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UNIVERSITY

SCHOOL OF COMPUTER SCIENCE AND ELECTRONIC ENGINEERING

ALUMNI NEWSLETTER
SPRING 2022

WELCOME

From Dr Iestyn Pierce, Head of School of Computer Science and Electronic Engineering

The School of Computer Science and Electronic Engineering is delighted to present the first full School newsletter. Since merging computing and electronics, the school of Computer Science and Electronic Engineering has gone from strength to strength. With two new centres, The Digital Signal Processing (DSP) Centre of Excellence, and Nuclear Futures institute, involvement with two Doctoral Training centres (one in Artificial Intelligence Machine Learning and Advanced Computing and the other in Nuclear Engineering) which funds PhD students in the school, and many other successful initiatives, some of which we highlight in this newsletter. We are also thrilled that Product Design are now part of the School, too.
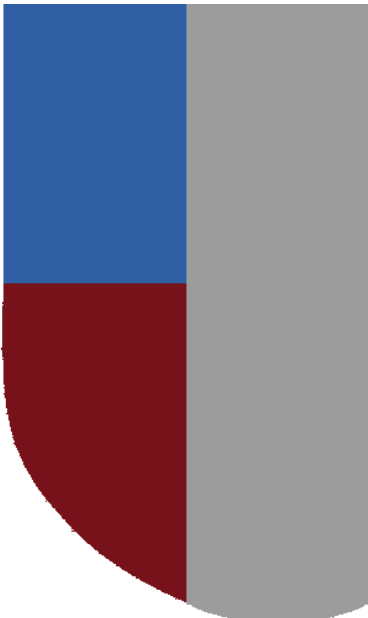
It is now exciting to also be back teaching in person. During the pandemic we all had to get used to working remotely, but it is great to see the department teeming with activities again. While the pandemic has proved to be a challenging situation for many, it has helped us innovate. Practical sessions went online, lectures were recorded or live-streamed, numerous laboratory practical sessions were delivered in the department and live streamed, and we held our final-year project EXPO virtually online. Furthermore, to help people to visit the school virtually, we were able to facilitate virtual laboratory sessions with the use of our Telepresence robots.

We are also excited about the research that we have accomplished. Developments and successes in Artificial Intelligence, Virtual Reality, Visualisation, Image Analysis, awards in Nuclear Engineering, research in Digital Signal Processing, among other successes. You can read more about these activities in this edition of the newsletter.

On a final note, we would be delighted to hear from you. Are you working in fields of Computing and Engineering? We would love to hear from you, learn of your experiences working in these fields, and setup future collaborations. We have many opportunities, including industrial talks, visitors, and joint research projects; indeed, we could feature you in the next newsletter.

Best wishes,

Dr Iestyn Pierce,
Head of School

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AIMLAC CALL FOR PhD STUDENTS

We start the new year with a call for PhD students in the Artificial Intelligence, Machine Learning and Advanced computing. We announced three fully-funded PhD positions available in the area of AI, Machine Learning and Advanced Computing (AIMLAC) to start October 2021, and another two to start in October 2022. Professor Jonathan Roberts (Bangor lead in the AIMLAC project) said "It is a great opportunity for these individuals to be trained in AI, Machine Learning and Advanced Computing. It is especially exciting at the start of 2021, as we are offering three full-funded PhD positions, and a further two to start in 2022. These opportunities are available to both UK and overseas applicants. There is a huge need for skilled researchers in this area, and we are excited to be able to train the next generation of computing students. We research a broad range of topics in data analysis, deep learning, design and visualisation, and have applied our skills to a diverse range of environmental, scientific, and social datasets. Students will have access to supercomputing Wales and become part of a dynamic team. How about becoming a future leader in AI, Data and computing?"

More: News, CDT-AIMLAC

Contact: Professor Jonathan C. Roberts

REVOLUTIONISING THE WAY WE INTERACT WITH DATA

Researchers present VRIA, an interactive online visualisation tool builder. Research into Immersive Analytics, undertaken in collaboration with the University of Chester, is far-reaching. Researchers at Bangor are enabling the immersive presentation and exploration of data insights in scientific research and our everyday lives, all from within a Web browser on desktop, mobile and virtual reality platforms. Since it was showcased at the world's biggest data visualisation conference, their work dubbed VRIA - Virtual Reality Immersive Analytics - has been downloaded more than 3,000 times. Dr Butcher, the developer behind VRIA, said: "VRIA provides an easily accessible path to those that want to be immersed in their data, and use novel immersive visualisation approaches through their Web browser. "It is particularly effective in a world affected by a pandemic when you can very easily create and use these experiences from home."
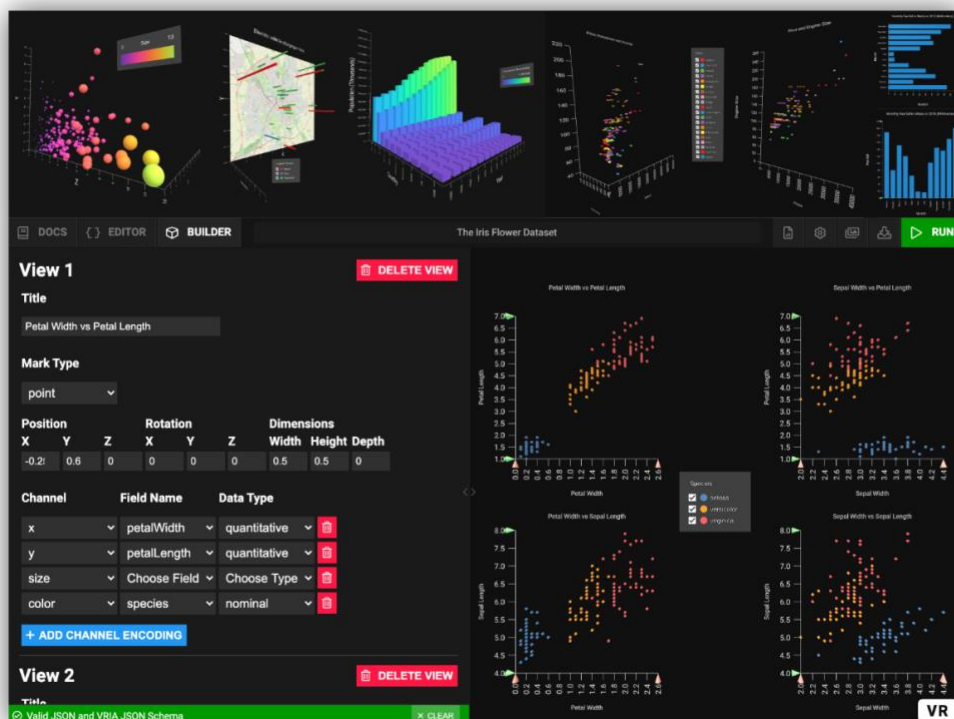
Dr Panagiotis Ritsos said "We're creating a tool where people can display information in virtual reality when they're not actually there, or in augmented reality when they are but want the user's experience to be enhanced by computer-generated information."

More: News, VRIA available as a web service on github.com

Related: BSc Data Science and Visualisation, PhD in data/visualisation.

Research: "VRIA: A Web-based Framework for Creating Immersive Analytics Experiences"

Contact: Dr Panagiotis Ritsos, Dr Peter Butcher

The VRIA Graphical user interface

In Memoriam

Ray Davies

Ray Davies the Director of the Photonics Academy of Wales @ Bangor (PAWB) died on the 14th January 2021. He was 85 and still actively engaged in photonic education: co-supervising three final year project students within the School of Computer Science and Electronic Engineering, Bangor University.

His longevity in educational activity is complemented by a quite remarkable educational career path. Having been a physics teacher at Manchester Grammar School for over 25 years, he began working in higher education with the Physics Department of Salford University where he remained for 12 years. Then on the invitation of Dave Rimmer, then the Director of Technium OpTic in St Asaph, Ray began his association with the Photonics Academy of Wales in 2006. Following some changes at OpTic, Ray transferred his activity to Bangor University in 2011.

When asked to define the age range of his target audience for disseminating understanding of optics and photonics Ray indicated '8 to 80'. He practiced what he preached. His engagement with the younger end of that age spectrum is encapsulated in sessions held at primary schools. With the school bell having rung for the end of the day and groups of parents outside anxiously waiting for their offspring to appear, the pupils were oblivious to both and were simply determined to complete the task at hand. That task was the design of a 'Magical Home 'wherein photovoltaics was to be deployed to maximum effect.

The key aspect was that the designs were the work of the children and this typified Ray's approach when working with all age groups. He would initially introduce a concept or a property of light and then ask his audience to use that aspect of light to devise a novel device or system of societal benefit. The latter qualification was central to Ray's handson practical approach to learning and teaching. One of his main interests was the use of light to assist partially sighted and blind people. A particular case of this was the challenge he set an assembly of European post-graduate researchers at the European Society of Precision Engineers (EUSPEN) summer school at Downing College, Cambridge University in 2011 The group was asked to find an optical means for helping sight-challenge people to negotiate a staircase. As he was preparing his kit to travel to Cambridge, Ray indicated to me that the previous evening he had thought of a dozen ways to meet his own challenge.

More: News, SPIE "Memoriam: Ray Davies"

Related: Photonics Academy of Wales at Bangor (PAWB).

Research: "Public engagement with photonics: International Year of Light celebratory event in Wales"., "Inspiration, imagination and implementation: International Year of Light activities of the Photonics Academy of Wales at Bangor (PAWB)"

Honorary Professor Mike Yates

We at Bangor University have been saddened to hear of the recent death of Honorary Professor of Mathematics, Mike Yates. Brought up in Penmaenmawr, Mike's father was the Rev John Yates, a lecturer in Theology at Bangor University from 1948-1951. Mike obtained a first class honours degree and PhD at Manchester University on the degrees of Turing unsolvability. Moving to the USA as a Fulbright Scholar in 1963, he spent a year each at Cornell University, Ithaca, NY and the Institute for Advanced Study in Princeton. He returned to Manchester University as a Lecturer Mike was an experienced mountaineer and rock climber; in 1971 he wrote the Cwm Silyn and Cwellyn Climber's Club Guide with Jim Perrin and accomplished a number
of first ascents including West Arete, Craig yr Ogof and Guardian Angel, Craig y Bera, in his beloved Snowdonia where he lived with his wife Pat and family. Mike's colleagues will be organizing a Mathematics colloquium to celebrate Mike's life and achievements later in the year.

More: News.

COULD YOU DEFEND YOURSELF ON AN ALIEN PLANET?

A virtual reality and animation expert and lecturer at Bangor University has developed the latest Virtual Reality headset game to be made available. Just launched, Crashland, on the Oculus Quest is timely, following images from the Perseverance Mars rover, recently sent back from the planet.

Llŷr ap Cenydd, from the School of Computer Science and Electronic Engineering at Bangor University has been closely linked with the Oculus VR headsets since their inception. He developed some of the first apps available, including Ocean Rift, a virtual underwater safari and one of the world's most popular virtual reality programmes. Llŷr explains that Crashland was another early spare-time project of his.

Llŷr explains that what Crashland offers is artificial intelligence driven procedural animation. "What that means is that the animation the player sees is generated live as they play, giving each play a unique experience. They aren't just seeing the same animation over again. This gives it a more visceral, real feel".

"Crashland started out as a tech demo in 2013 when I was experimenting with different ways of moving and tracking the human body in VR. It was a very popular demo at the time but it was placed on a back-burner as I focused on developing Ocean Rift for the first commercial headsets. I returned to the concept a few times over the years, but it took the launch of the Oculus Quest to convince me it was time to develop it into a full game. While being able to swim with sharks in Ocean Rift is great, Crashland delivers a more primal experience, and also reflects my lifetime love of sci-fi in all its forms."

Llŷr added, "We've got a lot of modules in this department like Artificial Intelligence (AI) and game design, programming and computer graphics. All these elements are related to virtual reality. In the third year, students have their dissertation project, where they can choose to spend the whole year working on their own virtual reality project. Students team up with a lecturer like myself and we spend a year developing their prototype and that can really be the main thing on their CV when they graduate, therefore it's a very important part of their final year."

At Bangor University, students at the School of Computer Science and Electronic Engineering have the opportunity to explore a broad range of technologies and collaborate with world leading researchers.

More: School news, University news, Crashlands on Oculus.

Research: "An embodied approach to arthropod animation".

Contact: Llŷr ap Cenydd

BANGOR'S IEEE STUDENT BRANCH HOLD ITS SECOND GUEST LECTURE

The second Bangor University IEEE student branch guest lecture took place online on the 24th February 2021. Over thirty students participated in the event and listened to two talks. Shaun Preston (Creo medical) and Pete Doggart (B-Secur and ACE45) talked about their experiences moving from academia to industry.

Shaun Preston graduated with a PhD after researching a novel coaxial structure and its use in haemostatic instruments. He is now a Head of Instrument Development at Creo Medical after being project lead working on bringing their 'Microblate Fine' product to market. Shaun talked about moving his expertise developed during the research of his PhD into a commercial and well-regulated environment. Shaun said "My PhD gave me the opportunity to learn how to perform research and approach problems in a different way, in fact the software that I learned whilst at University is something I use every day. We have developed an endoscopic device which is used with endoscopic ultrasound technology. It enables surgeons to apply energy to effect a multitude of clinical outcomes".

Pete Doggart graduated from Bangor with a MEng in Computer Systems Engineering. Since moving to industry, he has worked with Jaguar Land Rover on vehicle communications and now he leads a small team of experienced engineers and PhDs as well as co-founding a new business. Pete said "It was a delight to speak at the virtual event. There are many skills that I learnt when I was at Bangor, which I now apply in my daily life. Yet, I have done so much more learning since then too! When I was a student, I didn't realise the importance of non-technical skills to my future career. I learned working in industry, that knowing how people operate is equally important as technical know-how. I was glad to share my personal experiences and I hope that the talk was useful, and I wish everyone every success with their future careers."

More: News, Institute of Electrical and Electronic Engineers (IEEE), Creo Medical, BSecur,

Related: Bangor University IEEE Student Branch

Above Top: Shaun Preston, presenting his research

Above: Pete Doggart giving his presentation

INDUSTRIAL SEMINAR: CONTACT WITH THE PROFESSIONAL WORLD IN COMPUTER VISION

Mr Thomas Vidal, C++ developer in Computer Vision at LANACESS, gave a talk from Barcelona (Spain) to our 3rd year students in computer science, Monday 8th March via Blackboard.

LANACCESS has a team of professionals with extensive experience and expertise in communications, electronics, embedded systems, software development, smart analysis, and video. It has been in this market for over 20 years. It manufactures hardware and software for the security market. It specialises in distributed video systems to view, transfer, store and manage security images. It is successful in the security and video surveillance industry, especially for banking, transportation infrastructures, utilities, casinos, correctional facilities and government. LANACCESS is a private company, with 100% private capital, and half of its staff work in hardware and software research and development. It collaborates with Spanish and European technology research programmes.

At LANACCESS, Thomas' role is to develop video analytics solutions that can run on both PC (with NVIDIA graphic cards) and NVIDIA Jetsons module. He talked about his professional career and how he got involved in Computer Vision. One of the key topics he discussed is what makes you a good (C++) developer, clearly emphasising rigour and open-mindness: Always be ready to learn new things and new technologies. Thomas also introduced all the development tools that he uses on a daily basis, many of them also used in the computer vision module at Bangor University. He finished his talk with demos of solutions he contributed to at LANCACCESS, such has counting the number of people on the platform at tube stations to adjust the frequency of trains, and loitering detection near cash machines.

Armandas, 3rd year student in Computer Science said: "Guest speaker Thomas Vidal's insight into working as a C++ programmer in developing video analytics solutions for Lanaccess company has been engaging and inspirational. Thomas Vidal's demonstration of Lanaccess past projects has allowed me to create connections to real-world applications of what was taught by Dr Franck P. Vidal. The overall experience gave me an incentive to learn more around the topic and has provided a realistic insight into how it is like working in the computer vision field."

Dr Franck Vidal said "This industrial seminar was a great experience for students. They saw some real-life applications based on some of the techniques discussed in the lectures. It helped bridging the gap between theory and practice".

More: News, LANACESS

Contact: Dr Franck Vidal

SCHOOL CELEBRATES INTERNATIONAL WOMEN'S DAY

Academics and students in the school, help to celebrate International Women's day. The school encouraged everyone to get involved, whether in person or remotely working.
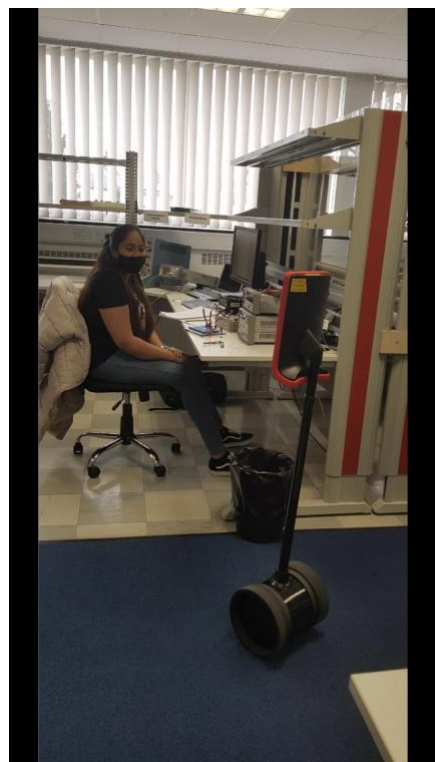
ARE YOU REMOTE OR PRESENT? ACADEMICS TRIALED TELEPRESENCE ROBOTS

Telepresence robots are now widely used in industry, particularly when individuals managing projects from afar want to gain a real 'feel' for their environment such as for remote construction site visits or inspection of huge concert rigs. But they are increasingly being used by educational institutions throughout the world, to allow learning to continue and a virtual presence when students cannot be physically present. This could be for man y reasons, from distance to a need for shielding due to health reasons.

This isn't the first time that Bangor's led the way in the use and development of cuttingedge technology. The School of Computer Science and Electronic Engineering at Bangor was the first in the UK to offer degrees in Electronic Engineering, and is a leader in research in fields like virtual reality and machine learning. Cameras, microphones and an array of Artificially Intelligent sensors allow the 'driver' to safely navigate around permitted areas, whilst a large screen means the individual's own face can be viewed by those around them.

A pilot project by the team at Bangor's School of Computer Science and Electronic Engineering could see some students getting the chance to try out the department's telepresence robots at practical sessions and seminars.

Dr David Perkins, Director of teaching and learning and senior lecturer in the School of Computer Science and Electronic Engineering at Bangor University said, "As the use of this type of Technology increases, it's important that we trial different ways of creating a learning environment.

Above: Dr Mohammed Madbrook teaching with telerobots

"Our aim is to give some students on computer science and electronic engineering courses the opportunity to try out the robots, and see how it goes. It takes a bit of getting used to, but it's surprising how different it feels to be in a room via a telerobot rather than Zoom or Teams. Having that freedom to look around, and for a lecturer to speak directly with you makes the whole experience much more immersive."

Dr Iestyn Pierce, head of school said, "Sometimes challenging situations also act as a catalyst for innovation and imagination. Augmented Reality and Digital to Real are very much part of what our student in Computer Science and Electronic Engineering are looking at, and what better way to see that working on a practical level than by giving them an opportunity to try out these robots. Certainly we're using our shared passion for new technology as a means of exploring different ways of delivering the very best teaching and learning for students".

More: News.

Contact: Dr Dave Perkins, Dr Mohammed Madbrook

EXPO, CELEBRATING THIRD-YEAR PROJECT WORK, GOES VIRTUAL

Above: The virtual reality software for the EXPO, developed by Dr Peter Butcher and Dr Cameron Gray.

The School of Computer Science and Electronic Engineering (CSEE) held their thirdyear project exhibition online this year. Each year the students from the school exhibit posters that showcase their individual project work. In 2021, due to the global pandemic, the event was moved online. The school setup a three-dimensional virtual reality gallery, where students could wander around and view different posters, and we had conversations using Microsoft Teams chat.

The Expo was held on Wednesday, 11th March 2020, between 13:00 and 16:00. There was a wide range of topics this year, including Internet of Things, Artificial Intelligence for Games, Visualisation, Communications, Computer Vision and Materials Science. Dr Dave Perkins (Director of Teaching and Learning at the School) and Dr Iestyn Pierce (Head of School) introduced and welcomed everyone.

Daniel Farmer (Computer Science BSc student) said "It was a really unique experience getting to present at the online EXPO, I enjoyed getting to walk round the rooms and seeing what all my peers had spent the past several months working on, and it was far more engaging than just staring at a page of posters. I was able to present my work in a virtual space and talk to more people than I might have been able to, without being overwhelmed by presenting to a crowd."

The Virtual reality software was developed by Dr Peter Butcher (post-doctoral researcher in the school) and Dr Cameron Gray (Lecturer in cyber security), with the plan to use it as an example virtual reality world in our teaching. Dr Panagiotis Ritsos (Lecturer in visualisation) said "The virtual world was built using AFrame, and develops from content that we teach in our modules, such as Web Technologies, and AI & Game Design, for the Computer Science with Games Design and Creative Technologies degree courses. It was exciting to engage with the students in this virtual environment".

Dave Perkins said "It was great holding the Expo event online. I especially enjoyed walking around the virtual space and speaking with the students. The Expo is a great opportunity for students to show what they have been working on. While the pandemic has changed the way we work, it has enabled us to do things differently. The 2021 Expo was a great success and the students enjoyed it."

Daniel Roberts (Lecturer in Electronic Engineering) commented "Every year the expo event gives the students the ability to showcase their project work, see what other students have created, and for us to celebrate the work of our students. It was especially great speaking with the students online and immersed within their work in a virtual environment".

More: News.

Related: Web Technologies, and AI & Game Design, Computer Science with Games Design degree course and Creative Technologies degree courses

Contact: Dr Dave Perkins, Dr Cameron Gray, Dr Peter Butcher, Dr Daniel Roberts

UNIVERSITY PARTNERS WITH ROYAL ACADEMY OF ENGINEERING IN THEIR "THIS IS ENGINEERING" CAMPAIGN

Bangor University and the School of Computer Science and Electronic Engineering becomes a partner with the Royal Academic of Engineering in their #ThisIsEngineering campaign.

The campaign helps to bring 'engineering to life' for young people. The idea is to give people information, and to help them pursue careers in engineering; in jobs that are rewarding, future-shaping, varied, well-paid and in-demand. The Royal Academy of Engineering website provides a advice and resources for people, covering different engineering disciplines. The website explains "Engineering is at the cutting edge: from robotics, machine learning and artificial intelligence, to mobile phones, medical technology, advanced sports equipment and driverless cars, engineering is shaping the future all around us. Engineering is for everyone: whatever your background and whatever you love – whether it's fashion, film, sport, music or technology."

On the 14th March, the school helped to celebrate pi day. The Greek letter π is used to represent the ratio of the circumference of a circle to its diameter. The day is an opportunity to celebrate "all things mathematics".

More: Twitter, Twitter This is Engineering,

Related: ThisIsEngineering, Royal Academy of Engineering

Contact: Dr Daniel Roberts

Image used to celebrate pi day.

SCHOOL HOSTS LIVE CHATS ON POSTGRADUATE STUDY, AND OFFERS KESS FUNDED SCHOLARSHIPS

On the 24th March, the school hosted live chats with the staff of the school, on postgraduate study. Hosted on the University's live chat server, members of staff spoke with interested applicants.

The School also announced, in collaboration with Qioptiq, a fully funded KESS2 MRes scholarship, on Metamaterial edge and bandpass filters. Knowledge Economy Skills Scholarships (KESS 2) is a major pan-Wales operation supported by European Social Funds (ESF) through the Welsh Government. KESS 2 links companies and organisations with academic expertise in the Higher Education sector in Wales to undertake collaborative research projects, working towards a PhD or Research Masters qualification. Research elements are integrated with a higher-level skills training programme, leading to a Postgraduate Skills Development Award.

Related: KESS2

Contact: Dr William Teahan (School's postgraduate lead), Dr James Wang (Metamaterial edge scholarship)

SCHOOL SENDS CONGRATULATIONS TO CAMERON GRAY

Dr Cameron Gray was nominated by her students for the prestigious Teacher of the Year award as part of the 'student led teaching awards' scheme. Well done Cameron.

LECTURER VISITS GOGLEDD CREADIGOL TO TALK OF HIS RESEARCH AND GAME DEVELOPMENT

Llŷr ap Cenydd visits Gogledd Creadigol and talks of his research into virtual reality, and talks about his game development in his spare time. Llŷr said "I was pleased to be able to speak about my work, and especially share some of the games that I have developed. I showed the Ocean Rift virtual reality experience. Ocean Rift allows you to swim with dolphins and with other creatures underwater. People feel immersed in the experience, and can be frightened by seeing a shark approach them underwater".

Research: "An embodied approach to arthropod animation"

Contact: Llŷr ap Cenydd

DAVID REES
Electrical Engineering, 1952

I was delighted the other day when my 15yr old grand-nephew told me he wanted to build a PC. I told him I had built a wireless set at his age, that was over 75 yrs ago. For him not to think I was living in the past I added that I have a Raspberry Pi kit he could have to build a simple computer. Silence. Then he told me he was thinking of a super gaming PC and had listed modules adding up to over £1200. He knew of CPU's, RAM, SSD's, Graphic Cards etc. Oh! I forgot to ask if he knew Ohm's Law. This made me reflect on what I knew at 15, a few years before going to Bangor to study Electrical Engineering and Physics.

I lived in rural Carmarthenshire where we had no electricity so my interest began with battery wireless sets, using 2V accumulators, 120V HT and 9V GB batteries. No one around me seemed to know much about electrical things. I managed to put together a 3 valve TRF set. The local Church had a Kohler petrol - electric generator, which was very advanced in its day. These were what kindled my interest in electrical work. I had to start from basics, learning about batteries, resistance, condensers, (capacitors not heard of), commutators etc. This made me think, can my nephew bypass this? He just plugs one module into another, does not even have to bother what signals the cables carry, as long as the plugs fit. Even so, one cannot say that he has no understanding, at some level, of the function of the modules. This brings up interesting educational points. Is the younger generation living in an IT environment better equipped for study in our field than we were? Students may know more than their seniors especially in fast advancing fields like IT. As Hugh Hilldreth Skilling, a outstanding engineering educator, said "because something is new to the teacher it does not follow that it is more difficult for the student".

When I told my teachers in school of my intention to study engineering, I was not encouraged except by the lady maths teacher. She understood what engineering was and the importance that maths played. When I said I was thinking of Bangor, there was disbelief. I was told that the only colleges in Wales for engineering were in South Wales. I pointed out that not one of those at the time had a Department of Electrical Engineering. Actually, when such a Department was established at Cardiff it was Professor Emrys Williams that was appointed to run it.

"All of us considered it a privilege to have studied at Bangor"

So I arrived in Bangor, after a day-long train journey from Llandeilo, joining the course a little late in January 1949. Entering Dean Street on my first day, I saw a man in a white coat with a duster in his hand. Thinking he was the cleaner I asked for Professor Emrys Williams. That is me he said! Emrys was a gifted teacher, and I am greatly indebted to him for his advice, guidance and friendship over very many years. Our courses introduced new approaches, we had "open-book" examinations and laboratory based examinations, which were always of an investigative nature, rather that a repeat of a standard laboratory experiment. Each year we had an Open Day when several groups of students would set up interesting and novel exhibitions to show to the public The laboratories delighted me with a selection of instruments and CROs. On the lower floor there were water turbines and electrical machines for experimental use. We also had a very good library. Standing out was the 20+ volumes of the MIT Radiation Laboratory Series. This was the product of RADAR research in WW2. The transistor had just arrived and it was essential to keep up with that. The Department managed to get a few, and one was made available to my friend Alwyn Owens for his project work. We were delighted to see and handle this little item that led to huge advances in electronics.

However, I think that Alwyn, to use modern parlance, overclocked it at some stage, and let us say, it didn't seem to work as intended afterwards! After graduation I lectured in Electrical Engineering at Bangor. I then received a Nuffield award and obtained a degree in Physiology and Biochemistry at U.C. Cardiff. Then to a research post at the MRC Neuropsychiatric Research Centre at Whitchurch Hospital. Cardiff. When the centre moved to Surrey I remained at Cardiff as a lecturer in Electronics at UWIST but still maintaining an interest in medical research. Then to the Gwent College of Higher Education (now part of the University) eventually becoming Head of the Department of Electrical Engineering and Instrumentation and then Dean of the Faculty of Science and Technology. We worked very closely with local industry running many specialised short courses and got involved in getting INMOS (from Colorado Springs) to set up a 'chip' manufacturing facility at Newport. It was the first in Wales.

My final working years were as Director for Wales for the Government Microelectronics Education Programme (MEP) for Schools. I was awarded an MBE in 1987 and am now approaching my 93rd birthday.

We were a happy crowd at Bangor, staff and students always getting on well together. Sometimes communication in Welsh between the North and South Walians often led to hilarious moments. We had an active Engineering Society that arranged interesting talks as well as visits to places such as the hydroelectric installations nearby, which had been the stimulus to set up the Department in the first place. I am sure all of us considered it a privilege to have studied at Bangor. It is good to see that the Department, which has made a vast contribution in electrical engineering education over many years, still providing the latest in Electronics and Computer education.

Image:
Honours class of 1952

CHRIS GREEN
Electronic Engineering, 1969

"I started my degree at Bangor in 1966 - the best of only 3 UK universities offering an Electronics degree at the time. We used the 1959 building for the first year as the "new" building (now 55 years old) was not finished. The lecture theatre had been repaired since Pochin, the builders, had dropped a tower crane through the roof the previous year.

David Last, Doc Last as we knew him, was a newly minted PhD. Dr James was proudly showing off his new JEOL microprobe analyser. We were intrigued by Prof Paul standing at the middle of the blackboard, writing left handed on the left and right handed on the right, without having to move his position, and the writing looked identical.
I vividly remember Prof Mendoza's 1st year physics demonstration of "work hardening", bouncing a ball bearing off a block of steel. His textbook was so new he handed out free advance copies, most welcome to hard up students.

Going to university was a huge privilege in the mid 1960s. Only 5% of school leavers went compared to over 30% now. We had no tuition fees to pay and there was even a grant for living expenses. I got no grant, as I was employed with a salary, a huge £470 a year! I had delayed entry to Bangor by one year, to take up a student apprenticeship, but then I didn't get my grades. I had to resit Maths A level at Christmas, going from an E to an A, and then they let me start late at Harwell atomic energy centre. There is life after A level disasters.

Harwell was a fantastic place to gain experience. I walked past the ZETA fusion experiment, with its 500kJ capacitor bank and 200kA pulse transformer https://en.wikipedia.org/wiki/ZETA_(fusion_reactor) , on my way to work on the Synchrocyclotron. I also worked on the LIDO "swimming pool" reactor. Cherenkov radiation let you "see" the fuel rods even through thick shielding https://en.wikipedia.org/wiki/Cherenkov_radiation . The design miscalculated the depth of water required for shielding the operators and at full power they had to unroll extra sheets of lead to stand on.

Image Above: "The photo shows me climbing the rigging of the SS Great Britain, in dry dock in Bristol in 2019. I had organised a trip for the Cardiac Rehab exercise group that I attend, after having a heart attack and 2 stents fitted in 2012."

The device characteristics and circuit design parts of the degree course were my favourite. I have used them in every job I have done. "We managed to teach you something useful then" said Alwyn Owens at the reunion in 2015. Dean Street certainly did. The 3 year's study for my degree have been repaid many times over during a career of over 50 years.
Sadly, the vector maths was lost to me within months of graduating. Hooray for pSpice, no more matrix algebra.

I graduated in 1969 and then worked for many electronic companies. ICL on mainframe computers; STC on analogue telecoms, with 6 months in the USA with my family at ITT in Raleigh; Mitel on PABX telecoms as a design manager, but always based in Wales. I gained wide experience of design, manufacturing, test, management and enough finance to get by.

I was a late starter but at the age of 50 I took the plunge and 3 of us started our own company, Silvertel, in Newport https://silvertel.com/ . Over 20 years later Silvertel is still growing, with a staff of 15 now, but I retired from active management in 2012. I still do online customer design support on a part time "as needs" basis. Unlike a lot of recent start-ups, we are a hardware company. We design and market electronic modules, originally for telecoms but now mainly for Power over Ethernet, PoE.   You can buy them from the Mouser catalogue https://www.mouser.co.uk/c/?q=silvertel . All our products are manufactured by subcontractors in the UK. Using overseas subcontractors would save very little money and, crucially, would not give us the flexibility we need to satisfy our many customers' rapidly changing needs.

We used the internet, from day one, to access a worldwide market. It allows us to sell electronics to Samsung and LG in Korea; Yamaha and OKI in Japan; Broadcom and Intel in the USA; Bosch and Saab in Europe, to name but a few. Our products are in the new GWR Hitachi Class 800 trains. Because we had sold to Hitachi in Japan, we were already on their preferred suppliers list. You have to be in it to win it. On the web a small company in Wales can be the equal of anyone worldwide.
There are also excellent mentoring programs available to start-up companies in Wales. We took advantage of many of them, especially Entrepreneur Action, to support our growth.

At the start the Covid pandemic was hard on us. We were on a cruise in the South Atlantic, just leaving the Falkland Islands heading for Argentina, when the world went into lockdown. No one would let us land. Not Buenos Aires, not Montevideo, not Rio de Janeiro. Finally, after 2 weeks, the final 5 days confined to our cabin, we docked in Miami, 8,000 miles from our intended destination. We flew home on a Foreign Office rescue flight. We both contracted mild Covid on the ship, but 3 less fortunate passengers died from it.
Silvertel also suffered initially from the disruptive effects of the pandemic. Sales for 2020/21 were down 25%. But after 6 months things started to pick up, with new orders at 3x sales in some months. We now have 4 subcontractors, doubled the usual 2, all working flat out to cope with a12 months order backlog. 2021/22 is going to be a record year.

I have used the knowledge I gained at Dean Street every day of my long and eventful career in electronics. And I found a wife at Bangor as well. Bronwen and I have been married for 50 years now. We have two children, Owain and Bethan, and two grandchildren, Elen and Sophie. I studied Electronics and Bronwen took Biblical Studies. A marriage made in heaven."

"The 3 years' study for my degree have been repaid many times over during a career of over 50 years."

ROGER KEENAN
Electronic Engineering, 1970

"Most new graduates of the School of Electronic Engineering at UCNW (as it was when I was there) start in technology-related roles; designing, operating, selling, teaching or supporting technology and using the skills they have gained. Most will not end in such roles because there is a natural progression with age away from technology activities and into economic activities. There are good reasons why software teams are not often led by 70-year olds. Some graduates become Technical Directors; most don't. My career led me from technology, through an MBA, to marketing, to running technology businesses, then to being an Advisor to small (£0.5 to 5 million turnover) businesses.

Every business is unique, but they all suffer the same problems as they grow. Some deal with them well, some ignore them and don't survive. Looking across many small businesses, patterns emerge. The key issues are:

1) Every month, more money must come in the door than goes out of the door. Technologists often get excited by the technology and lose sight of this basic requirement for survival;

2) The founders must delegate. Most businesses are founded because someone is good at something. It is

hard to delegate tasks to people who will not do them as well as the founders. But not delegating means that every decision goes through the founders and the business is then throttled by them. Successful founders build a management team under them, spend time on training it well and trust it;

3) You can only control something if you can measure it. Technology businesses are not about technology, they are about money, just like every other business. Controlling the business means controlling the money, which means measuring the money. Every small business needs good financial controls and accurate monthly management accounts from Day One."

"My career led me from technology, through an MBA, to marketing, to running technology businesses, then to being an Advisor..."

PETER BAXTER
Physics, 1970

"I arrived in Bangor on a disintegrating Honda 50 at the beginning of a very wet autumn in 1967, and attended lectures in Dean Street, the Department of Physics and the tower of Mathematics and Chemistry.

Whilst not the most studious of students, being very keen on the outdoors, I was somewhat seduced by what seemed then to be an impressive machine known as the 'mainframe computer' in the annex on Garth Road. It was housed in a special environment, fed punched tape or stacks of cards, attended by minions and produced box-loads of printout (if you didn't terminate your loops sensibly!). I took my first tentative steps in Algol.

Graduating in 1970, I started a career in commercial earth science research, just down the road in Deganwy. I was there for 7 years, in which I was exposed to diverse problems in mining, quarrying, oil exploration and civil engineering. One of my routine tasks was to carry out calibrations of 3-axis force transducers, which involved many tedious data plots in order to calculate the 9 coefficients that made up the calibration matrix. It wasn't long before I was back at the Maths tower seeking advice, and then back to the Computer Centre to get myself hooked up as one of the first remote users of "the computer". This was beginning of a long career in which data manipulation and statistics played a large part, in which I became slightly more proficient in Basic, Pascal, R, Python and Matlab than I'd ever been in Welsh, although that doesn't say much.

My stumbling journey through life, which seems a more apt description than "my career", took me via the underground tunnels at Dinorwig, the deserts of Arabia, the city-state of Singapore to the metropolis of Perth in Western Australia, where I transitioned from measuring the macro-properties of materials of construction and the behaviour of foundations and structures, to the micro-metrology of animal fibres. Over the next 25 years I left theodolites and 200 tonne laboratory presses behind and moved into the world of microscopes and image analysis. I moved back to Caernarfon for a short period before running away to Uruguay and then on to New Zealand.

When I semi-retired in 2012, I decided to go back to one of my first interests, sparked not only in the laboratory but in the abandoned mines and quarries of Gwynedd: earth sciences. I took my Masters in geophysics at the University of Victoria in Wellington and worked on slow slip earthquakes and latterly on the seismicity of Uruguay. I had to re-learn how to write code and found out that today's students have a quite different approach to what I'd been taught back in the days of slow processors and kilobytes of storage.

So, where is the link with Dean Street? It was there that I learnt that computers could help solve many practical problems. I learnt about variability in the properties of natural and man-made materials and in the measurement of those properties that's been such a major part of my life. There's probably much more computing power on my desktop here in Montevideo than there was in that little building on Garth Road. I've seen the progression from a punched card multi-user mainframe in the 1960s; a tape-casette-fed HP desktop used for calculating rock mechanics problems and heat dissipation in large concrete pours at Dinorwig; through the first multi-user Wang mini to be installed in a materials lab in Saudi Arabia in the 70's; to the first "portable" devices such as the IBM 5100 that we used for dynamic testing of foundation piles; the first cloned desktops such as the Apple 2e lookalikes that we used for data analysis in Singapore in the 80's; via server- based 1200 baud WANs used for wool certification in NZ in the 90's, to today's powerful multicore laptops that we use for analyzing multi-million row spreadsheets that we can download from anywhere on the planet in seconds.

In my 70's I'm now surrounded by laptops and screens attempting to squeeze subsurface geology out of satellite-derived gravity and magnetic field data - the technology has changed dramatically, but the desire to squeeze meaning out of arrays of numbers hasn't diminished.

As a teenager I played with valve electronics. In Dean Street we experimented with discrete PNP transistors. Now we have literally billions of transistors in our mobile phone. We've come a long way in half a century, but it continues to be an interesting life, and even in this time of COVID-19 – there's still lots of data to analyse."

DAVID BROWN
Electronic Engineering, 1971

"I look at my time in the School of Engineering Science, Dean Street as if from the wrong end of a telescope – so clear yet distant and detached.

I ended paid employment a couple of years ago. My career experiences were not guided by any strategic plan, but by the satisfaction I gained. The following insights might inform recent graduates, in these difficult times.

My father encouraged me to pursue a career in electronic engineering, rather than my own more lurid preferences, because 'electronics is the future'. He was dead right, but my future was not how he and I imagined, and he sadly never saw any of it.

I never mastered the necessary maths. I didn't have a decent grip on circuit design. I did find logic design and computer programming pretty easy and compelling – signs perhaps of mild autism and an obsessive-compulsive disposition?

So, looking back, what has experience taught me?

- Empathy with people and with their viewpoint is an important part of any professional portfolio. All those hours of conversation with students of all disciplines and nationalities, in the residential halls and the bars of Bangor and Anglesey might have compromised a decent degree, but in retrospect were pleasurable career investments, and not just idle time wasting.
- Life brings surprises; early experience in a range of disciplines will be useful. Changing jobs, or even careers, every cfew years need do no harm.

My 'career' went like this ...

- Aircraft instrument fitter's mate at 16 and Electrician's mate at 17. Builders' merchant labourer/driver.
- Student apprentice with a global telecoms corporation. This was called a 1-3-1 thick sandwich course. Really valuable experience, even now.
- Computer hardware design engineer for a year, aged 22. I can do this. But 8 hours a day, 5 days a week sat at a desk was never going to work for me; too much 'indoors', not enough 'people' time.
- Computer programmer – as above. (I chose these last two because I had the aptitude, and they have been essential foundations to the rest of my working life.)
- Telecoms quality engineering, aged 25, two years on the factory shop floor – REALLY interesting
- Another three years' quality engineering, but in electronic phototypesetting manufacturing. People, processes, automation, supplier evaluations. I met sales people – the daily varied travel, the company car, the expense account lunches – that's the life for me!
- Computer hardware sales, aged 30. Big, multi-national corporation. Ten years of privilege and travel. Progressed to Sales channel management. Eight more very challenging years of crisis management and hard negotiations.

At this point I chose to 'retire' from a proper, well paid job. I was 48, and went freelance. I initially took on a couple of small projects, using my existing expertise in quality assurance, but again there was not enough 'people time' for my taste.

I started working with an existing agency, delivering strategic sales training and coaching across Europe. A totally new career, and one that fed on all my experience. And it was ALL 'people' time.

Then in 2001 – 9/11, the Twin Towers. My entire business, and the biggest income I have ever had, fell off a cliff. Along with many others at that time, I had a lean couple of years until I hooked up with a former HP colleague to deliver product and sales training to HP sales people worldwide. This led to developing and delivering advanced training to sales teams across Europe. Later I developed and delivered 'Virtual' training, long before the emergence of Zoom or Teams. Challenging and fun!

These foundations enabled me to spend the last fifteen years of my career as the director/consultant of my own sales training company. Sounds impressive?

- The reality – a one-man band; I am management, admin, contracts manager, marketing, and above all, product. My essential partner – an excellent firm of accountants.
- The benefits – fifteen years of regular and significant income, worldwide travel from Beijing to California via Moscow, Johannesburg, Tunisia, Bulgaria, Arabia, Sweden, Serbia and every European country. All this, and I could choose where and when I worked, but I was never sure where the next pay cheque was coming from.

As a so-called career, it's nothing spectacular, but each part has been rewarding – technically, intellectually and financially.

A final warning. Thirty years of my working life were spent with five well- known international corporations, four of which disappeared without trace, along with my pension contributions. The fifth, thankfully, was / is Hewlett-Packard. I regularly raise a glass to the joint founders, Bill and Dave, for their vision of progressive management and of workers' entitlements."

COLIN DALTON

BEng 1994; MSc Electronic Engineering, 1998; PhD 2002

"I came to the University of Calgary, Canada for a 6- month research position after finishing my postdoc in Bangor (where I'd got my original electronics degree, my MSc and my PhD). That was 19 years ago now!

I go back to the UK about once every two years to catch up with friends and family, and have popped into the University to catch up with people too, to see the changes, to show family a University with real history and beautiful buildings, and to walk in Snowdonia and play on Anglesey's beaches. Obviously since Covid this has been harder to do.

The University of Calgary is in Alberta, on the Canadian high plains (at the height of Snowdon), so it's very dry and different to the lushness of Wales. The Rocky Mountains are pretty spectacular and only an hour's drive away, and I think that has been a big reason I like it here so much, they remind me of the Glyders. No bears or cougars in Snowdonia though!
I'm faculty at the University of Calgary, in the Electrical and Software Engineering department. I am also the Director of the University's microfabrication cleanroom facility, which I helped set up when I first came to Canada.

My research is split into two main areas – the first is lab- on-chip, which is miniaturising all the stuff you'd find in a typical laboratory and making it faster, cheaper, more accurate. This is similar to what I was doing for my PhD and postDoc in Bangor. My focus is the electrokinetic motion of fluids in microchannels, specifically for microneedles research, to make drug delivery less painful and more personalised.

My other main research area is brain machine interfaces (BMI) - using microelectrodes to communicate with neurons and also to promote nerve regeneration through stimulation. Some of this BMI research span out into a company called Neuraura Biotech Inc. in 2018, with one of my PhD students, which is focused on improving epileptic neurosurgery outcomes.

All of my research is linked to my microfabrication experience, which I started learning about way back in the School of Computer Science and Electronic Engineering's cleanroom during my MSc.

"I'm faculty at the University of Calgary, Canada, in the Electrical and Software Engineering department."

COVID has changed a great many things everywhere. The two major ones for me is trying to do research from home. While we can do a lot of design work and simulations, and I've had 7 undergraduate summer students these last two years doing just that with my PhD and MSc students, we only have limited into our labs to do actual experiments and validate our designs, so all my research has been being delayed. It is similar for my spin-out company, we were delayed with starting animal trials due to parts and services from our suppliers being affected. For my teaching, I had to take everything online, and that's been hit and miss, lecture content is easy enough, but in-person labs, hands on with equipment, teamwork, all of that is now very difficult to implement. But we've worked it out and adapted and learnt and got better, and slowly we are going to get through this and back to in-person with new skills.

On a personal note, working at home has given me more time to spend with my family, seeing them at lunch and getting home from 'work' (ie the upstairs office) is a lot easier than driving through the snow at -20C. I feel incredibly lucky that I can work from home and that, in these interesting and trying times, my family is safe and well."

JAKOBUS GROENEWALD
Electronic Engineering, 2010; PhD 2014

"I recently started to work for Muontech, a small start-up electronic engineering consultancy focusing on vehicle control systems, automation systems, and battery management systems for the last-mile mobility, automotive, rail and marine sectors.

My previous role was with WMG (Warwick Manufacturing Group). WMG is an academic department at the University of Warwick and is the leading international role model for successful collaboration between academia and the public and private sectors, driving innovation in science, technology and engineering, to develop the brightest ideas and talent that will shape our future.

I graduated with a First-Class BEng Honours degree in Electronic Engineering from Bangor University in 2010 and subsequently gained my PhD in Optical Communications Systems in 2014. In November 2014, I was appointed as a Research Fellow on the ABACUS project that forms part of the WMG High Value Manufacturing team to conduct research into innovative business models and design approaches for extending the in-service battery life of future low carbon vehicles. In 2016 I was appointed as Test Facilities Engineer for the 3xD simulator at WMG. In 2017 I was promoted to Lead engineer in WMG's Connected and Autonomous Vehicles Research Group. In 2021 I achieved Chartered status through the IET and was promoted to Principal Engineer in the Connected and Autonomous Vehicles Research Group.

I was responsible for several Intelligent Vehicle research facilities. I operated and maintained the state-of-the-art multi-million pound 3xD intelligent vehicles experimental test simulator that supported WMG activities as part of the High Value Manufacturing Catapult in collaboration with industry and academic partners. Some of the simulator features include:

- Full 360° screen 8 meters in diameter and 3 meters high inside an anechoic Faraday Chamber
- 8 Canon projectors with VIOSO warp and blend software
- Full drive-in capability including customised steering plates with Sensodrive motors
- Fully customisable Range Rover Evoque with Dbox motion base and Sensodrive steering system
- Various software environments such as rFpro, Carmaker, Unreal and XPI
- LIDAR scanned visualisation of real-world driving routes within local area
- Infotainment hardware-in-the-loop to emulate complex external signal environments
- Customisable HMI interfaces
- Lidar, Radar and camera models and noise models
- National Instruments real-time platform for vehicle dynamics simulations

My research interests include Smart, Connected and Intelligent Vehicles focusing on ADAS systems, V2x communications, automotive sensor spoofing, modelling, simulation and emulation."

"I was responsible for several Intelligent Vehicle research facilities"

THAMRAA ALSHAHRANI
PhD Electronic Engineering, 2014

Thamraa is an Assistance Professor in the Physics department of Princess Norah University, Riyadh, Saudi Arabia. She is a specialist in solar energy, focusing to improve the solar cells efficiency and stability. As a scientist she also applies project management and leadership strategy in her projects to gain both solutions and best practices.

Thamraa gained her PhD from Bangor University in Organic Solar Cells following her Masters degree in Nanotechnology and Microfabrication in 2010.

Thamraa did her postdoctoral research in PV Lab at Massachusetts institute of technology (MIT) in Boston 2017-2018 and conducted research with the MIT PV lab group in topics relating to my country (Perovskite Si Tandem Solar Cells for Hot/Arid Climates) and the results were presented in MRS 2018 spring conference in Arizona.

She was a visiting researcher in the civil structure and environmental engineering department at Trinity college of Dublin in summer 2019 and her research interest areas include photovoltaics, LED, transistor, energy storage, hydrogen fuel cells, semiconductor materials and Nanomaterials.

During the COVID-19 pandemic, Thamraa was on maternity leave then worked from home on research papers.

ALEXANDRA VINCA
Business and Computer Information Systems, 2019

"After graduating in July last year, I started my job as a Technology graduate with Costain in August and moved to England two days after the graduation ceremony took place. One of my highlights at Costain so far is being awarded a Quality Award in "Best Example of Quality in Data and Digital Technology" for a project I had the opportunity to work on in my first months there and the award for my team's work arrived after just 3 months of employment. Since then I moved from a Business Analyst role in Costain, to a more technical developer role returning to Italy where my family is based. I am now working with the Microsoft Power Platform offering international clients innovative solutions that make proccesses more reliable and efficient.

I feel very lucky for the opportunities I was given as well as working alongside amazing people and for this I want to thank my lecturers for everything that they taught me and that I am using in my current role."