



Engineering and
Physical Sciences
Research Council



**CENTRE FOR DOCTORAL TRAINING IN
APPLIED PHOTONICS**
industry inspired: imaging | sensing | analysis

ANNUAL REPORT

2023/2024

EPSRC Centre for Doctoral
Training in Applied Photonics



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Welcome

Photonics contributes over £15bn to the UK economy annually, with companies spread across the whole of the UK. This is an exciting sector to be part of – with research and innovation taking place in a multitude of areas, from advanced manufacturing to developing new laser systems, advancing sensor technology to applying novel analysis to support medical clinicians, monitoring the environment and serving the ever-present needs for enhanced safety and security. This broad range of application areas, and geographical spread, is reflected in our student projects and our industrial partners, some of whom you will hear more from in this annual report.

The UK is a world leader in Photonics, but this is only possible because of the high calibre of people working in our sector. While we are enthusiastic about the exciting research taking place by our researchers we are mindful that the goal of our national Centre for Doctoral Training is to foster the next generation of photonics technology leaders. We are all about inspiring and empowering our students to make a difference in society. This is evident through the impact of their research – commercially via new and improved products and services, as well as reporting to the scientific community – and in other ways, such as outreach activities and the diverse range of careers that our graduates pursue.

All of this is a credit to our students and the support that helps them achieve success – supervisors from across the partner Universities, the CDT support team, the wider university community, and of course our industry partners. This industry engagement is critical to our success, with all our projects inspired by industry. This allows us to remain at the forefront of industry relevant photonics research. We highly value this sense of co-creation, and perhaps it goes some way to explain our success in operating a Doctoral Training Centre for over 20 years!

Looking forward, we are excited to report the funding awarded by the UK EPSRC that will allow the centre to continue for a further 5 years of cohort intakes (Academic Year 2024-5 through to 2028-9). The bid, led by Professor Derryck Reid, and supported by over 30 companies welcomes the University of Huddersfield and the National Physical Laboratory as formal partners to in the Centre. This represents an overall investment in the development of photonics expertise of over £9M, with £6.1M provided by the UK EPSRC. The new centre will have an emphasis on Use-Inspired Photonic Sensing and Metrology. This reflects our experience of working with industry for co-creation of applied research and training that is essential to keep the UK at the forefront of industrial Photonics!



Dr Bill MacPherson
Centre Director

Principal Contacts

Executive



Dr Bill MacPherson
Director
W.N.MacPherson@hw.ac.uk
+44 (0)131 451 3733



Dr Gordon Flockhart
Deputy Director
Gordon.Flockhart@strath.ac.uk
+44 (0)141 548 4267



Prof. Derryck Reid
Deputy Director
D.T.Reid@hw.ac.uk
+44 (0)131 451 3652



Alison Low
Centre Manager
A.H.Low@hw.ac.uk
+44 (0)131 451 8245



Louise Exton
Training Programme Manager
L.Exton@hw.ac.uk
+44 (0)131 451 8229



Chloé Baines
Centre Administrator
C.Baines@hw.ac.uk
+44 (0)131 451 3792

Coordinators



Dr Keith Wilcox
University of Dundee
K.G.Wilcox@dundee.ac.uk



Dr Phillip Hands
University of Edinburgh
Philip.Hands@ed.ac.uk



Prof. Martin Lavery
University of Glasgow
Martin.Lavery@glasgow.ac.uk



Prof. Graham Turnbull
University of St Andrews
gat@st-andrews.ac.uk



Dr Ralf Bauer
University of Strathclyde
ralf.bauer@strath.ac.uk



Contact Us

CDT in Applied Photonics
Heriot-Watt University
School of Engineering and Physical Sciences
Edinburgh
EH14 4AS

T: +44 (0)131 451 8245/3792

E: CDTphotonics@hw.ac.uk

www.cdtphotonics.hw.ac.uk

 @CDTAP

 www.linkedin.com/groups/2497044/

 [cdtappliedphotonics/](https://www.instagram.com/cdtappliedphotonics/)

Committees

Programme Committee

The Programme Committee, which includes representatives of the academic partners, has oversight of the implementation and development of the accredited and professional-development training programme, and the operational aspects of student admission and progression.

Management Committee

The Committee's remit is to provide oversight and strategic input to the CDT Executive and to maintain a strong connection between the CDT and its industrial partners. CDT students and the EPSRC have representation on this committee.

Independent Advisory Committee

The purpose of the Independent Advisory Committee is to provide external perspective to the CDT by drawing on expertise from the international photonics community and other nationally-funded CDTs.



CDT in Use Inspired Photonic Sensing and Metrology (UIPSM)

In March 2024 UKRI announced that the Centre for Doctoral Training (CDT) in Applied Photonics will be refunded as the CDT in Use Inspired Photonic Sensing and Metrology (UIPSM). The existing consortium of Heriot-Watt University (lead) the universities of Dundee, Edinburgh, Glasgow, Strathclyde and St Andrews is now joined by the University of Huddersfield and by NPL, who are world leaders in optical metrology and for the first time extending the footprint of the CDT governance to outside Scotland.

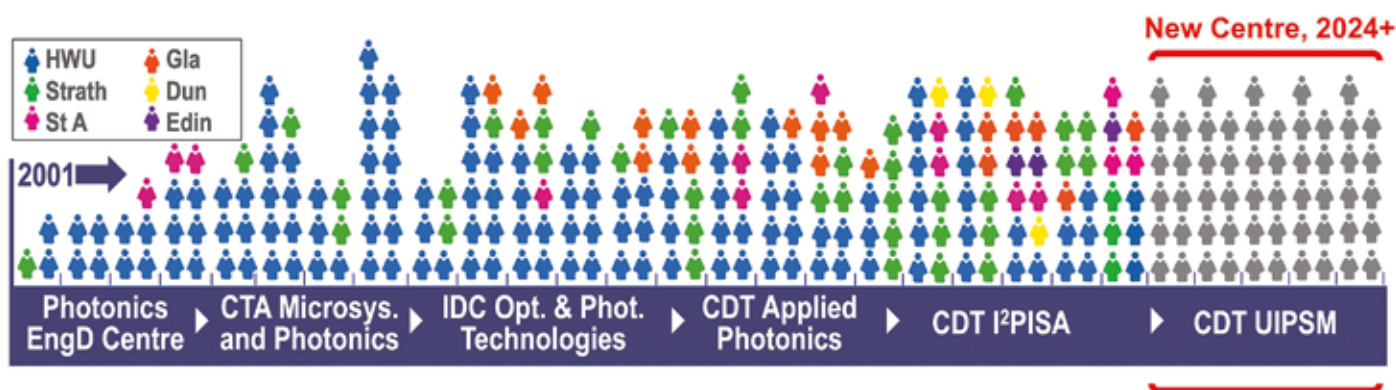
The Centre Principal Investigator Prof. Derryck Reid commented “The commitment of the CDT staff, students, supervisors and Industrial partners is what makes our Centre special and has secured its continuation for another 5 years.”

The EPSRC CDT in Applied Photonics and its predecessors has been funded by EPSRC and Industry since 2001 and is the UK’s longest running Centre for Doctoral Training in Photonics.

This new CDT will train 55 students and the first students will start in September 2024. These will comprise at least 40 EngD students, characterised by a research project originated by a company and hosted on their site. A complementary stream of up to 15 PhD students will pursue industrially relevant research in university labs, with more flexibility and technical risk than in an EngD project.

A 9-month frontloaded residential phase in St Andrews and Edinburgh will ensure the cohort gels strongly, equipping students with the knowledge and skills they need before starting their research projects. These core taught courses, augmented with electives from the other universities, will total 120 credits and will be supplemented by accredited MBA courses and training in outreach, IP, communication skills, RRI, EDI, sustainability and trusted-research. Collectively, these training episodes will bring students together a few times each year, consolidating their intra- and intercohort networks.

Joining the existing coordinators in the new centre are Dr Haydn Martin (University of Huddersfield) and Dr Daniel O’Connor (NPL).





Centre Highlights



New Students

We were delighted to welcome our new students in September 2023 at our induction event held at Heriot-Watt University. The new students are hosted by five of our academic institutions and eight different industry partners.

At the Welcome Event, new students were able to get to know each other, receive advice from a CDT student representative about what to expect and hear from a seasoned supervisor about how to get the most out of their supervisory support.

The students also had a presentation on Mental Health and Wellbeing given by the Student Welfare team at Heriot-Watt University.

Academic and Industry supervisors also attended lunch with the students.

The cohort of students spend their first year completing technical courses before moving to their companies for the research component in June 2024. The companies supporting our 2023/24 cohort are:

- **Dotphoton**
- **Canon Medical Research Europe**
- **Ceres Holographics**
- **Fraunhofer**
- **NHS Lothian**
- **STFC**
- **STMicroelectronics**
- **STFC**



CDT in Applied Photonics Student Conference 2024

The CDT held its Student Conference on 1 July 2024 at the James Watt Centre, Heriot-Watt University. The students had the opportunity to meet with peers and learn more about each other's research, as well as the research of the keynote speakers. Academic and industrial supervisors attended the conference, as well as members of the CDT Management Committee. The conference BBQ concluded the event.

Keynote Speakers

We were delighted to have Centre alumna and now industrial supervisor, **Dr Alison O'Neil** (Canon Medical Research Europe) give a keynote talk at the conference. The title of Alison's presentation was *Photons, Foundation Models and Automated Radiological Findings*.

Also providing a keynote talk at the conference was **Dr Jonathan Silver** from NPL, giving a presentation on *Kerr nonlinear optics with microresonators*. We were delighted that Jonathan was able to join us to represent NPL, who will be joining the academic consortium for the newly refunded CDT.

Conference abstracts for students presentations and posters and keynote speakers are available at:

[CDT-in-Applied-Photonics-Abstracts-handbook.pdf](#)





Conference Prize Winners

The conference prize winners were as follows:

Year 1 Group Poster:

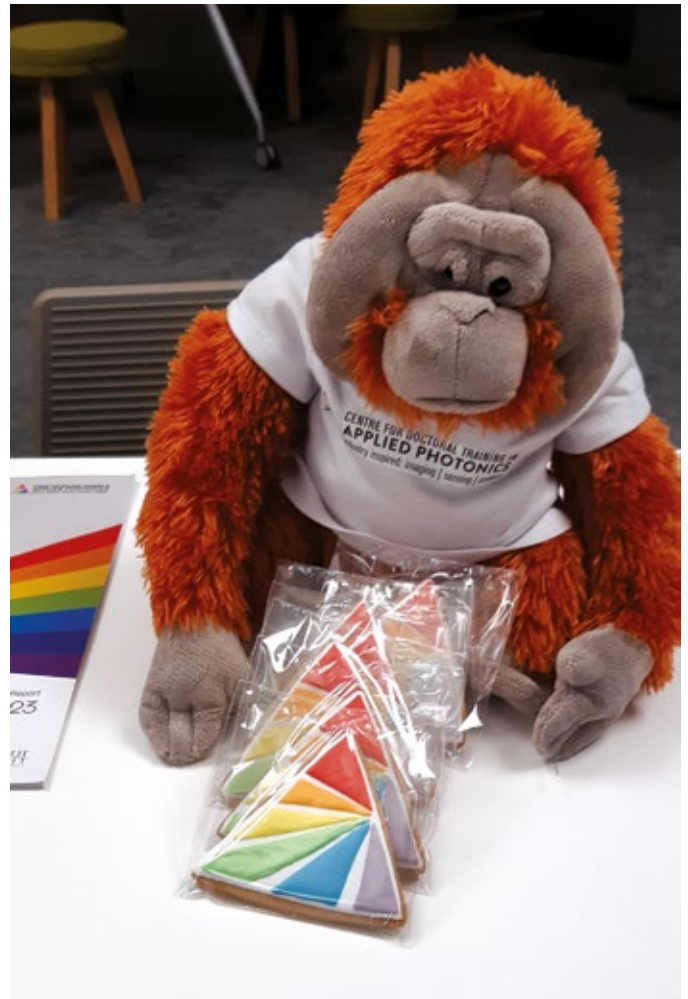
B. Calder S. Kutiyal, H. Mackinnon,
S. Quinn (MyRIO Marble Maze)

Year 2 Individual Poster:

Kamal Gil

Year 3 and 4 Oral Presentations:

Christopher Boland and Shannon Thompson



We were delighted that Centre mascot, Brewster Orangutangle, attended this event and as well as joining the research discussion, enjoyed sampling the Photonics inspired food.



Outreach at Glasgow Science Centre

Our students took part in outreach and public engagement training delivered by Glasgow Science Centre. This includes a workshop given by the Science Centre on in-person public engagement training followed by a 'Meet the Experts' session where our students explain their research to the public visiting the Science Centre during the busy April school holidays.

The 'Yee-Haw See-Saw' was such a hit with the visitors, that the group that developed it, Aoife, Christopher and Shannon donated it to the Science Centre!





Supervisor Training Event

On Friday 3rd May 2024 the CDT in Applied Photonics held a half-day training workshop followed by lunch for academic and industrial supervisors of current and prospective CDT students in the Technology Innovation Centre in Glasgow.

Representatives from our industrial partners, including Thales, Canon Medical Research Europe, UKNNL, Occuity, Coherent, and Fraunhofer participated in the event alongside some of our academic supervisors from the University of Strathclyde, University of Dundee, and Heriot-Watt University.

They heard talks on the CDT from our Centre Director, Deputy Director, Training Programme Manager and CDT Cross-Cohort Student Representative. In addition, one of our industrial supervisors provided an overview of his experience of supervising a CDT student.

We had positive feedback on the day, including:

“I thought that the event was very useful and well organised. I particularly enjoyed the session on student and supervisor expectations...”

“It was great the meeting was at Strathclyde. I could travel overnight to Glasgow and just walk over... Overall, I thought the training was good. There were some good points made.... It shows you all have the experience and knowledge.”

We will be holding a similar event in 2025.



FLAIR Conference Italy



Our CDT students Kamalpreet Gill, Will Gash and Euan Martin attended the FLAIR conference in Assisi Italy and tell us about their experiences.

Euan Martin

Being a member of the CDT in applied photonics conveys many benefits: a cohort-based teaching experience during the first year, attendance at the bi-annual summer schools, support and knowledge from a wide range of photonics specialists, and the continued training and skills opportunities presented throughout the 4-year programme. When applying the benefit that stood out most strongly to me was the £4000 travel budget, able to be spent on trips to conferences or other events to further your understanding of photonics and disseminate your research. As such, many students take at least one international trip during their time in the programme, and my first occurred in September 2024, heading to the FLAIR conference in Assisi, Italy.



A pair of BA flights and a selection of trams, trains and buses transported myself, two fellow CDT students and two researchers from Strathclyde from the dreary autumnal afternoon of the central belt to the delightfully temperate climes of central Italy and a scrumptious dinner of pizza and pasta overlooking the central square of Florence. We soon found our way to Assisi, nestled in a central valley of the Umbrian Uplands, an ancient city famed for its Saint and monastic order, and now our home for the week.

Field Laser Applications in Industry and Research, or FLAIR for convenience, is a conference specialising in any topics associated with the sensitive and selective detection of molecular species with a broad interdisciplinary approach. Talks consisted of a range of industry focused sessions, highlighting new and innovative products and technologies, and academic sessions on a range of topics including dual comb spectroscopy, atmospheric monitoring, hollow core fibre spectroscopy and plasma analysis

techniques. With such a wide range of speakers it would be easy to fail to grasp the range of topics discussed each day, particularly those far removed from my own field of photoacoustics, however the broad introduction to photonics given by the first year of the CDT provided extremely valuable here. My favourite talk of the week came from a researcher based in Oxford using pulsed lasers to drill microchannels into hollow-core fibres for remote, distributed sensing- a combination of techniques I knew vaguely of, but combined into a fascinating application. Attending at the end of my second year meant that I didn't yet have sufficient data to present at this iteration of FLAIR, but the opportunity to speak to other researchers at poster sessions gave me inspiration for conducting my own research and how to share it at the next iteration.

Aside to the day-time activities, conferences such as FLAIR often offer fantastic social programmes to allow for networking with fellow researchers. This included evenings of fine Italian dining in spectacular scenery amongst vineyards and olive groves, a rain-soaked day-trip to Spoleto and evenings basking in the sun around the historic citadel of Assisi. This provided ample time to network both with senior figures in the gas sensing world but also to meet other early stage researchers, who's valuable insight into their own research journeys provides both reassurance and inspiration for my own. I also tail-ended my trip with some time in Rome and Naples (funded from my own pocket!), allowing me to explore a country I'd never visited before- and eat lots of pizza!

Will Gash

Back In September I was lucky enough to attend the FLAIR (Field Laser Applications in Industry and Research) 2024 conference in the beautiful town of Assisi, Italy. The conference has been running since 2007, and this year featured a wide range of topics, from atmospheric monitoring to biomedical applications. Speakers were invited from both academic research institutions and industry. I particularly enjoyed this aspect of the conference as it provided students with a fascinating glimpse into possible careers beyond academia, not to mention the freebies.

My research project is looking at developing reliable long-term fibre-optic sensor systems for environmental condition monitoring experiments at AWE. Recently I have been developing wavelength modulation spectroscopy (WMS) based CO₂ sensors with near-infrared DFB lasers. These topics featured extensively throughout the conference, which meant I could really engage with the talks and the other attendees. The opportunity to see how similar research is being conducted across differing applications can be insightful and



motivating. Personal highlights included a talk on the development of novel circular multi-reflective cells for high-sensitivity atmospheric sensing, and the use of undetected photons in enhanced midinfrared interaction-free sensing.

The conference had a strong community spirit, and it was clear that the event was driven by the passion that the research community has for the field. While there were many invited speakers, the focus of the conference was on giving students and early-career researchers an opportunity to present their work and to meet like-minded people. The whole experience was down to earth and felt very welcoming to newcomers. I met some wonderful people and made connections with academics who have been very generous in sharing their knowledge and literature. In addition to the talks there was a healthy variety of excursions and evening meals, which gave me a good opportunity to meet other students.

Overall, I would strongly encourage any CDT students who work with lasers, particularly those involved in optoelectronic sensing, to consider attending future FLAIR events. I'm grateful to my supervisors for allowing me to attend and I thank the CDT for the travel allowance that makes these opportunities possible.

Kamalpreet Gill

Attending the FLAIR Conference in Assisi, Italy, was an incredibly enriching and transformative experience for my academic journey. The event brought together a diverse group of academic researchers and industry leaders from around the world, creating a vibrant platform to exchange ideas, present research and foster collaborations.



The conference's theme, *Gas Sensing Based on Photoacoustic*, was perfectly aligned with my research interests. I had the privilege of attending inspiring keynote presentations by both early-career researchers and senior academics, which provided fresh insights into laser-based mid-infrared detection. A standout moment for me was Pelini Jacopo et al.'s fascinating work on 3D-printed acoustic resonators for MEMS-based photoacoustic spectroscopy. Their detailed exploration of the design and fabrication processes of photoacoustic cells gave me a deeper understanding of emerging trends and challenges in this rapidly evolving field.

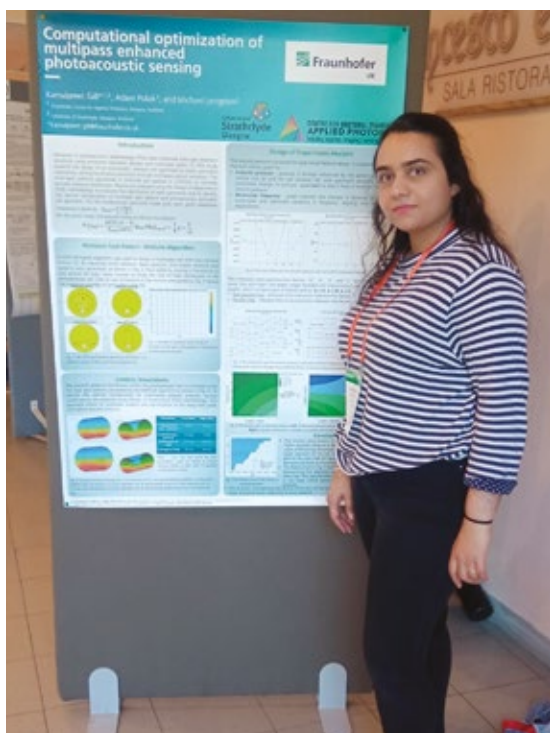
One of the most memorable aspects of the conference was the opportunity to present my research during the poster session. Sharing my findings with a knowledgeable and engaged audience was both exciting and deeply rewarding. The feedback I received was incredibly valuable, as it validated key aspects of my work while providing constructive suggestions for potential future

directions. Conversations with peers working in similar areas further reinforced my appreciation for the global and collaborative nature of academic research.

Beyond the academic sessions, the conference offered rich networking opportunities. Informal discussions during coffee breaks and social events allowed me to connect with researchers whose work closely aligns with mine, sparking ideas for future collaborations. Engaging with professionals from diverse cultural and academic backgrounds was equally enlightening, reminding me of the importance of interdisciplinary approaches in addressing complex research challenges.

The setting of the conference added an extra layer of inspiration. Assisi, along with nearby Spoleto, is steeped in history and culture. Exploring the iconic landmarks, winding streets, and breathtaking views provided a perfect counterbalance to the academic rigor of the conference. This blend of intellectual stimulation and cultural immersion made the experience truly unforgettable.

Overall, attending the FLAIR Conference was a profoundly rewarding experience. It not only enhanced my academic and professional development but also left me inspired to refine and expand my research. I am deeply grateful to CDT and my supervisors for supporting my participation in such a globally impactful event, and I look forward to applying the insights and connections gained to my future work.





Management Committee at the National Robotarium

We were delighted to hold our first CDT in Applied Photonics Management Committee meeting of 2024 at the National Robotarium. It was a great opportunity to meet with our EPSRC representative, student reps and our academic and industrial partners.

The meeting ended with a tour of the Photonics and Robotics labs in the Robotarium.












Centre Administrator

We are delighted that Chloé Baines has joined our Support Team as Centre Administrator. Chloé graduated from the University of York with a degree in Theatre: Writing, Directing and Performance; following graduation Chloé applied her love of travel to working as a travel consultant for Trailfinders, and brings her personal and business knowledge of travel to the CDT, coordinating a range of travel for the CDT students. Chloé also manages student Admissions to the CDT and an array of other tasks.



Our Students

Year 1

	Brandon Calder University of Strathclyde	Sellafield	Advanced video analysis for automated feature identification on Special Nuclear Materials (SNM) packages
	Will Carter Heriot-Watt University	STFC	Technological development in Multi Petawatt laser system
	Andrew Gardner University of Strathclyde	Fraunhofer	Chemical, biological and explosives sensing at stand-off with quantum cascade laser dual-comb spectroscopy
	Satyendra Kutiyal Heriot-Watt University	Renishaw	L-PBF process control to reduce hot-cracking and residual stress
	Hamish MacKinnon University of St Andrews	Canon Medical Research Europe Ltd	Deep learning approaches to imaging genomics for precision medicine
	Rajan Mistry Heriot-Watt University	STFC	Development of new technologies to scale the average power (pulse energy and pulse rate) and efficiency of high average power DPSSL systems
	Valeria Pais University of Glasgow	Dotphoton	Physics-informed and physics-constrained machine learning for next generation imaging
	Shiju Prasad University of St Andrews	Ceres	Conformable holographic metasurfaces for industrial imaging and sensing applications
	Sean Quinn University of Strathclyde	Fraunhofer	Novel laser sources for deep-UV applications
	Mateusz Trabszo University of Edinburgh	NHS Lothian	Using surface-enhanced Raman spectroscopy to improve the delivery of radiotherapy in 3D tumour models
	Zaka Ullah University of St Andrews	STMicronics	Synthetic optical materials for photonic metasurfaces applications



Year 2



Alastair Clarke
Heriot-Watt University

PowerPhotonic

Laser based fabrication of freeform optics



Natasha Crossley
Heriot-Watt University

Leonardo

Mechanical movement in electronic products and structures



Kamalpreet Gill
University of Strathclyde

Fraunhofer

Compact, ultra-sensitive gas sensing techniques



Brendan Hall
University of Strathclyde

Coherent

Novel laser architectures for the next generation of multi-photon imaging tools



Euan Martin
University of Strathclyde

Emerson

Trace gas detection for hydrogen purity using advanced optical methods and technologies



Kieran McGovern
Heriot-Watt University

Razorbill Instruments

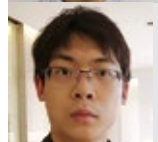
Optical sensing of electronic interactions in two-dimensional semiconductors using a novel cryogenic surface force apparatus



Martin Monaghan
University of Strathclyde

Fraunhofer

Optical communications in challenging environments



Kuo Wang
University of Glasgow

Nokia

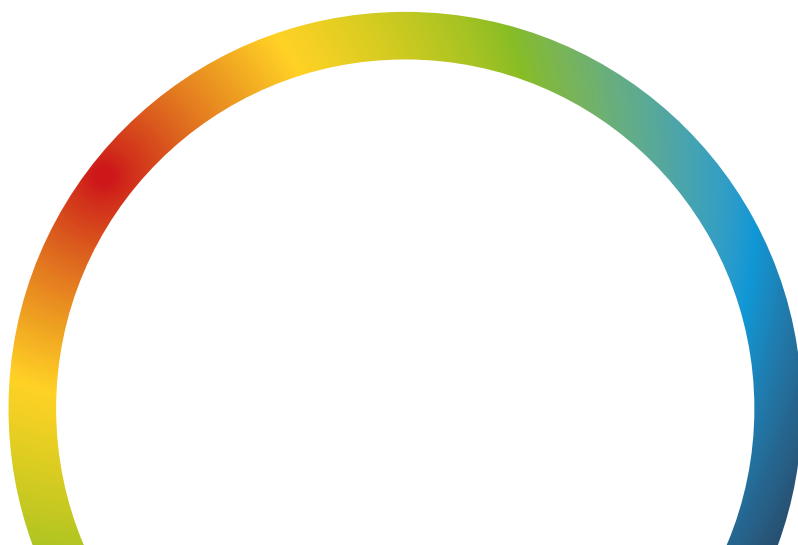
Advanced optical systems for terabit free-space communications



Agnieszka Wojtusiak
Heriot-Watt University












STFC

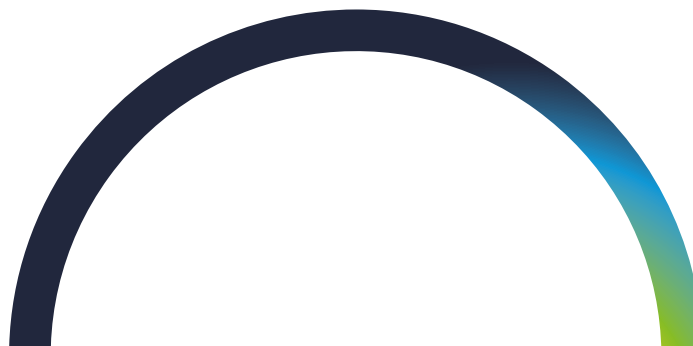
Development of advanced high energy, high pulse rate laser architectures for industrial, healthcare, and scientific applications









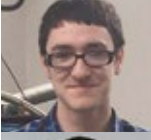



Year 3



	Iman Alhamdan University of St Andrews	VividQ Ltd	Metasurfaces for augmented reality applications
	Mohanad Al-Rubaiee University of Glasgow		Laser sources and semiconductor optical amplifiers for free-space orbital angular momentum communication systems
	Christopher Boland University of Edinburgh	Canon Medical Research Europe Ltd	More efficient deep learning for medical image analysis
	Jemma Callaghan Heriot-Watt University	STMicroelectronics	Active 2-dimensional optical meta-surfaces
	Patrick Foley Heriot-Watt University	Leonardo	Development of multi-kW coherently combined fibre master oscillator power amplifiers
	Femy Francis University of St Andrews	AWE	Development of planar waveguide based gas sensors for challenging environments
	William Gash Heriot-Watt University	AWE	Development of remote optoelectronic sensor systems for long-term component monitoring
	Aoife Keane University of Strathclyde	NNL	New optical imaging and analysis techniques for the early detection and quantification of corrosion on special nuclear materials packages
	Cosmin Suci University of Glasgow	NPL	Ultra-high-Q integrated optical microresonators for frequency comb generation
	Shannon Thompson University of Edinburgh	NHS Lothian	Optical spectroscopy to enable screening in the liver transplant theatre
	Dorian Urban University of Dundee	Optos	Hybrid optical-digital coherence tomography



Year 4

	Samuel Buck Heriot-Watt University	STFC	Development of technologies for high-repetition rate PW level laser systems
	Danielle Clarke Heriot-Watt University	STFC	Development of a DPSSL pump for a 10 Hz petawatt laser system
	Francesco Dalla Serra University of Glasgow	Canon Medical Research Europe Ltd	Answering questions about medical images
	Ultan Daly University of Glasgow	BT	Atmospheric monitoring for next generation cable free optical communication technologies
	Matthew Gil University of Strathclyde	NHS Glasgow and Greater Clyde	Multi-modality image registration
	Harry Hall Heriot-Watt University	Fraunhofer	Ultrafast laser inscription of components for quantum technologies
	Paul Hawthorne Heriot-Watt University	MBDA	Electro-optic devices for extreme LIDAR in highly dynamic environments
	Nick Kabawa University of Dundee	STAR Dundee	Data handling in spacecraft optical systems
	Nathaniel Marsh Heriot-Watt University	MTC	Optical sensors for monitoring and control of ultra-short pulsed laser manufacturing processes
	Marek Michalowski University of Strathclyde	Fraunhofer	Intelligent and directed laser-based spectroscopy

Writing Up



Ellis Kelly
University of Strathclyde

Fraunhofer

Stand-off, SPAD-enhanced ultra-violet Raman spectroscopy



David Webster
University of St Andrews

KP Technology

Kelvin probe and ambient photoemission measurements of organic and hybrid semiconductors



Suki Yau
Heriot-Watt University

Lightpoint Medical

Biomedical imaging and signal processing for the intra-operative detection of cancerous tissue



Student Perspectives

Brendan Hall – 3rd Year, University of Strathclyde

Project Title – Novel Laser Architectures for the Next Generation of Multiphoton Microscopy Tools

Supervisors – Prof. Alan Kemp (University of Strathclyde) and Dr Ian MacGillivray (Coherent)

Multiphoton microscopy is a biological imaging technique used for research into cancer and dementia. Currently, this technique relies on large, complex, and costly femtosecond lasers at uncommon wavelengths to produce the non-invasive, high-resolution, deep-tissue images of live biological samples that it is capable of. I am attempting to reduce the complexity of these laser systems and by engineering novel solutions in optical parametric generation and amplification to simply and efficiently generate the necessary wavelengths.

So far, I have managed to replicate results of previous work, demonstrating a hybrid optical parametric oscillator and amplifier, emitting coherent light at a key wavelength of 1700nm. An engineering solution has then been developed which achieves the same or better levels of performance whilst reducing the complexity and cost of the nonlinear wavelength conversion stage. This technology is potentially patentable, so my industrial partner, Coherent, are currently exploring options for protecting the idea that has been proven by this project. This exciting development has opened options for exploring more details in this area of technology.

In reducing complexity of laser systems, the cost of the resultant technology is driven down. By making multiphoton microscopy a more affordable technique, more researchers will be able to explore cancer and dementia research with high-quality, real-time imaging. As we continue to simplify and enhance this technology, we pave the way for deeper understanding of these critical diseases. Ultimately, this progress could lead to breakthroughs in prevention and treatment, potentially transforming these diseases from life-threatening to manageable or even curable conditions. Our work not only advances fundamental photonic knowledge but also holds the promise of profound impacts on global health.

I was unsure of what to expect from the CDTAP when I started, I went into a job immediately after university that didn't fully satisfy me, and I didn't know where I wanted to go but I knew I wanted a change. Once I got into the programme and arrived in St Andrew's, it was clear I had made a seminal decision in my life.

The project genuinely excited and interested me, which is one of the reasons I joined the CDTAP, so being able to be so free to make it my own has been fantastic. It's such a flexible way to understand research projects first hand and experience running a cutting-edge development from the ground up.

As a bridge between academia and industry, one of the most important pillars of the CDTAP is the connections you make during your time, and I am proud to say that I have forged both friendships and professional connections that will last.



Sean Quinn – 2nd Year, University of Strathclyde

Project Title – Novel laser sources for deep-UV applications

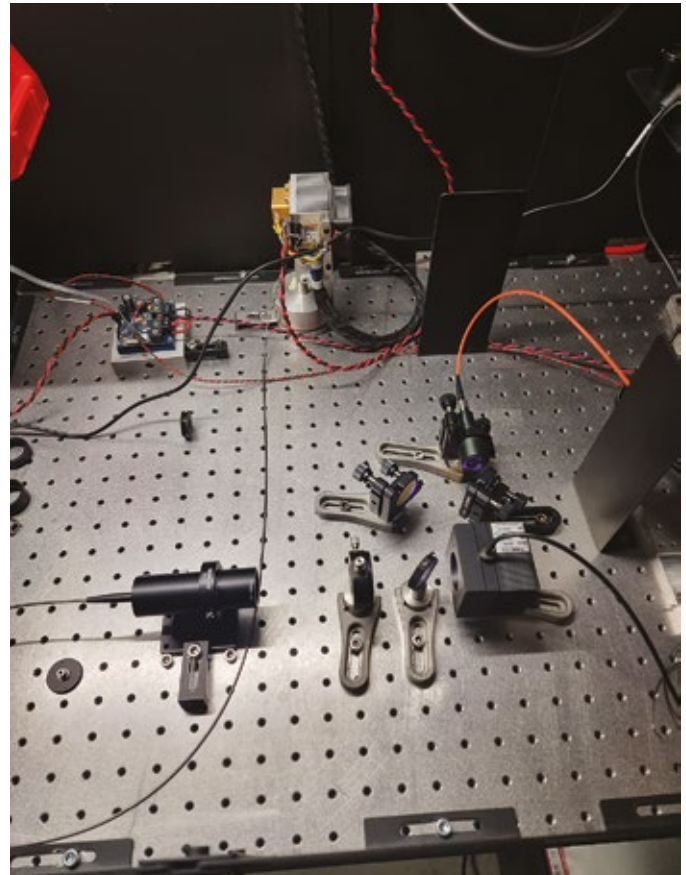
Supervisors – Prof. Alan Kemp (University of Strathclyde), Dr Peter Schlosser (Fraunhofer CAP), and David Stothard (Fraunhofer CAP)

My project's main objective is to develop deep UV lasers. I am currently in the process of making my first one. The target wavelength for this laser is 236.5nm. The approach I am taking to reach this region of the deep UV involves using the 946nm emission from an optically pumped Q-switched Nd:YAG laser, from there I will frequency double the laser using a non-linear frequency converting crystal to produce 473nm light, and then frequency double again to reach 236.5nm. Each stage of building this laser comes with its own challenges both engineering and physics related.

During the first six months of my project I have been focusing on the developing and optimising the 946nm laser as this will be the foundation on which the rest of my laser shall be built upon. I therefore need an efficient, stable laser with good beam quality. I have just finished some absorption measurements which I shall use to tune my pump laser to increase the efficiency of the Nd:YAG laser. I expect to start Q-switching measurements and experiments in the new year, moving my laser from CW to pulsed which is necessary for efficient non-linear frequency conversion.

The end result is to produce a deep UV laser that is not only good quality but low size, weight, and price (SWAP). Deep UV lasers are very well suited for applications in detecting and monitoring substances at range, which is useful across a large number of processes. I am particularly interested in the applications it has in the medical field, where deep UV lasers can be used for detecting biomarkers in low concentrations, this would lead to earlier diagnosis of certain diseases, reducing the impact that they might have on peoples lives.

My experience with the CDTAP over the last year and a half has been fantastic. The first semester in St Andrews allowed me access to world-class quality teaching, giving me a fantastic basis of understanding and setting me up for the next semester where I could choose my classes to focus on the topics of interest to my project.



This left me feeling ready to start at Fraunhofer, the industrial sponsor of my project and where I shall be spending the majority of my time for the remainder of the EngD programme. The CDTAP offers the opportunity to enrol in online business courses, the first course of which is called "Developing Successful Projects", this course has been interesting and will likely prove useful later in my career when project management scenarios arise. It is also worth mentioning just how helpful, supportive and understanding the CDTAP staff are, as they have allowed me to feel more comfortable and given me the room to excel in the pursuit of a doctorate.

Kieran McGovern – 3rd Year, Heriot-Watt University

Project Title – Optical sensing of electronic interactions in two-dimensional semiconductors using a novel cryogenic surface force apparatus

Supervisors – Prof. Brian Gerardot (Heriot-Watt University), Dr Alex Ward (Razorbill Instruments) and Dr Jack Barraclough (Razorbill Instruments)

I entered the CDT after spending three years working as a researcher in the semiconductor industry, following an integrated master's in physics. I was keen to develop my technical abilities further but wanted to keep a focus on industry, so an EngD with the CDTAP was an ideal opportunity. I am now working on a project which aims to combine the technological capabilities of Razorbill Instruments with the expertise of the Quantum Photonics Laboratory (QPL) at Heriot-Watt university to perform novel experiments on 2D materials.

There is a huge amount we do not understand about the fundamentals of condensed matter physics. A promising avenue for deepening our knowledge of this subject is 2D materials. By controlling the alignment of layers of samples, where layers are a single atom thick, 2D materials can be used to create semiconductor heterostructures with exciting physical properties. Changing the layer alignment creates long-range periodic patterns called a moiré superlattices. These superlattices can give rise to a range of collective phenomena such as superconductivity, quantum spin liquids, and exotic types of magnetism which cannot be easily investigated in conventional materials. A key challenge is that the layer alignment must be done at cryogenic temperatures with movements on the scale of a few nanometres, which is not an easy task. To overcome this, I am working with Razorbill Instruments to design, build and test a 6 degree of freedom cryogenic nanopositioner. The intention is that this instrument will be capable of manipulating the heterostructure layer alignment in situ, meaning the emergent phases of matter mentioned above can be probed and studied.

The nature of this project means there is a great amount of variety, with the work being split into different parts, focusing first on instrument design and testing with my industrial supervisors, then on spectroscopy and other optical experiments in the lab at Heriot-Watt. The design-focused portion of the work has led me to develop my CAD and

programming skills beyond what I'd thought myself capable of as I've had to solve completely new problems. I've learnt about positioner kinematics, which I used to create a tool in python to calculate movement ranges in each degree of freedom for different positioner designs. I've had the opportunity to design and build a completely unique kind of instrument with expert technical help from my industrial supervisors, developing my essential skills as an engineer. I've also worked on creating metrology techniques as part of the characterisation and control of the positioner, requiring me to develop an interferometric imaging system and create ways of extracting and analysing essential information from the available data. With a prototype device now in the lab, I am excited to try and perform a practical demonstration by tuning the layer alignment of 2D material samples as part of a real experiment.



As well as the focus on the industrial partnership, EngD students are given the chance to attend conferences and summer schools, creating the important opportunity to network and communicate with other academics and researchers.



The CDT also recognises the importance of non-technical skills such as project management and financial analysis, providing courses through the Edinburgh Business School. This is not something I would necessarily have looked into myself, but I have found the knowledge gained from these courses valuable. One of my favourite activities I took part in through the CDT was working with the Glasgow Science Centre to improve our ability as researchers to communicate science in a relatable way. This involved researching a topic to produce a short recording to be used in the Spark of Science podcast series.

I feel very fortunate to be part of this CDT because it offers such a great opportunity for professional growth; when I explain to friends and family what I do they often can't believe a single programme offers so much. I enrolled with the CDTAP in order to develop my technical skills and maximise my career options going forward, and there is no doubt in my mind that the CDT has facilitated that.

Research Outputs

We are delighted that our students have managed to disseminate their research widely at conferences in 2023 and 2024.

Journal Articles

Fan Y., Yuan B., **Al-Rubaiee, M.**, Sun Y., Zhu S., Akbar J., Marsh J. and Hou L. "Millimeter-wave generation based on four phase-shifted sampled Moiré grating dual-wavelength DFB laser", IEEE Photonics Technology Letters, 36(4), pp. 282-285 (2024).

Buck, S., Derryck Reid, and Marco Galimberti, "Automated control and stabilization of ultrabroadband laser pulse angular dispersion," Appl. Opt. 63, 1613-1617 (2024).

Buck, S., Pedro Oliveira, Theodoros Angelodos, Marco Galimberti, "A Review of Optical Parametric Amplification at the Vulcan Laser Facility", MDPI Special Issue: Recent Advances in Optical Parametric Amplifiers (2024)

Clarke, D., J. Phillips, M. Divoky, J. Pilar, P. Navratil, M. Hanus, P. Severova, O. Denk, T. Paliesek, M. Smrz, P. Mason, T. Butcher, C. Edwards, J. Collier and T. Mocek. "Improved stability second harmonic conversion of a diode-pumped Yb:YAG laser at the 0.5 kW level," Optics Letters 48, 6320-6323 (2023).

M. De Vido, G. Quinn, **Clarke, D.**, L. McHugh, P. Mason, J. Spear, J. M. Smith, M. Divoky, J. Pilar, O. Denk, T. J. Butcher, C. Edwards, T. Mocek, and J. L. Collier. "Demonstration of stable, long-term operation of a nanosecond pulsed DPSSL at 10 J, 100 Hz," Optics Express 32, 11907-11915 (2024).

Z. Chen, **Daly U.**, A. Boldin, L. Hirsch, M. Chen, M. P. J. Lavery, "Environmental monitoring using orbital angular momentum mode decomposition enhanced machine learning", arXiv:2403.19179, 2024.

Conference Proceedings

Al-Rubaiee, M., Ye S., Yuan B., Fan Y., Marsh J. H. and Hou L., "10 GHz Low Divergence Angle Mode-Locked Lasers with Ultralow Timing Jitter through Injection-Locking Techniques", CLEO 2024, Charlotte, North Carolina, USA, 5-10th May 2024.

Fan Y., Yuan B., **Al-Rubaiee, M.**, Marsh J., and Hou L., "Dual-wavelength DFB Laser Based on Four Phase-shifted Sampled Moiré Grating for MMW Generation," CLEO 2024, Charlotte, North Carolina, USA, 5-10th May 2024.

Clarke, D., J. Phillips, M. Divoky, J. Pilar, P. Navratil,

M. Hanus, P. Severova, O. Denk, T. Paliesek, M. Smrz, P. Mason, T. Butcher, C. Edwards, J. Collier, and T. Mocek, "Improved stability frequency conversion of a diode-pumped Yb:YAG laser at the 0.5 kW-level," in Laser Congress 2023 (ASSL, LAC), Technical Digest Series (Optica Publishing Group, 2023), paper AM3A.6.

M. De Vido, G. Quinn, **Clarke, D.**, L. McHugh, P. Mason, J. Spear, J. M. Smith, M. Divoky, J. Pilar, O. Denk, T. J. Butcher, C. Edwards, T. Mocek, and J. L. Collier. "Demonstration of stable, long-term operation of a kW-class nanosecond pulsed DPSSL operating at 10 J, 100 Hz," Proceedings Volume PC12864, Solid State Lasers XXXIII: Technology and Devices; PC128640E (2024)

<https://doi.org/10.1117/12.3020136>

G. Quinn, M. De Vido, **Clarke, D.**, L. McHugh, P. Mason, J. Spear, J. M. Smith, M. Divoky, J. Pilar, O. Denk, T. J. Butcher, C. Edwards, T. Mocek, and J. L. Collier. "A Nanosecond Pulsed DPSSL Demonstrating Long-Term, Stable Operation at 10 J, 100 Hz," SF2G.5, CLEO US (2024).

Clarke, D., M. De Vido, G. Quinn, L. McHugh, P. Mason, J. Spear, J. M. Smith, M. Divoky, J. Pilar, O. Denk, T. J. Butcher, C. Edwards, T. Mocek, and J. L. Collier. "Characterisation of stress-induced depolarisation in a 10 J, 100 Hz nanosecond diode-pumped solid-state laser," SF2G.6, CLEO US (2024).

Daly, U., A. Boldin, L. Skvarenina, M. Milanizadeh, A. Melloni, D. Miller, M. Sorel, F. Morichetti, M. P. J. Lavery, "Dynamic Demultiplexing of Low-Loss Spatial Modes in Strong Turbulence Using Reconfigurable Photonics," 2024 Conference on Lasers and Electro-Optics (CLEO), Charlotte, NC, USA, 2024

Gil, M., Craig Dick, Stephen Harrow, Paul Murray, Gabriel Reines March, Stephen Marshall, "A Deep Learning Based Approach to Semantic Segmentation of Lung Tumour Areas in Gross Pathology Images," Medical Image Understanding and Analysis, Aberdeen, UK, 19-21 July 2023 doi:10.1007/978-3-031-48593-0 2

Gil, M., Stephen Marshall, Stephen Harrow, Paul Murray, William H Nailon, "Robust Models for Oesophageal Toxicity Prediction from Radiation

Dose Maps”, International Conference on the Use of Computers in Radiotherapy, Lyon, UK, 9-11 June 2024.

Gil, M., Stephen Marshall, Sorcha Campbell, Ai Wain Yong, John Murchison, Gillian Ritchie, Stephen Harrow, Paul Murray, William H Nailon, “Predicting Radiation Pneumonitis using Pre-Radiotherapy CT Scans by Radiomic and a Pre-Trained CNN Based Feature Extraction”, International Conference on the Use of Computers in Radiotherapy, Lyon, UK, 9-11th June 2024.

Hawthorne, P., McDonald, M. W., Park, I., Hand, D. P. (2023). “The Practicalities of a Spatial Coherence Filter in free-space LIDAR Environments”, Electro-Optical and Infrared Systems: Technology and Applications XX Article 127370B (Proceedings of SPIE; Vol. 12737). SPIE. <https://doi.org/10.1117/12.2678435>

Oral Conference Papers

Al-Rubaiee M., Ye S., Yuan B., Fan Y., Marsh J. H. and Hou L. “Ultra-stable 10 GHz Optical Clocks Based on Injection Mode-Locked Semiconductor Lasers” presented at ESLW 2023, Glasgow, UK, 30th September 2023.

Yuan B., Fan Y., Cheng W., **Al-Rubaiee M.**, Zhan Y., Chen X., Marsh J. H. and Hou L., “Monolithic Dual-wavelength Laser Array Based on Four Phase-Shifted Grating and Equivalent Chirp Technology”. ECOC 2023, Glasgow, UK, 1-5th October 2023.

Daly U., A. Boldin, L Skvarenina, M. Milanizadeh, A Melloni, D. Miller, M. Sorel, F. Morichetti, M. P. J. Lavery, “3.52 Tbps Dynamic Demultiplexing of Low-loss Spatial Modes in Strong Turbulence Using Reconfigurable Photonics,” [Oral Presentation], Telecommunications, Optics & Photonics in London, 2024.

Foley, P. J., I.J. Thomson, M.J.D. Esser and A.C. Fleming, Demonstration of Coherent Beam Combination with a Novel Control Algorithm, SPIE Security and Defence, Edinburgh, September 2024.

Foley, P. J., Demonstration of Coherent Beam Combination, Scottish Conference in Optical Technologies (SCOT), St. Andrews, April 2024.

Francis, F., Philip Keenan, Ann Harvey, and Andrea Di Falco, ‘Fiber coupled on-chip CO2 sensor using Photonic Crystal waveguides’ presented at the C-PASS conference on Photonics for Advanced Spectroscopy and Sensing, Bari, Italy 3rd-8th September 2023.

Francis, F., Philip Keenan, Ann Harvey, and Andrea Di Falco, ‘Fiber coupled on-chip CO2 sensor using Photonic Crystal waveguides’ presented at the SCOT conference on Scottish Conference in Optical Technologies, St Andrews, UK, 22nd-24th of April 2024.

Hawthorne, P., McDonald, M. W., Park, I., & Hand, D. P. (2024). “DMD as a pseudo-pixel array for long-range high-speed LIDAR”, Laser Radar Technology and Applications XXIX, SPIE Defence and Commercial Sensing 2024.

Michalowski M., A. Polak, E. L. Francois, and D. Stothard, “Multimodal approach for chemical and biological substance screening”, presented at Chemical, Biological, Radiological, Nuclear, and Explosives (CBRNE) Sensing XXV, National Harbor, Maryland, US, 22nd-25th April 2024.

Urban, D. R., T. Vettenburg, M. Preciado, P. Novak, “Optical Coherence Tomography with Opto-Electronic Reference Arm” Scottish Conference in Optical Technologies, St Andrews, UK.

Poster Conference Papers

Alhamdan, I., “Epsilon near zero Metasurfaces in the visible”, Scottish Conference in Optical Technologies (SCOT).

Boland, C., et al. “There Are No Shortcuts to Anywhere Worth Going: Identifying Shortcuts in Deep Learning Models for Medical Image Analysis.” Medical Imaging with Deep Learning. 2024.

Callaghan, J., J. Downing and E. Carnemolla, “Spatially-decohered channel metasurface for 2D beam steering with a 1D scan”. ST Meta-Day, 23 May 2024, Crolles, France.

Clarke, D., A. Flak, P. D. Mason, M. De Vido and M. J. D. Esser. “Development of a Cross-Polarised Imaging System for Assessing the Quality of Large-Aperture Titanium-doped Sapphire Crystals,” CDT Summer School, Dublin (2023).

Dalla Serra, F., Chaoyang Wang, Fani Deligianni, Jeff Dalton, and Alison O’Neil. 2023. Controllable Chest X-Ray Report Generation from Longitudinal Representations. In Findings of the Association for Computational Linguistics: EMNLP 2023.

Dalla Serra, F., Chaoyang Wang, Fani Deligianni, Jeff Dalton, and Alison O’Neil. 2023. Finding-Aware Anatomical Tokens for Chest X-Ray Automated Reporting. In Machine Learning in Medical Imaging: MLMI 2023.

Mistry, R., Poster presented at OPTICA Oxford Student Chapter 2024 event (“Synthetic darkfield imaging for damage detection”).

Thompson, S., Joseph Black Conference, 5th June 2024, Edinburgh, UK

Patents

Urban, D. R., M. Preciado, P. Novak, Patent Application EP 24159625.3

Urban, D. R., M. Preciado, P. Novak, Patent Application EP 24159626.1

Other

Alhamdan, I., OPTICA Student Leadership Programme, 7th-12th October 2023.

Buck, S., Enrique Garcia-Garcia, Cruz Mendez, “Full-beamline Characterisation of Angular Dispersion on the VEGA Petawatt System” CLF Annual Report 2023-2024

Calder, B., NDA Academic Research Forum, 27-29th 2024 February, Sheffield, UK

Calder, B., Sellafield SNM Research Group Workshop, 30th April-1st May 2024, National Physical Laboratory, Teddington, UK

Clarke, D., OPTICA Student Leadership Programme, 7th-12th October 2023.

Clarke, D., and G. Quinn. “Recent DiPOLE Technology Developments,” OPTICA Event talk (21 February 2024).





Project Supervisors

Name	Academic/Industrial	Affiliation
Dr Ravi Aswathanarayanawamy	Industrial	Renishaw
Dr Benoy Babu	Industrial	NHS Lothian
Prof. Iain Baikie	Industrial	KP Technology Ltd
Dr Bob Bennett	Industrial	Taylor Hobson
Dr Paul Black	Industrial	Emerson
Dr Paul Blair	Industrial	PowerPhotonic
Dr Gerald Bonner	Industrial	Fraunhofer
Dr Henry Bookey	Industrial	Fraunhofer
Dr Antonio Di Buono	Industrial	National Nuclear Laboratory
Prof. Colin Campbell	Academic	University of Edinburgh
Dr Enrico Carnemolla	Industrial	STMicroelectronics
Dr Richard Carter	Academic	Heriot-Watt University
Dr Xianzhong Chen	Academic	Heriot-Watt University
Dr Yuhang Chen	Academic	Heriot-Watt University
Dr Fani Deligianni	Academic	University of Glasgow
Dr Mariastefania de Vido	Industrial	STFC
Dr Antonio Di Buono	Industrial	National Nuclear Laboratory
Dr Andrea Di Falco	Academic	University of St Andrews
Dr Ross Donaldson	Academic	Heriot-Watt University
Dr James Downing	Industrial	STMicroelectronics
Dr Ewan Eadie	Industrial	NHS
Prof. Daniel Esser	Academic	Heriot-Watt University
Prof. Daniele Faccio	Academic	University of Glasgow
Dr Marco Galimberti	Industrial	STFC
Prof. Brian Gerardot	Academic	Heriot-Watt University
Dr Keith Goatman	Industrial	Canon Medical Research Europe
Dr Andrew Grant	Industrial	Ceres
Prof. Duncan Hand	Academic	Heriot-Watt University
Dr David Harris-Birtill	Academic	University of St Andrews
Dr Stephen Harrow	Industrial	NHS

Name	Academic/Industrial	Affiliation
Dr Ann Harvey	Industrial	AWE
Dr Anne-Marie Haughey	Industrial	Fraunhofer
Dr Corne Hoogendoorn	Industrial	Canon Medical Research Europe
Dr Lianping Hou	Academic	Univeristy of Glasgow
Dr Emilio Hugues Salas	Industrial	BT
Dr Andrzej Kaczorowski	Industrial	VividQ Ltd
Dr Phil Keenan	Industrial	AWE
Prof. Alan Kemp	Academic	University of Strathclyde
Dr Nicolas Laurand	Academic	University of Strathclyde
Prof. Martin Lavery	Academic	University of Glasgow
Dr Michael Lengden	Academic	University of Strathclyde
Dr David Li	Academic	University of Strathclyde
Dr Andrew Lord	Industrial	BT
Dr Ian MacGillivray	Industrial	Coherent
Dr Bill MacPherson	Academic	Heriot-Watt University
Dr Vitor Marques	Industrial	Leonardo
Dr Jose Marques-Hueso	Academic	Heriot-Watt University
Prof. John Marsh	Academic	Univeristy of Glasgow
Prof. Stephen Marshall	Academic	University of Strathclyde
Dr Paul Mason	Industrial	STFC
Dr Mikael Mazur	Industrial	Nokia
Prof. Duncan McLaren	Industrial	NHS Lothian
Prof. Andrew Moore	Academic	Heriot-Watt University
Dr Joao Mota	Academic	Heriot-Watt University
Dr Paul Murray	Academic	University of Strathclyde
Mr. Gareth Myers	Industrial	Sellafield
Dr Dirk Nather	Industrial	Edinburgh Instruments
Dr Pawel Niewczas	Academic	University of Strathclyde
Dr Pedro Oliveira	Industrial	STFC
Dr Maciej Pajak	Industrial	Canon Medical Research Europe

Name	Academic/Industrial	Affiliation
Dr Ian Park	Industrial	MBDA
Dr Steve Parkes	Industrial	STAR Dundee
Dr Adam Polak	Industrial	Fraunhofer
Dr Miguel Preciado	Industrial	Optos
Prof. Derryck Reid	Academic	Heriot-Watt University
Prof. Erling Riis	Academic	University of Strathclyde
Mr. Stephen Robertson	Industrial	Optocap
Dr Bruno Sanguinetti	Industrial	Dotphoton
Dr Vasili Savitski	Industrial	Fraunhofer
Dr Peter Schlosser	Industrial	Fraunhofer
Dr Sebastian Schulz	Academic	University of St Andrews
Dr Tian Long See	Industrial	MTC
Dr Jonathan Silver	Industrial	NPL
Dr Jodie Smith	Industrial	STFC
Dr Marc Sorel	Academic	University of Glasgow
Dr David Stothard	Industrial	Fraunhofer
Dr Ian Thomson	Industrial	Leonardo
Prof. Robert Thomson	Academic	Heriot-Watt University
Prof. John Travers	Academic	Heriot-Watt University
Prof. Sotirios Tsaftaris	Academic	University of Edinburgh
Prof. Graham Turnbull	Academic	University of St Andrews
Dr Tom Vettenburg	Academic	University of Dundee
Dr Kunal Vyas	Industrial	Light Point Medical
Dr Alex Ward	Industrial	Razorbill Instruments
Dr Craig Whitehill	Industrial	Wideblue
Dr Keith Wilcox	Academic	Dundee
Dr Kenneth Wood	Academic	University of St Andrews



Alumni

Graduations and Vivas

The following graduated from the Centre between September 2023 and August 2024.

Dr Owen Anderson	University of Glasgow
Dr Natalie Flaherty	Heriot-Watt University
Dr Paul Harrison	Heriot-Watt University
Dr Angel Victor Juanco Muller	Heriot-Watt University
Dr Antanas Kascenas	University of Glasgow
Dr Alexandra Lee	Heriot-Watt University
Dr Stavros Misopoulos	Heriot-Watt University
Dr Nicholas Smith	Heriot-Watt University

The following have successfully defended their theses between September 2023 and August 2024 and will be graduating in Autumn/Winter 2024

Natalie Bruce	University of Strathclyde
Rachel Cannon	University of Strathclyde
Louise Finlayson	University of St Andrews
Eilidh Johnston	University of Strathclyde
Gary Quinn	Heriot-Watt University



Dr Natalie Flaherty



Dr Alex Lee and Dr Ross Donaldson (supervisor)



Recent Graduate

Dr Louise Finlayson

NHS Tayside and St Andrews University



Glioblastoma (GBM) is a rare but deadly form of brain cancer with a median survival rate of only 14.6 months. The INDYGO clinical trial, which recently took place at Lille University Hospital in France, tested a treatment that aims to extend this survival time by intraoperatively treating GBM with light via a process called photodynamic therapy (PDT). Published preliminary phase I trial results already show an increased survival of 23.1 months, an improvement of over 8 months. The main aim of my PhD research was to help increase understanding of intraoperative PDT for glioblastoma by computationally simulating the INDYGO trials protocol treatment within a realistic brain model using Monte Carlo Radiative Transport (MCRT) techniques. By changing various parameters within the simulation such as treatment time and light power, predictions of how these changes affect the treatment outcome were produced. A safety study on how the treatment affects the temperature of brain tissue near the treatment site was also completed. The research completed throughout my PhD was published across two journal papers as well as my thesis titled 'Monte Carlo Simulation of Intraoperative Photodynamic Therapy for Glioblastoma: Investigating Dosimetric Parameters and Treatment Efficacy'.

As one of the first PhD students funded by the CDTAP, I worked collaboratively between the School of Physics and Astronomy at the University of St Andrews and the Photobiology Unit at Ninewells Hospital in Dundee. Being a PhD student allowed me to focus on developing academic skills such as writing papers and presenting at conferences. The connection with the hospital then gave me the opportunity to massively enrich my research with the clinical expertise of my supervisors there. Until the end of 2021, my research focused on simulating light penetration depth into skin for wide range of wavelengths. This project helped solidify my understanding of the MCRT code and culminated in the publication of a journal paper and the development of a web app to allow clinicians to easily

access the data from the paper. This experience helped me move into the GBM work with more confidence and, with the clinical guidance of my supervisor Kismet, a neurosurgeon at Ninewells, we developed a realistic simulation of the Lille clinical trials protocol.

During my PhD I had the opportunity to present my GBM work at a PDT conference in Nancy, France, also attended by a leading scientist involved in the INDYGO trial. This led to a closer collaboration with their research group, further increasing the opportunity for the research to have a real clinical impact. At the end of my talk, I received a question about what being part of the CDTAP involved. They were impressed by the range of skills developed and liked the idea of having research students directly involved in industry, stating that a program like this should also be developed in France. I fully agree with them, the CDTAP builds much needed bridges between academia and industry, creating valuable connections that lead to unique research opportunities. In my research specifically, collaboration with clinicians allowed me to direct my research to answer questions that I as a physicist would not have thought to ask. It also allowed me to present the results and data in a way that is most valuable and accessible to them, increasing the likelihood of the research having an impact on clinical practice. Working at Ninewells also gave me the opportunity to observe while patients were treated using PDT which was a rewarding and eye-opening experience. It allowed me to see PDT happening outside the realms of my laptop and to see first-hand the real-life applications of this research field.

One of my favorite parts of my PhD was knowing that my research could help change clinical practice and form part of a body of work that aims to improve medical care and quality of life for brain tumour patients. As a result, I wanted to continue working in clinical research and have since enrolled onto the NHS Scientific Training Program (STP) where I am training to become a clinical scientist specialising in clinical scientific computing. During my training, I am based at the TriTech Institute in Wales. They are a department situated within the NHS whose purpose

is to evaluate clinical practices and medical devices to ensure they are compliant with NHS practices and providing the needed level of impact. Working here is providing me with a great insight into the regulations and steps needed for new medical technology to be incorporated into public health care within the NHS. It is my hope that the knowledge and skills that I am gaining now, combined with my research experience gained during my PhD, will help me to further contribute to medical research and technology development in the future.



Alumni List

The following have graduated from the Centre for Doctoral Training in Applied Photonics.

Name	Institution	Graduated	Job Title
Dr Stavros Misopoulos	Heriot-Watt University	2024	Optical Systems Engineer, STFC
Dr Rachel Cannon	University of Strathclyde	2024	Research Associate, University of Strathclyde
Dr Natalie Flaherty	Heriot-Watt University	2024	Lead Algorithms Engineer, Thales
Dr Natalie Bruce	University of Strathclyde	2024	Researcher, Fraunhofer
Dr Louise Finlayson	University of St Andrews	2024	Trainee clinical scientist - Clinical scientific computing, TriTech Institute
Dr Eilidh Johnston	University of Strathclyde	2024	Optical-Mechanical Engineer, Fraunhofer
Dr Angel Victor Huanco Muller	Heriot-Watt University	2024	Research Engineer, Canon Medical Research Europe Ltd
Dr Alexandra Lee	Heriot-Watt University	2024	Physicist, Wideblue
Dr Paul Harrison	Heriot-Watt University	2023	Research Associate, University of Glasgow
Dr Owen Anderson	University of Glasgow	2023	Scientist (Bioinformatics), Canon Medical Research Europe Ltd
Dr Nicholas Smith	Heriot-Watt University	2023	Researcher, Fraunhofer
Dr Antanas Kascenas	University of Glasgow	2023	Canon Medical Research Europe Ltd
Dr Vladimirs Horjkovs	Heriot-Watt University	2023	R&D Engineer
Dr Ben Michie	Heriot-Watt University	2023	Optos
Dr Tamer Cosgun	Heriot-Watt University	2022	Postdoctoral Research Associate, Heriot-Watt University
Dr Ben Gore	Heriot-Watt University	2022	Optical Development Engineer, Alter Technology TUV Nord UK Ltd
Dr Daniel Marwick	University of St Andrews	2022	Development Scientist, Malvern Panalytical
Dr Munadi Ahmad	Heriot-Watt University	2021	Instrument Systems Engineer, University of Oxford
Dr Andreas Aßmann	Heriot-Watt University	2021	Senior System Architect, STMicroelectronics
Dr Christopher Blackwell	Heriot-Watt University	2021	Optical Engineer, Ceres Holographics
Dr Jamie Coyle	University of Strathclyde	2021	Senior Laser Engineer, Leonardo
Dr Tamrha Cummings	University of Glasgow	2021	Lead Hardware Engineer, Leonardo
Dr Riccardo Geremia	Heriot-Watt University	2021	System Engineer, Oxford Lasers
Dr Juan Pedro Godoy Vilar	Heriot-Watt University	2021	Research Engineer, MTC
Dr Calum Hill	Heriot-Watt University	2021	Principal Development Engineer, Vector Photonics
Dr Anna Michalska	Heriot-Watt University	2021	Optical Instrumentation Engineer, Edinburgh Innovations
Dr Paul Mitchell	Heriot-Watt University	2021	Principal Engineer, Intel

Name	Institution	Graduated	Job Title
Dr Michael Reilly	Heriot-Watt University	2021	Senior System Engineer, Leonardo
Dr Jack Thomas	University of St Andrews	2021	Researcher, Fraunhofer
Dr Peter Wakeford	University of Glasgow	2021	Research Engineer, Optos
Dr Michael Woodley	Heriot-Watt University	2021	Research Fellow, University of Sussex
Dr Hollie Wright	Heriot-Watt University	2021	Research Associate, Heriot-Watt University
Dr Jonathan Crabb	University of Strathclyde	2020	Applications Engineer, European Space Agency
Dr Matthew Daykin	Heriot-Watt University	2020	Senior Software Analytics Engineer, Csignum Ltd
Dr Mariastefania de Vido	Heriot-Watt University	2020	Senior Laser Scientist, STFC
Dr Leonardo Del Bino	Heriot-Watt University	2020	Co-founder, Akhetonics
Dr Tom Dyer	Heriot-Watt University	2020	Senior Engineer, Defence Contractor
Dr Jamie Foubister	University of Glasgow	2020	Research Engineer, Optos
Dr Yili Guo	Heriot-Watt University	2020	Optical Engineer, Baraja
Dr Matthew Knights	Heriot-Watt University	2020	Product Manager, Electric Portfolio, Groupe Atlantic
Dr Gabriel Reines March	University of Strathclyde	2020	Digital Pathology R&D Project Manager, OracleBio
Dr Neil Stevenson	University of St Andrews	2020	Senior Laser Engineer, Leonardo
Dr James Brooks	University of Strathclyde	2019	Research Assistant, Universitätsklinikum Düsseldorf
Dr Michele Guastamacchia	Heriot-Watt University	2019	Optical Modelling Engineer, ASML
Dr Giovanni Giuliano	University of Glasgow	2019	Postdoctoral Researcher, Istituto di Scienze Marine, Consiglio Nazionale delle Ricerche (ISMAR – CNR)
Dr Dominic Hunter	University of Strathclyde	2019	Research Associate, University of Strathclyde
Dr Aneta Lisowska	Heriot-Watt University	2019	Senior Postdoctoral Researcher, Sano Centre for Computational Medicine
Dr Iain Mckeeman	University of Strathclyde	2019	Senior R&D Engineer, Synaptec Ltd
Dr Adam Polak	University of Strathclyde	2019	Researcher, Fraunhofer
Dr Adam Sroka	University of Strathclyde	2019	Director, Hypercube Consulting
Dr David Barr	Heriot-Watt University	2018	Software Engineer, Durham University
Dr Ioannis Bitharas	Heriot-Watt University	2018	Research Associate, Heriot-Watt University
Dr Luke Maidment	Heriot-Watt University	2018	Project Leader, Class 5 Photonics
Dr James Morris	Heriot-Watt University	2018	Programme Engineering Manager, Raytheon UK
Dr Iain Rodger	Heriot-Watt University	2018	Head of Data Science, Arachnys

Name	Institution	Graduated	Job Title
Dr Paul Ross	Heriot-Watt University	2018	Principal Software Engineer, hyperTunnel Ltd
Dr James Sloan	University of Glasgow	2018	Data Scientist, Baillie Gifford
Dr Marc Smillie	University of Strathclyde	2018	Senior Sales Manager, NKT Photonics
Dr Gediminas Sumskis	Heriot-Watt University	2018	Research Engineer, Luxinar
Dr Stefano Valle	University of Glasgow	2018	Senior MEMS Metrologist Engineer, SiTime
Dr Ross Aitken	Heriot-Watt University	2017	Senior Antenna Engineer, Leonardo
Dr Ian Baker	Heriot-Watt University	2017	Product Manager, NKT Photonics
Dr Robert Campbell	University of Strathclyde	2017	Research Engineer/Physicist, Self Employed
Dr John Molloy	Heriot-Watt University	2017	Research Fellow, University of York
Dr Howard Moshtael-Oskui	Heriot-Watt University	2017	Science (Physics) & Maths Teacher, North Cambridge Academy
Dr Alison O'Neil	Heriot-Watt University	2017	Principal Scientist, AI Team, Canon Medical Research Europe Ltd
Dr Alexander Weir	Heriot-Watt University	2017	Senior Technical Manager, Canon Medical Research Europe Ltd
Dr Anthony Corcoran	University of Glasgow	2016	Principal Optical Engineer, Leonardo
Dr Maurice Lessing	University of St Andrews	2016	Group Leader, Menlo Systems
Dr David Myles	Heriot-Watt University	2016	Head of Systems Engineering, Opsydia
Dr Agata Pawlikowska	Heriot-Watt University	2016	Project Engineering Lead, Leonardo
Dr Savino Piccolomo	University of Strathclyde	2016	Postdoctoral Researcher, Universite Pierre & Marie Curie
Dr Gary Stevens	University of Glasgow	2016	Principal Scientist, Electro Optic Concepts, DSTL
Dr Mel Strachan	Heriot-Watt University	2016	Project Manager, UKATC
Dr Joseph Thom	University of Strathclyde	2016	Quantum Technology Scientist, M Squared Lasers
Dr Marcus Ardron	Heriot-Watt University	2015	Senior Design Engineer, Renishaw
Dr Will Cochrane	Heriot-Watt University	2015	Mechanical Design Engineer, UKATC
Dr Michael Crozier	Heriot-Watt University	2015	Technical Specialist (Laser Processing), MTC
Dr Matthew Currie	Heriot-Watt University	2015	Sales Director, Skylark Lasers
Dr Oliver Daniell	Heriot-Watt University	2015	Senior Software Engineer, Veracity
Dr Christopher Dickson	Heriot-Watt University	2015	Algorithms Engineer, Thales
Dr Daniel Drysdale	Heriot-Watt University	2015	Senior Process Engineer, Huawei Technologies Research & Development Ltd
Dr Benjamin Fulford	Heriot-Watt University	2015	Solid-State Laser Technical Stream Manager, Luxinar
Dr Michael Leach	Heriot-Watt University	2015	Co-founder & CEO, GenomeKey

Name	Institution	Graduated	Job Title
Dr Eoin Murphy	University of Strathclyde	2015	Research Engineer, BAE Systems, Inc
Dr Mathieu Rayer	Heriot-Watt University	2015	Product Owner, Mynaric
Dr Ryan (John) Anderson	Heriot-Watt University	2014	CTO, Vault Laboratories, Inc
Dr Roger Fenske	Heriot-Watt University	2014	CEO, Edinburgh Instruments
Dr Brian Flemming	Heriot-Watt University	2014	Principal Systems Engineer, Leonardo
Dr Viktor Granson	Heriot-Watt University	2014	R&D Scientist, Trumpf
Dr Javid Khan	Heriot-Watt University	2014	Artificial Intelligence, Neuromorphic Processing, GPU & Data Visualisation Engineering Lead, Leonardo
Dr Mhairi Martin	Heriot-Watt University	2014	Primary School Teacher, Highland Council
Dr Andrew White	Heriot-Watt University	2014	Laser Engineer, Leonardo
Dr Lucy Williamson-Hodge	Heriot-Watt University	2014	R&D Scientist, Abbott Diabetes Care
Dr Margaret Anyaegbu	Heriot-Watt University	2013	Senior Software Design Engineer, TES Electronic Solutions
Dr James Beedell	Heriot-Watt University	2013	Laser Engineer, Leonardo
Dr Jochen Deile	Heriot-Watt University	2013	Product Line Manager, Coherent Kaiserslautern GmbH
Dr James Downing	University of Glasgow	2013	Senior Staff Engineer, Optical Metasurface R&D Manager, STMicroelectronics
Dr Catherine Fitzpatrick	Heriot-Watt University	2013	Research & Technology Translation Manager, University of Cambridge
Dr Yves Lacrotte	Heriot-Watt University	2013	Microelectronic Engineer, Renishaw
Dr Marcus Perry	University of Strathclyde	2013	Senior Lecturer, University of Strathclyde
Dr Veronika Tsaturian	Heriot-Watt University	2013	Postdoctoral Researcher, University of Aston
Dr James Bain	University of Strathclyde	2012	Director of Innovation, M Squared Lasers
Dr Patrick Harding	Heriot-Watt University	2012	Postdoctoral Researcher, University of Frankfurt
Dr Paul Harrison	Heriot-Watt University	2012	Chief Engineer, Product Applications, Trumpf
Dr Thomas Legg	University of Strathclyde	2012	Team Leader, EFFECT Photonics
Dr Gordon McKenzie	Heriot-Watt University	2012	Senior Electronic Engineer, University of St Andrews
Dr Gerald Wong	Heriot-Watt University	2012	Data Strategy and Governance Lead, UK Hydrographic Office
Dr Suzanne Costello	Heriot-Watt University	2011	CEO, MCS Ltd
Dr Michael Poulter	University of Strathclyde	2011	Global Product Manager, Trumpf
Dr Charles Ward	Heriot-Watt University	2011	Portfolio Management Consultant, Fiji Roads Authority
Dr Paul Black	University of Strathclyde	2010	Engineering Manager, Emerson Automation Solutions

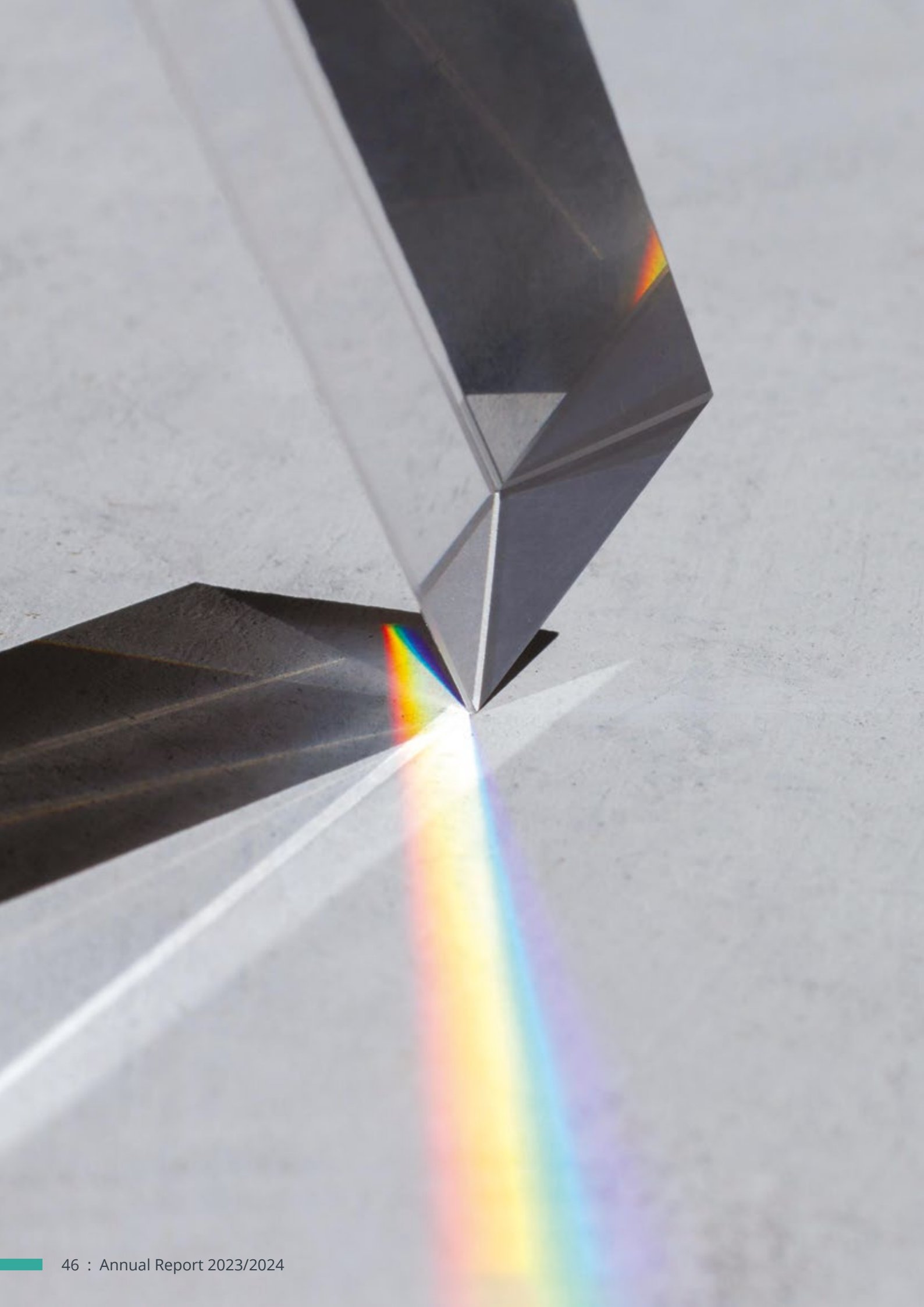
Name	Institution	Graduated	Job Title
Dr Richard Dunn	Heriot-Watt University	2010	Business Partnerships, University of Bradford
Prof. Daniel Esser	Heriot-Watt University	2010	Professor, Heriot-Watt University
Dr Yvonne Huddart	Heriot-Watt University	2010	Design & Development Engineer, Renishaw
Dr David Mitchell	Heriot-Watt University	2010	Senior Integration Engineer, Coherent
Dr Peter Thomas	University of St Andrews	2010	Chief Scientist, NORCE Norwegian Research Centre
Dr Clare Dillon	Heriot-Watt University	2009	Senior Optical Engineer, Leonardo
Dr Tiina Delmonte	Heriot-Watt University	2008	Product Line Manager, Optoscribe Ltd
Dr Trefor Sloanes	University of St Andrews	2008	Scientist, DSTL
Dr David Faichnie	Heriot-Watt University	2007	International Manager, TechnipFMC
Dr John Wooler	Heriot-Watt University	2007	Applications Engineer, Fibercore Ltd
Dr Daniel Purchase	Heriot-Watt University	2006	Head of Optics, Rayner
Dr Ian Armstrong	University of Strathclyde	2005	Research Associate, University of Strathclyde



Industry Partners

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Contact Us

CDT in Applied Photonics
Heriot-Watt University
School of Engineering and Physical Sciences
Edinburgh
EH14 4AS

T: +44 (0)131 451 8245

E: CDTphotonics@hw.ac.uk

www.cdtphotonics.hw.ac.uk

 [@CDTAP](https://twitter.com/CDTAP)

 www.linkedin.com/groups/2497044/

 [cdtappliedphotonics/](https://www.instagram.com/cdtappliedphotonics/)

