

# University of Bristol IEEE Student Branch

Half-day "Technology" Symposium

Date: 7<sup>th</sup> June 2022 Venue: University of Bristol, GEOG BLDG G.1S HEPPLE

## **EVENT FULL PROGRAMME**

Registration	09:00-09:20
Opening and Welcome by the IEEE Student Branch Counsellor	09:20-09:30

- Talk title: Microchip Our Technology and Opportunities09:30-09:55
- > Speakers' biography:
  - Alexander George works in the Research & Design group at Microchip Technology Caldicot. He graduated from Swansea University in June 2020 with a master's degree in electronic and electrical engineering, and shortly after that, he started his work at Microchip. His main focus for his career is high power electronics design, with a side focus on advanced electronic device packaging. Since working with Microchip at the Caldicot site for two years, Alexander has worked on many multi-million pound projects, including high-temperature power modules for the automotive and aerospace industries, as well as miniature energy harvesting devices.
  - Michelle Taylor is working within the European HR function at Microchip. She supports the UK and Ireland sites. Michelle has experience both within Finance, Manufacturing and Engineering industries and have over 10 years' experience with the Microchip site at Caldicot. Her role includes the full employee life cycle from recruitment through to retirement. Her passion is identifying talent that can take the business forward to achieve it's goals and at the same time watching and supporting that talent grow and develop into future leaders of the business.
- > Talk abstract:

Our talk will share information around the global business of Microchip, it's markets, locations and technologies. Alex will specifically talk about the technology has been working on and the future technologies that we are developing at Caldicot.

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- Talk title: Engineering on the Smallest Scale: Molecular Machinery for Medical Applications
  09:55-10:20
- Speaker's biography:

**Anthony P. Davis** gained a B.A. in Chemistry from Oxford University in 1977, then stayed for a D.Phil. and two years' postdoctoral work. In 1981 he moved to the ETH Zürich as a Royal Society European Exchange Fellow, then in 1982 was appointed as a Lecturer in Organic Chemistry at Trinity College, Dublin. In September 2000 he moved to the University of Bristol, where he is Professor of Supramolecular Chemistry in the School of Chemistry. In 2002 he was awarded the Tilden Medal of the Royal Society of Chemistry, in 2015 the RSC Award for Physical Organic Chemistry, and in 2020 the RSC Robert Robinson Award. He is currently Chair of the Editorial Board of Organic and Biological Chemistry.

### > Talk abstract:

The Davis group's research has focused on supramolecular chemistry, which is essentially the design of functional molecules. They are focused especially on molecules which go beyond proof-of-principle, and work well enough to be used in real-world settings. Their main success has come in the area of carbohydrate recognition, where they have designed molecules that bind glucose under biological conditions with remarkable strength and selectivity. These molecules have potential for applications in the management of diabetes, either in continuous glucose monitoring or in glucose responsive insulin. The work has led to the foundation of two companies; Ziylo, which was sold in 2018 to Novo Nordisk, and Carbometrics, which is developing applications in glucose sensing.

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Coffee Break

10:20-10:35

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**Talk title:** Metasurfaces for Communications, Sensing and Energy Applications

10:35-11:00

## Speaker's biography:

Martin Cryan has worked in the fields of electromagnetic modelling, device and circuit fabrication for 36 years. He is interested in metasurfaces, metamaterials, plasmonics, photonic crystals, nanophotonics and rf-photonics applications. He is involved in a recently awarded EPSRC project: GLIMMER which is developing RF-acoustic filtering devices on Gallium Nitride (GaN). He worked on an EPSRC grant on GaN Photonic Crystal fluorescence sensors and an EPSRC grant on Integrated Tunable Flat Lenses. He is co-founder of recent Bristol spinout <u>www.FluoretiQ.com</u>, which is developing low-cost biosensors for bacteria detection, and has a joint Innovate UK project with FluoretiQ exploring the use of microfluidics in biosensing.

Metasurfaces have very wide range of applications across the whole EM spectrum and in other fields such as acoustics and mechanics. There are a number of different types, but generally they are thin, 2D periodic structures with sub-wavelength periodicity formed from resonant "meta-atoms" which have controlled phase and amplitude responses. This allows for effects such as wave-front control, enhanced emission and absorption. In this talk I will show some recent work from Bristol using metasurfaces for photonic applications.

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Talk title: Personal Health, Care & Wellbeing Technologies "In the Wild" 11:00-11:25

## Speaker's biography:

**Aisling (ASH-Ling) Ann O'Kane** is a Senior Lecturer of Human-Computer Interaction for Health at the University of Bristol. She is the Deputy Director of the EPSRC CDT in Digital Health & Care, and is currently the Interim Head of Computer Science. Her research is on the real-world use of technologies for health, care and wellbeing, particularly for diabetes, mental wellbeing, social care, and parenting. Using pragmatic semi-structured qualitative studies and participatory design approaches, she explores how technologies are actually used 'in the wild' and what this means for the design of future technologies with partners from industry, local government, not-for-profits and charities.

## > Talk abstract:

This talk will outline my ten years of research into technologies to support health and care outside of clinical settings, specifically how they are used, abused, mis-used and not used in the real world. I will look toward the future of co-designing technology enabled care and widening participation in the design of health, care and wellbeing devices.

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Coffee Break

11:25-11:40

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Talk title: Spectrum Sharing in C-Band – An Economic Case Study 11:40-11:55

## Speaker's biography:

**Simon Wilson** spent 15 years working in a variety of roles in the electronics and communications industries before specialising in the world of radio spectrum in 2001. During his work on spectrum Simon led several industry groups as well as leading spectrum policy development within the O2 and Telefónica Groups. He took the opportunity of a voluntary redundancy package from Telefónica to embark on a PhD at the EPSRC Centre for Doctoral Training in Communications at the University of Bristol in September 2018. The focus of his research project is secure Dynamic Spectrum Access. Most recently, Simon joined Real Wireless as Radio Spectrum Expert in September 2020.

## > Talk abstract:

This presentation looks at innovation in spectrum management and how a form of Dynamic Spectrum Access (DSA) could enable more dense spectrum sharing. In theory, DSA systems should improve the technical efficiency of spectrum usage, but does this lead to overall economic benefit by increasing the amount of spectrum available to MNOs as a supplement to their licensed spectrum?

Research has considered the optimisation of spectrum use from a bit rate perspective and characterised the availability and take up of new spectrum bands. An analysis of candidate DSA bands suggests that the best opportunities for DSA might be around 4GHz, and either 26GHz or 40GHz. 3GPP has already standardised 3.3 – 4.2 GHz but standards are limited in their maximum carrier aggregation opportunities. The author suggests that future research should continue to push boundaries in this area, enabling users to access larger bandwidths via carrier aggregation. There is no reason why a DSA ecosystem should artificially limit addressable bandwidths.

The protection of Primary Users (PUs) is an essential requirement of any DSA system, and there are many studies that inform how these users should be protected. This presentation considers the UK situation, looking at existing fixed links and permanent earth stations in the 3.8 - 4.2GHz band, but the process of characterising the potential availability of DSA spectrum and making it available can follow the same methodology regardless of spectrum band or geography:

- Identify PUs
- Define their required protection ratios
- Determine any and all Exclusion Zones (EZs) in the frequency, geography and time domains
- Enable DSA outside EZs

SEAMCAT has been used to simulate Ofcom's local access licenses and variations thereon, using extant antenna characteristics to calculate EZ sizes. Taking a theoretical target market of Greater London, the author estimates the addressable spectrum opportunity in the 3.8 – 4.2GHz band for different Secondary User (SU) channel bandwidths and uses a cost avoidance model to compare total cost of ownership over a period of time. The comparison is made between the cost of deploying additional base stations to meet increasing traffic demands, with the cost of deploying DSA spectrum within the existing base station portfolio.

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Talk title: A high-performance digital RF power amplifier and how machine learning can enable the RF design
11:55-12:05

## Speaker's biography:

**Jiteng Ma** received the B.E. degree from Beijing University of Posts and Telecommunications and the M.S. degree (distinguished) from University of Bristol, where he is currently working towards the Ph.D. degree in electrical engineering. His doctoral research focuses on design high-performance RF power amplifiers.

## > Talk abstract:

Power efficiency is one of the most challenging specifications in communication systems, especially in the emerging wireless network, where energy consumption leads to significant growth of the operators' power cost as well as carbon emissions. We propose a multi-bit digital power amplifier architecture to notably improve the power efficiency of amplifying the OFDM signal. Machine learning techniques are also introduced to fully enable the potential of the power amplifier design.

Lunch Break

12:05-13:05