineering technologies of economic and fundamental scientific interest. Research conducted in NIST has helped SNSPDs become one of the most mature and commercially successful quantum technologies to date. As such it was a fantastic opportunity to meet with Dr Adam McCaughan and Dr Varun Verma who focus upon next generation SNSPD development for imaging and min-infrared sensing application such as spectroscopy, exoplanet searching, remote gas sensing and Light Detection and Ranging. Alongside this I was able to visit NIST and see their laboratory facilities and discuss future research opportunity which will hopefully lead to a work placement within NIST. I'd like to thank Colorado University Boulder, NIST, the PIADS CDT, Varun Verma, Adam McCaughan and Robert Hadfield for helping to facilitate this trip and giving me this opportunity.

Bioreactor Training at the University of Lyon 23rd - 27th September 2024

Rhianne Curley



I had the privilege of attending the practical training course in Bioreactor Modelling and Monitoring at the University of Lyon in France. This course was organised by the European Society for Animal Cell Technology (ESACT). While ESACT offers a range of theoretical courses each year, this was the first time they hosted a practical training course, making it a unique and exciting opportunity. Last summer, I attended the 13th Animal Cell Technology course in Llafranc, Spain, which was a theoretical course also hosted by ESACT. That experience laid a solid foundation for this hands-on training. Personally, I believe the best way to learn is through direct practical experience, so having the chance to try things out in the lab was an invaluable opportunity.

A bioreactor is essentially a controlled vessel used to cultivate and grow living cells in an optimal environment. Bioreactors are often found in both industrial and research settings and can be used to produce pharmaceuticals. These systems require careful control of various factors such as nutrient levels, oxygen, pH, and temperature to ensure that the cells grow and function properly. Understanding how to model and monitor these processes is essential for anyone working in biotechnology, and this course aimed to provide both the theoretical knowledge and practical experience needed to manage these systems effectively.

I was fortunate to receive an academic grant from ESACT and additional training funding from IPIC to support my attendance. As I near the final stage of my PhD, this practical training has been invaluable, and it will undoubtedly help in my post-PhD job search. The course allowed me to deepen my understanding of bioreactor systems while also refreshing concepts from my undergraduate degree. During my internship at Bristol-Myers Squibb, I gained hands-on experience with bioreactors, primarily working with 5 L systems. It was particularly interesting to see the differences in how we approached sampling and monitoring the smaller 500 mL bioreactors used during the training course.

Throughout the course, we worked with both CHO (Chinese Hamster Ovary) and SF9 (insect) cells, monitoring their behaviour daily by taking samples to measure cell viability, count, pH levels, nutrient and metabolite concentrations, and antibody production. I have extensive experience working with CHO cells, which are commonly used in the pharmaceutical industry to produce biological drugs. However, I had never worked with insect cells before, so this was an especially exciting aspect of the course for me. We infected the insect cells with baculovirus, and I found it fascinating to observe how their cell size changed after viral infection and to monitor their reactions to this process.

Overall, this experience gave me a much deeper understanding of the complexities involved in bioprocess engineering. I am incredibly grateful for the financial support I received to attend, and I'm confident that the skills I gained during the course will greatly benefit my future career.

My placement at Seagate

Daniel Kelly

Towards the latter half of my second year in PIADS, I started loosely pondering on post-PhD occupational plans. A very brief consideration got me thinking: wouldn't it be great to make use of the close tie between PIADS and Seagate and convince someone at 1 Disc Drive to take me in for a brief internship?

And so together with Aidan Goggin, the principal coordinator of all things CDT at Seagate, we started devising a plan for what I could do there for such a short internship. I didn't want to take out much more than about 3 months from the PhD, to which Aidan responded"That's pretty short" (spoiler: he was right). But I decided to get myself in there for a good time, not a long time. And so the preparations began.

After that I had to apply formally through HR including an interview (which for some reason I got into my head that I botched completely). But regardless of any self-inflicted anxiety, pretty soon after that the long-awaited email came through: Accepted for the position of R&D intern.

I managed to hastily find a room in a house for rent with a bunch of lovely medical students, who have since become good friends. The house also presented absolutely scenic views of the setting sun over the hills of Donegal - Irish spring this year was obscenely sunny!

I arrived on my first day incredibly excited - getting my own employee badge, meeting the team I would be working in. And so I dug out a suit I hadn't worn since school and cycled across a route that became my best friend for the next 90 days (even though I somehow got into 2 bike accidents in that time).

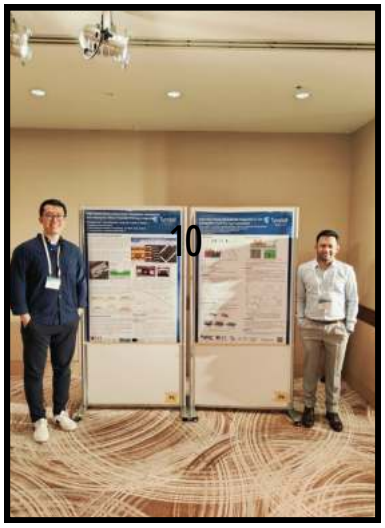
I ended up working in the laser design team doing simulations, but the openness of people in my team, around me in R&D, and Aidan's welcoming and inclusive management gave me plenty of opportunity to find out about so many different aspects of the HAMR technology. It honestly surprised me how kind and welcoming everyone was, making it quite sad when the placement finished!

My task was set to researching and simulating a particular electro-optic component for the HAMR reader-writer head. I ended up even having to report to the people in Springtown's sister plant in Minnesota, US. The challenge felt almost impossible, like trying to squeeze in a 7th person into a 5-seater car, and the car is heating up to 200 °C and running at 100 mph. The number of years that's gone into designing the current generation of the head to be as dense as possible, while running at extreme efficiency is quite impressive, to say the least! Yet here I was trying to add an extra gizmo to it.

Ultimately, it ended up being one of the most exciting 3 months I've spent in my whole professional career! So, a huge thank you to everyone who made it possible: from the PIADS placement fund to every colleague I met along the way.

Our trip to IEEE SiPhotonics Conference in Tokyo, April 15-18 2024

Shengtai Shi and Yeasir Arafat



Since I was a college student I have had Japan on my travel bucket list. This conference trip is quite special not only because it is the first time I could visit Japan for the travel experience part that I am excited about, but also from a perspective of my PhD work, during the last year it is truly a great chance to promote my work at a top conference and get feedback from the worldwide photonics community such as in America and east Asia. I presented my poster titled “High-Speed Electro Absorption Modulator Assited by Iron Doping for Micro-Transfer-Printing Integration”, and throughout the session I had some encouraging and valuable discussions in the field, particularly with few Japanese experts who works on similar topics in III-V on Si heterogeneous Integration with the die bonding technology. The conference program itself is also very informative on frontiers of industry and research collaboration results, such as from Intel or HP, and I definitely found many talks very inspiring to learn from. Overall, it's a truly rewarding experience for me to present my work and network with colleagues from different parts of the world. This is also a fun trip to explore the conference and Tokyo a little bit together with my colleagues from Tyndall and make some new friends over the trip. I very much appreciate all the support and good memories this trip had brought to my PhD journey!

Shengtai Shi

I presented a poster on my PhD research at the IEEE Si Photonics conference. Attending this international conference in my third year at PIADS CDT was a fantastic opportunity. During the poster session, I engaged in many insightful discussions with researchers from both academia and industry. I also networked with PhD students from around the world, exchanging ideas about their projects and experiences. I discovered that some of their work closely aligns with my own, and we explored potential collaborations for future research. The lectures provided valuable insights into the direction of current research in the field. I presented on the topic of “Extended InGaAs photodiode integrated on SOI waveguide circuit for 2 μm waveband”.

The potential applications of integrated silicon photonics have expanded into sensing and biomedical instrumentation. In optical sensing, the mid-infrared waveband (2-8 μm) is particularly promising due to the strong absorption characteristics of molecules in this range. Devices utilizing this spectroscopic sensing mechanism can be designed for handheld applications that demand compactness and low power consumption, highlighting the importance of an integrated approach. In my work, I demonstrated, to the best of our knowledge, the first integrated multi-quantum well photodetector via micro-transfer printing, capable of absorbing in the 2 μm wavelength band on a silicon-on-insulator (SOI) platform.

Yeasir Arafat

Reflections of the first year of my PhD

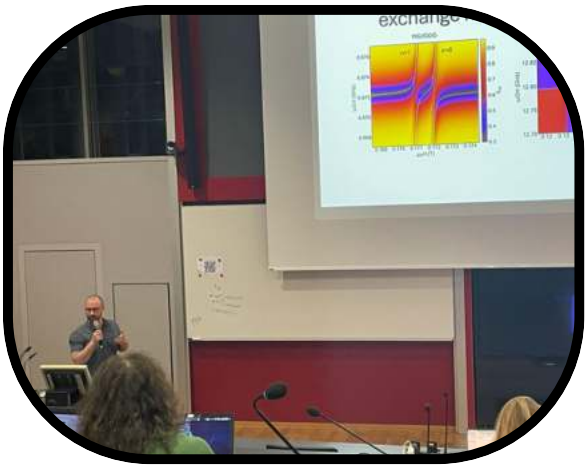
Kaynat Alvi

As I approach the end of my first year of PhD studies this November, I reflect on a transformative journey marked by unique challenges, significant growth, and memorable academic experiences. My time as a PIADS student has provided invaluable opportunities, from engaging in pivotal events to forming connections that will undoubtedly shape the rest of my academic career. Participating in the PIADS Winter School 2024 at Tyndall National Institute and PIADS Conclave 2024 at Queen's University Belfast was very exciting and transformative. Navigating language barriers and cultural differences in a new environment presented initial challenges. Yet, the supportive, inclusive atmosphere created by the faculty and fellow students made an incredible difference. Their openness and encouragement helped ease my concerns, fostering a welcoming environment, where I felt comfortable to learn, grow, and connect. This experience underscored the value of professional engagement and broadened my perspective on the scope of academic research. Meeting like-minded individuals and potential collaborators added depth to my PhD journey, emphasizing the importance of both networking and building a support system within the academic community.

A particular highlight of my year was attending the ePIXfab Silicon Photonic Summer School at the University of Southampton. This event gathered international researchers working in fields closely related to my own, offering an immersive experience that allowed me to learn from experts and industry leaders, including representatives from Intel, imec, and Cornerstone. The lineup of lectures was both comprehensive and insightful, covering advanced topics in silicon photonic and offering a glimpse into future directions in the field. A pivotal moment came when I met a professor from imec, with whom I had an in-depth discussion about my research interests. This conversation has since led to a potential internship opportunity in future, a prospect that would further enhance my skills and provide invaluable industry exposure. Engaging with such a diverse group of professionals helped me envision my own potential contributions to the field and provided clarity on the impact I aspire to make in my research. Reflecting on this first year, I feel an overwhelming sense of gratitude and achievement. Each experience has been a crucial stepping stone, enriching my professional capabilities and deepening my confidence in navigating academic settings. This initial phase of my PhD journey has already been a period of profound personal and professional transformation, allowing me to grow both as a researcher and as an individual. I look forward to expanding my skill set, building a stronger academic network, and exploring innovative avenues in my research over the coming years. With the foundation I've built, I feel more prepared than ever to tackle the challenges and embrace the opportunities that lie ahead in my PhD journey.

Giving a talk at the annual American Physical Society's March Meeting

Mawgan Smith



The beginning of 2024 for myself was deeply punctuated by the anticipation and arrival of my first attendance at the annual American Physical Society's March Meeting, held this year in Minneapolis, Minnesota. Here I presented a short talk on some of our research into cavity magnon-polaritons, a type of light-matter quasiparticle that has been under intense study in recent years for its potential to accelerate new and improved applications across quantum and classical technologies. Though admittedly slightly daunting, it was a deeply valuable experience. And I was also very fortunate to attend many talks that were extremely pertinent to my research interests, and indeed a few that were not so directly relevant - such was the breadth of research presented, with 13,000 physicists in attendance. At once a delirious dream and nightmare.

Alas, there is no rest for the wicked scientist, after the March Meeting I had the arguably even greater privilege to travel to Boston, Massachusetts, to meet with collaborators at Boston College. The folks over at BC are experts in theoretical condensed matter physics and quantum optics, and this is in fact where our beloved cavity magnon-polariton comes into the picture. The field dedicated to its study – cavity magnonics, is seen as something of a lovechild of condensed matter physics and quantum optics, bringing the two communities quite literally into resonance. Of great importance to this area, and to the practical implementation of quantum technologies in general, is the study of open quantum systems, i.e. what happens when your cat in a box is coupled to external baths or systems outside of the box. In essence this is how one begins to consider dissipative effects in quantum systems, and this is what I went to BC until the end of March to learn about. At the beginning of July, I was happy to see a paper on the work presented at the March Meeting published in Advanced Quantum Technologies. And it was a great pleasure to attend the October WE-Heraeus Seminar on Hybrid Angular Momentum Transport and Dynamics in Bonn, Germany, where I presented a poster on this work. A big thank you to collaborators at none other than QUB for their important contributions to this work. For me this year has been a true testament to the amazing opportunities that PIADS enables us to seize, and for that I am truly grateful. I must also thank my supervisor Dr Rair Macêdo for encouraging and facilitating these opportunities. My aim in the final year is to bring what I have learned to full fruition and make meaningful contributions to the field. The insight I was awarded in Boston has been very helpful in constructing a current project, and I am also delighted to have been part of a collaboration with BC for which a paper was published at the beginning of December.

Useful Links:
https://meetings.aps.org/Meeting/MAR24/Session/T53.5
https://onlinelibrary.wiley.com/doi/full/10.1002/qute.202300420
https://www.nature.com/articles/s44306-024-00062-z

PhD Reflections: Ayse Ozcan Atar

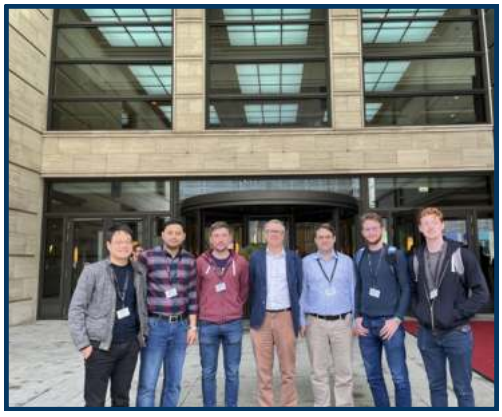
I just completed my PhD with the CDT-PIADS program, and looking back, this experience has been one of the most formative phases of my career. I began my PhD in 2020, focusing on the dopant profiles in epitaxially grown III-V materials at the Irish Photonic Integration Center (IPIC, based at Tyndall National Institute) in Cork. IPIC provided a dynamic environment where I could engage with cutting-edge research in photonics. Now, as I step into a new role as a Research Ireland-GOI postdoctoral fellow at Tyndall National Institute, I'm grateful for the diverse skills and insights gained through CDT-PIADS program, which have been invaluable in preparing me for the next stage of my work. The program also helped me build a strong professional network that I look forward to drawing upon in the future, whether through collaborations or simply as a source of ongoing support and inspiration.

During my PhD, I challenged a 50-year-old paradigm in metalorganic vapor phase epitaxy (MOVPE) that had limited advancements in the field. Through extensive experimentation, I demonstrated that zinc (Zn) acts as a surfactant, incorporating through different mechanisms, with only certain paths leading to electrically active states. I also found that the commonly observed "rollover" effect in Zn-doped devices could be effectively suppressed by introducing a competing surfactant, offering a new approach to optimizing device performance. Building on these "surface science" concepts, I applied similar ideas to another long-standing challenge in MOVPE—the incorporation of oxygen in aluminum-containing layers. I demonstrated that oxygen incorporation could be managed and addressed, potentially improving the reliability of III-V devices. These findings will open new doors for advancements in the field and have also laid the foundation for my next project.

In my postdoctoral project, I aim to build upon the unique knowledge gained during my PhD to push III-V integration technology forward. The project seeks to achieve a breakthrough in photonic integrated circuits (PICs) by demonstrating previously challenging, regrowth-free design that combines high-performance Mach-Zehnder modulators (MZM) and lasers vertically. This will be achieved through a challenging epitaxial design, introducing a novel architecture with MZM on top of an inverted laser.

Reflections of my PhD with PIADS

Dr. Thomas O'Connor, 2019 Cohort



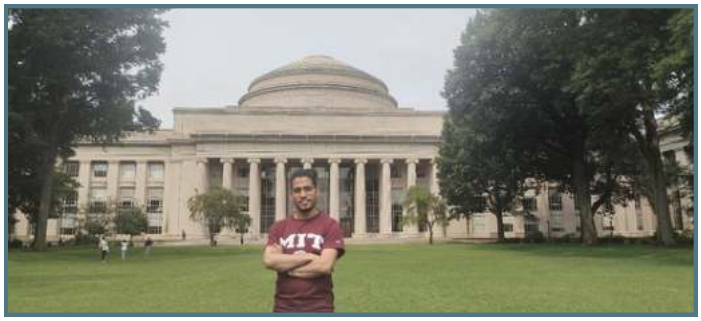
After completing a joint honours BSc in Applied Mathematics and Physics I was keen to pursue my interest in the field of computation and physics. I started my PhD at Tyndall National Institute, Cork in 2019 under my supervisor Prof. Peter Parbrook (Head of the III-Nitride Group) and Co-supervisor Dr. Stefan Schulz (Head of the Photonics Theory Group). My PhD focused on the growth and modelling of B containing III-Nitride materials for their emission in the Ultraviolet range.

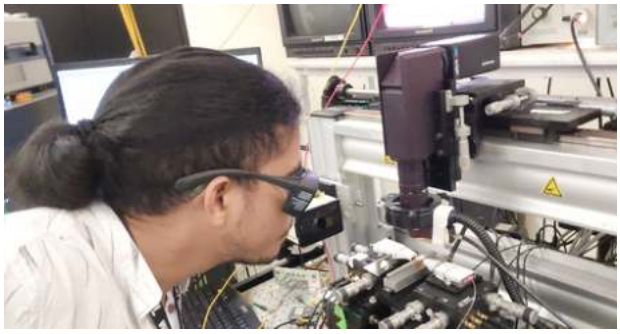
In the early stages of my PhD, I travelled to the University of Glasgow for my first PIADS conclave. It was a great opportunity to meet other students and academics in the field. I gained valuable insights into the various challenges and rewards I could expect to encounter during my studies. The conclave also enabled me to experience my first conference but with a more relaxed environment. The COVID pandemic struck towards the end of my first year, however, I was fortunate to be able to work on my simulation work during this time. Once restrictions were lifted, I received firsthand experience and training in using structural and spectroscopy techniques from Dr. Vitaly Zubialevich and Dr. Pietro Pampili. Their knowledge and experience were invaluable to me. Being part of the CDT programme allowed easy collaboration with other groups such as Dr. Miryam Arredondo when we needed cross section transmission electron microscopy measurements. Her knowledge and expertise were crucial in our understanding of how B impacted the growth of our multiple quantum well structures. Further to this, I always enjoyed the summer and winter school where I met the other PIADS students and discussed how they were progressing through their PhDs.

I was given the opportunity to present my work at conferences both at a national and international level such as 'SPIE' in San Francisco, 'ICNS' in Fukuoka Japan, 'IWN' in Berlin, 'EMRS' in Warsaw, 'UKNC' in Bristol, 'ICMOVPEXX' in Stuttgart and various other renown conferences. This developed my public speaking skills along with the opportunity to network with other experts in the field. I gained insight into the novel work which other groups were pursuing around the world along with discussing my own research. The conferences also contained excursion events where we were given the opportunity to do some local sightseeing. When I was in Stuttgart, Ayse (another PIADS student) and I went to the Mercedes Benz Museum. When I was in Fukuoka, my group attended a National Sumo wrestling championship. Overall, pursuing the PIADS PhD programme was a rewarding experience that enabled me to deeply explore my research interests, develop valuable skills, collaborate with exceptional individuals and travel to new places.

My visit to MIT for 3 months with Wrixon Research Excellence Bursary

Saif Wakeel





It was a great opportunity to attend MIT for 3 months with the Wrixon Research Excellence Bursary. This bursary is to support PhD students in the pursuit of research excellence, to broaden the student experience and to promote new national and international research collaborations. MIT.nano and Photonic Materials Lab (PMAT, MIT) are world-class facilities recognized for their state-of-the-art capabilities in fabricating nano and micro-scale photonic devices. With approximately 1200 users of MIT.nano, including top-tier companies and academic institutions, it serves as a hub for innovation and technological advancement. During my three-month stay with Prof. Juejun Hu's group, I gained hands-on experience in fabricating advanced photonic integrated circuits (PICs) and optical components essential for wafer-level photonic packaging technologies. This experience helped bridge the gap between developing a PIC and making it ready for packaging. I strengthened the collaboration between Tyndall and MIT, fostering a partnership that holds potential for new breakthroughs in the field of photonics.

In the first month, I received training on various fabrication tools, including e-beam lithography, silicon and oxide etching, profilometry, SEM etc. In the second month, I completed the first batch of silicon PICs which I fabricated and fondly called my "babies." During the third month, I was trained on micro-optics fabrication tools, such as the Up-Nano system, and developed a micro-optics library using two-photon polymerization-based 3D printing. At the end of his visit, I presented my work to MIT's Photonic and Electronic Materials Group, where I found many students interested in photonics packaging collaborations. I also assisted some students with packaging their PICs. Additionally, Cambridge and Boston provide opportunities to connect with brilliant minds from around the world, offering a rich environment for cultural exchange and the formation of both professional and personal connections. The experience is further enriched by the stunning fall colors of New Hampshire, the beaches of Boston, and the vibrant energy of New York City.

My PHD Journey thus far

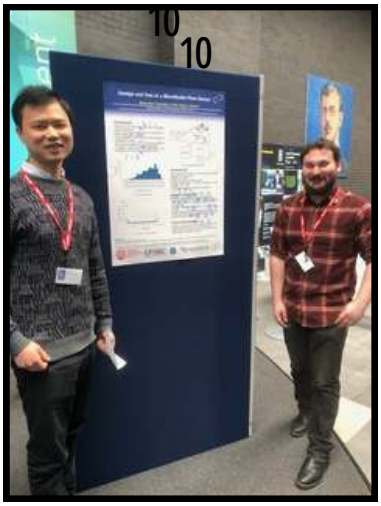
Ethan Crawford

Having only recently started my second year in the PIADS CDT, this term has mostly consisted of familiarising myself with the research environment I aim to contribute to, during the research phase of my PhD project. I was fortunate being able to attend the Materials and Molecular Modelling Hub user meeting 2024 conference held at the Battle of Britain Bunker in Uxbridge, London. I was unable to present anything as my project is still in the early stages, however the conference was an amazing opportunity to meet other students in my field of research as well as adjacent fields while networking with academics and industry partners present at the event. The speakers at the event covered topics like Density Functional Theory (DFT), Neural Networks, machine learning methods and force fields being the most popular. These talks were very useful as they helped contextualise how computational methods can be used for problems different from my project. So far with my own project I am combining computational and experimental methods with investigating Single Molecule Magnets and Spin Crossover Complexes. Computationally the focus has been on DFT methods which produced results that did not align with current literature nor experimental results. Experimentally I have been getting trained on a piece of equipment called a SQUID Magnetometer which I have been using to gather a vast array of data for complexes produce by University College Dublin (UCD). Recently I have been collaborating with a chemistry PhD student from QUB taking measurements for them and beginning to characterise and explain the phenomena detected using my physics background to assist that process.

Going forward, I am really excited to begin contributing to the scientific community and engaging with members of the community, through other conferences or winter/summer schools.

Conference Review: 2024 Mechanical and Design Excellence Doctoral Conference | Rolls-Royce, Derby

Qixuan Chen



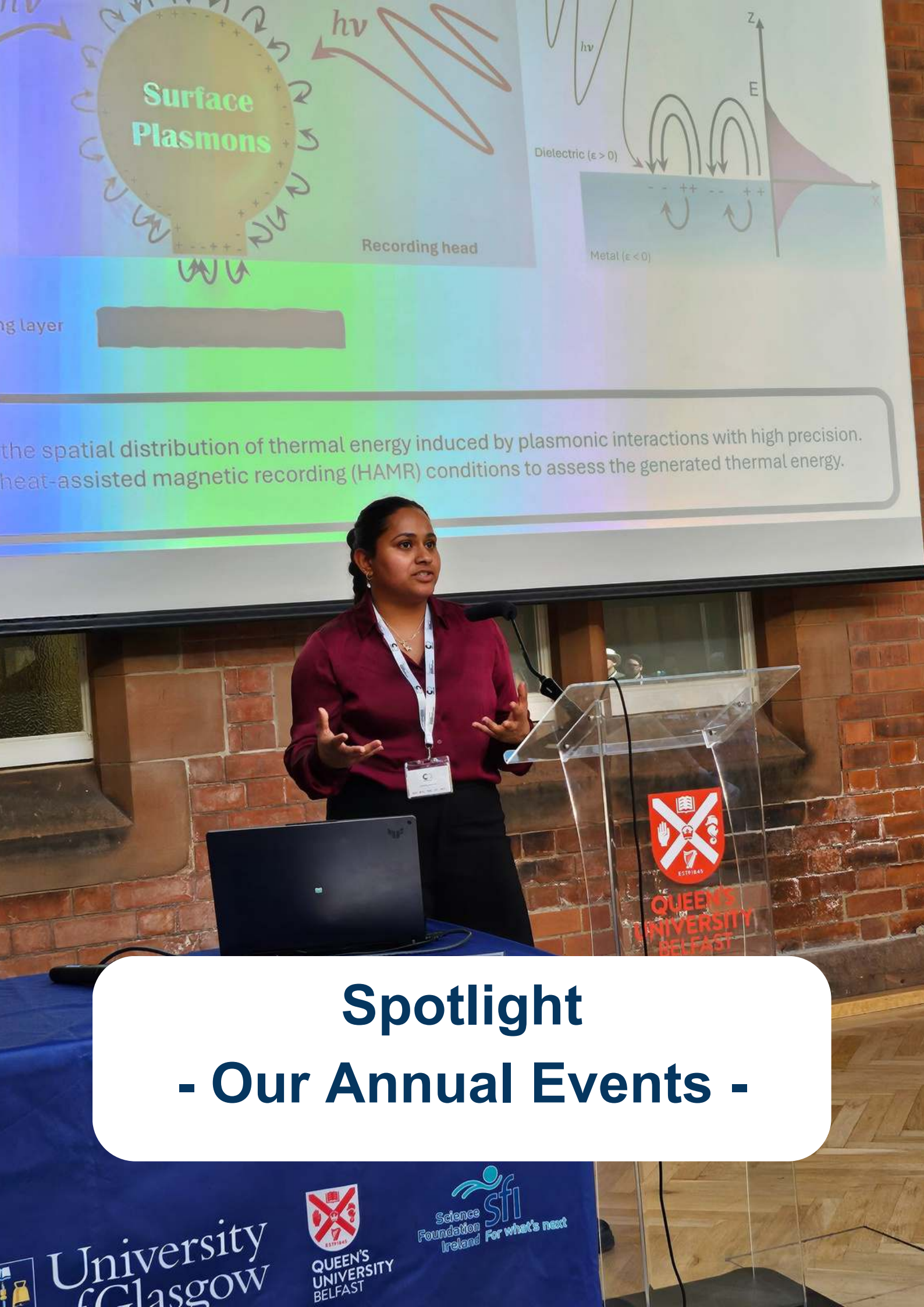
Thanks to the strong partnership between PIADS team and Rolls-Royce, I had the privilege of being invited to attend the 2024 Mechanical and Design Excellence Doctoral Conference. Held in April 2024 at the Rolls-Royce Learning and Development Centre in Derby, this conference brought together experts and scholars from aerospace and engineering. It provided valuable insights into the latest advancements in sustainable aviation and advanced propulsion technologies. In this article, I will share my experiences, including my poster presentation, my visit to the Rolls-Royce exhibition hall, and the engaging discussions on hydrogen-powered aviation.

During the conference, I presented my research poster titled “Design and Test of a Microfluidic Flow Sensor”. The poster showcased a novel method for accurately counting and monitoring droplets within a microfluidic system using an Arduino microcontroller and photoelectric sensors. This approach ensures high precision in chemical reactions and the preparation of microfluidic devices, providing a low-cost and easy-to-implement solution that is suitable for widespread use in laboratory and industrial settings. Although my research area does not directly overlap with Rolls-Royce's aerospace innovations, having the opportunity to present my work at such an important international conference was highly significant for me. It was my first time presenting in such a professional setting, and it provided a valuable opportunity to practice communicating with students from related fields. During the presentation, I not only received feedback from professionals but also gained new perspectives from the questions and suggestions of other attendees. This experience made me realise that even research seemingly unrelated to the aviation field can find potential applications through technological crossovers and integration.

One of the most memorable parts of the two-day conference was visiting the Rolls-Royce exhibition hall. During my undergraduate studies, I took courses related to aerospace engineering, but this was the first time I saw the internal structure and intricate details of an engine up close. The complex network of turbine blades, combustion chambers, and fuel systems was truly awe-inspiring, as if the diagrams from textbooks had come to life, showcasing the precision and complexity behind modern aviation technology. The exhibition also presented the evolution of engine design over the past century, from the earliest piston engines to the latest jet turbines and hybrid systems. This journey through time made me realise the tremendous progress in the aviation field and highlighted how Rolls-Royce has continuously led and innovated in this field.

Among all the talks, the one that interested me most was about the use of hydrogen as a sustainable aviation fuel. The speakers discussed the key role hydrogen-powered engines could play in achieving zero-emission aviation in the future. Although it is currently only in the conceptual stage, challenges such as storing hydrogen under high pressure and establishing the necessary infrastructure were also mentioned. However, the vision of a hydrogen-powered aircraft producing only water as a byproduct is truly inspiring.

Attending the Rolls-Royce conference was an inspiring experience that gave me the opportunity to gain further understanding of different research fields. At the same time, I also realised that these technologies driving the aviation sector towards sustainability share a similar goal with my current research on semiconductor lasers—to improve target efficiency, maximise resource utilisation, and minimise environmental impact through innovative technological means. This conference has motivated me to continue my efforts and contribute to technological progress.



Spotlight

- Our Annual Events -

Reflections on Winter School 2024

Our annual Winter School was hosted at the Irish Photonic Integration Centre (IPIC) at Tyndall National Institute in Cork, and what a fantastic few days it was! This event, dedicated to the professional development of our students, provided invaluable insights and guidance for mapping out their future careers in the photonics industry and beyond.

Over two action-packed days, participants were immersed in a variety of insightful sessions, delivered by the experts at Tyndall and University College Cork (UCC). On Day one, the focus was on building inclusive and diverse workplaces, intellectual property (IP), and commercialisation. Topics covered also included the intricacies of start-ups and essential legal matters, offering our students a well-rounded view of the professional landscape.

Day two, took a more hands-on approach with workshops on planning public engagement events, managing data and time, and developing an international presence for their PhDs. A key highlight was the storytelling session, where students learned how to share their research in a way that makes an impact on a wider audience. The Winter School closed on a high note, guiding students through career planning, including CV writing, and how to craft an impactful motivation letter—tools that are sure to be invaluable as they advance in their careers. Of course, it wasn't all work and no play. Students were treated to a tour of University College Cork's beautiful campus, and had the opportunity to explore the state-of-the-art laboratories at Tyndall, where cutting-edge research and technology are developed. These tours offered a deeper understanding of the key processes and equipment driving the future of photonics. The Winter School also provided ample opportunities for networking and socialising, all while enjoying the warm hospitality of Cork—a perfect backdrop for a productive and memorable few days. An excellent few days had by all! The Winter School was a resounding success, helping our students gain the skills, knowledge, and confidence needed to succeed in their future careers.

2024 Mechanical and Design Excellence Doctoral Conference | Rolls-Royce, Derby

This year's Mechanical and Design Excellence Doctoral Conference in Derby was a fantastic opportunity for PIADS students to engage with top experts in the field. The event, which evolved from the previous Cornerstone initiative (an EPSRC-funded Prosperity Partnership between Rolls-Royce, the University of Nottingham, University of Oxford, and Imperial College London), showcased cutting-edge research in the fields of structural dynamics, materials engineering, aeromechanics, lightweight structures, thermal management, and more.

Held at the Rolls-Royce Learning & Development Centre, the conference brought together nearly 60 doctoral students, 38 technical presentations, and 26 poster sessions. Participants had the opportunity to interact with technical leaders from Rolls-Royce and academic colleagues from renowned institutions, including the University of Southampton, University of Bristol, University of Sheffield, Cranfield University, and international partners like Brandenburgische Technische Universität Cottbus-Senftenberg and Technische Universität Dresden.

The conference served as an excellent platform for doctoral students to present and discuss their research, particularly in the areas of Structural Dynamics, Friction & Contact, System Design, and Computational Fluid Dynamics. Notably, the event welcomed four first-year doctoral students, as well as representatives from the Photonic Integration and Advanced Data Storage Centre for Doctoral Training, including Lynda Mahon and Lisa Campbell.

The conference featured insightful talks from industry and academic leaders, with Dr. Amanda Chmura (Deputy Director, Business and Impact Partnership at EPSRC) delivering the keynote on the importance of academic-industrial collaboration. Charlotte Brownsword from the Institution of Mechanical Engineers (IMechE) also provided valuable insights into the significance of Professional Registration and Development. A major highlight was the focus on sustainability in aviation, with guest talks from Dr. Sebastian Eastham (Imperial College), Prof. Dong Liu (Oxford), Jonathan Hall (MAHLE Powertrain), and Dr. Helen Brocklehurst (Aerospace Technology Institute). The event concluded with a panel session chaired by Steve Gregson CEng FIMechE FIAM, Senior Fellow at Rolls-Royce, who facilitated a lively discussion on the future of sustainable aerospace technologies.

Special thanks go to the dedicated student organizing team, including Connor M., Allan G., Kwan Lok (John) Wong, Christian Stewart, Neil Dickson, Gerico Vidanes, and Lars Muschalski, as well as Rebecca Shaw and Adam Morgan for their excellent coordination of the event. The conference dinner, held at the University of Nottingham, was a lovely way to end the two-day gathering.

You can read ‘Conference Review: 2024 Mechanical and Design Excellence Doctoral Conference’ by Qixuan Chen which provides his reflections of presenting his research at the event, on Page 31.

Exciting Careers Event: Bridging Academia and Industry for PIADS PhD Students

We were thrilled to team up with FUSE CDT: EPSRC Centre for Doctoral Training in Future Ultrasonic Engineering, to come together to deliver a unique careers event, hosted at the University of Glasgow. This event provided our students with a fantastic opportunity to explore diverse career paths, from industry leadership to academic advancement. Our goal is to equip students with essential tools and insights to enhance their employability, offering guidance on how to thrive in both academic and industry settings. The event featured expert-led sessions, providing valuable perspectives on progressing in an academic career, understanding the evolving demands of the industry, and developing a skillset that aligns with the future of technology and innovation.

A special thank you goes to our industry partners, whose participation made this event truly remarkable. We were proud to be joined by:

- Rolls-Royce
- Oxford Instruments plc
- Appleyard Lees IP LLP
- STMicroelectronics
- Yelo Photonics
- Smart Nano NI
- Vector Photonics
- Kelvin Nanotechnology Ltd
- Fraunhofer-Gesellschaft
- Glasgow Science Centre
- Nami Surgical
- Canon Medical Systems Europe

These leading organisations shared their knowledge, expertise, and career opportunities with the next generation of engineers, entrepreneurs, and innovators, providing our students with opportunities to unlock new career pathways and build connections that will last a lifetime!

Round-Up of Conclave 2024!

What an incredible few days it was! As we closed the curtains on our 9th Concalve! Another successful year, as we reflect on the engaging and inspiring research presented by our students. The event provided an exceptional platform for PIADS CDT students to showcase their hard work, presenting both cutting-edge research and innovative ideas through presentations and posters. It was a brilliant opportunity to share knowledge with fellow students, academics from Queen's University Belfast, the Irish Photonic Integration Centre, and the University of Glasgow, alongside industry leaders who contributed their insights and expertise.

A highlight of this year's Conclave was an insightful panel discussion featuring PIADS CDT alumni, who shared their journeys in engineering and research since completing their PhDs. Their stories offered invaluable guidance on how to enhance employability in today's competitive job market, sparking thoughtful discussions and encouraging the next generation of engineers and researchers. We were also privileged to hear from our esteemed Keynote Speaker, Dr. Miryam Arredondo from Queen's University, whose presentation added a wealth of knowledge to the event.

Celebrating our past and looking to our future, Robert Bowman PIADS CDT Director and Marc Sorel Deputy Director, thanked John Marsh for his outstanding work, vision and integrity as PIADS CDT Co-Director, as we mark his retirement. From all your PIADS colleagues and students, we wish you a wonderful retirement!!

A massive thank you to our Conclave organising committee — you truly outdid yourselves in bringing this event to life. Special recognition goes to Ruairidh Heron Cunningham, our exceptional MC, whose energy and charisma kept the event running smoothly. To all the PIADS CDT students and academics who made this event so special, thank you for your hard work and dedication.

We also extend our gratitude to our wonderful sponsors, Vector Photonics and Seagate Technology, for their generous support in making Conclave 2024 possible.

Here's to another successful year of collaboration, innovation, and inspiration.... Until next time!

Spotlight
- Educational Outreach -

Glasgow Science Festival

Katherine Stevens

The PIADS educational outreach programme aims to highlight the real-life applications and implications of our research while allowing cohorts to develop their science communication skills. In June of 2024, the 18th Glasgow Science Festival took place. PIADS in collaboration with the University of Glasgow Optical Society delivered our "Faster than the Speed of Light" activities, engaging with young students and members of the public in Glasgow Botanic Gardens for two days. We demonstrated some of the basics of photonics through hands-on activities, exploring our theme of "Faster than the Speed of light" and were visited by 5 schools across the two days, as well as some of the public in the afternoons.

We had a total of three stations on our stall. Firstly, we created a wave machine using skewers and jelly babies, which showed how oscillations creates waves. The children got a jelly baby to skewer onto the wave machine, and a jelly baby to eat, and once word got around we became inundated with eager volunteers.

We then demonstrated how data can be transmitted via light, playing animal crossing music sent by an LED and received by a solar panel connected to a speaker. While we explained how this worked, the children were able to move the solar panel around and hear how the sound could be controlled (and fully understand that the music was from the LED). We were then able to explain to them some of the emerging technologies that use this principle, and where they may start to see this in the future.

Our final station was handing out activity packs for them to take home with them. This included a make your own spectroscope pack (as well as some ideas for other experiments they can do using things they will have at home). While all of the instructions were inside the pack, we did take the opportunity to explain how the spectroscope worked, separating the different colours of light. We also got to show them that different light sources contain different wavelengths, by showing the difference between sunlight and a phone torch through the diffraction gratings. These demonstrations were popular with the children, with some returning faces, and also led to some interesting conversations with the public, about the future of photonics and how it impacts them.

Glasgow Science Festival provides an invaluable opportunity for children to engage with Science in a non academic setting. The ASPIRES studies [1,2] showed that the two main reasons that children stop having scientific career aspirations are based not on how much they enjoy science, but due to how they and their peers see themselves. Children who don't feel recognised as 'brainy' or 'having a science brain' are less likely to engage with science as a career. Facilitating science participation in ways that aren't being assessed allows children to build confidence in their scientific ability, and can challenge misconceptions about the type of person you need to be to be a scientist.

References:

[1] Archer Ker, et al. (2013). _ASPIRES Report: Young people's science and career aspirations, age 10 – 14_. King's College London.
[2] Archer, L., et al. (2020). ASPIRES 2: Young people's science
and career aspirations, age 10-19. London: UCL Institute of Education.

OUR STEERING BOARD

The CDT Steering Board provides important oversight & guidance on the strategic direction of our CDT, ensuring that it remains closely aligned to industry roadmaps.

It has executive & oversight authority over all aspects of strategy, policies & performance, meeting bi-annually to monitor progress against the CDT Key Performance Indicators. These include: the recruitment of a diverse, well-qualified student cohort; the delivery of a high quality & dynamic doctoral training programme; the provision of rich & embedded industrial engagement; the delivery of doctoral research projects that are cutting-edge, innovative & collaborative; & strong & robust governance & management.

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