

### **Yogesh Ramadass, Texas Instruments, Energy Harvesting: Past, Present and Future**

Yogesh Ramadass received his B. Tech. degree from IIT-Kharagpur and the S. M. and Ph.D. degrees from MIT all in Electrical Engineering. He is currently the director of power management R&D at Kilby Labs, Texas Instruments, where he is involved in research and product development efforts looking into high power density automotive and industrial switching converters, small form factor power management solutions for consumer electronics, nano-power IoT designs and high voltage power systems.

Dr. Ramadass was awarded the President of India Gold Medal in 2004 and the EETimes 'Innovator of the Year' award in 2013. He was a co-recipient of the Jack Kilby best student paper award at ISSCC 2009 and the Beatrice Winner award for editorial excellence at ISSCC 2007. He is a senior member of the IEEE, chair of the 'Power Management' sub-committee at ISSCC and serves as an associate editor of the IEEE Journal of Solid-State Circuits and on the Technical Program Committee for the IEEE VLSI conference.

### **Eric Yeatman, Imperial College London, Alternative Powering Methods for Miniature Wireless Sensors**

Eric M. Yeatman has been a member of academic staff in Imperial College London since 1989, and Professor of Micro-Engineering since 2005. He has published more than 200 papers and patents, primarily on optical devices and materials, and micro-electro-mechanical systems (MEMS). He is Head of the Department of Electrical and Electronic Engineering, and Co-Director of the college's Digital Economy Lab. He is a Fellow and a Silver Medalist of the Royal Academy of Engineering, and a Fellow of the IEEE, IET and IoM3. Prof. Yeatman is also co-founder and director of Microsaic Systems plc, which develops and markets miniature mass spectrometers, based on MEMS technology, for portable chemical analysis. His current research interests are in energy sources for wireless devices (particularly energy harvesting), radio frequency and photonic MEMS devices, pervasive sensing and sensor networks.

### **Ausrine Bartasyte, FEMTO-ST, From Green Piezoelectric Materials to Designed Hybrid Piezoelectric Energy Harvesters**

Ausrine Bartasyte is an associate professor—chair of excellence of Labex ACTION at the Institute FEMTO-ST, University of Bourgogne Franche-Comté (Besançon, France). A. Bartasyte has an experience of 17 years in deposition of epitaxial multifunctional oxides and their heterostructures (superconductors, mixed conductors, high-k dielectrics and ferroelectrics) by means of PI MOCVD and RF sputtering. She started to work on thin films during her undergraduate studies in Chemistry at Vilnius University in Lithuania and PhD in Grenoble INP, France (2007). She was a postdoctoral research assistant in Prof. A. M. Glazer's group at the University of Oxford, UK, working on the crystal growth of  $\text{LiNbO}_3$ – $\text{LiTaO}_3$  solid solutions. During her sabbatical leave to Harvard University, she optimized titanium oxide films for photonic applications. At present, her research is focused on Strain and Chemical engineering of structural and physical properties of alkaline niobate/tantalate single crystals, films, heterostructures & nanostructures for miniaturized and/or integrated devices with better performance in acoustics, optics and energy harvesting.

### **Dhiman Mallick, Tyndall National Institute, Broadband Vibrational Energy Harvesting using Nonlinear Systems**

Dr. Dhiman Mallick is a post-doctoral researcher at Tyndall National Institute, Cork, Ireland. Currently, he is working in the area of micro-system technologies leading to the autonomous operation of 'Internet of Things (IoT)'. He received B.Sc. in Physics (Hons.) from University of Calcutta in 2007, followed by B.Tech. (post-graduate) and M.Tech. Degrees in Radio Physics and Electronics Engineering from University of Calcutta in 2010 and 2012, respectively. He received the Ph.D. degree in Electrical and Electronic Engineering from Tyndall National Institute, University College Cork in February 2017. Till date, he has authored/co-authored around 30 published articles in peer-reviewed journals and conference proceedings, one book chapter and one global patent. He received DST INSPIRE faculty award in 2018. His research interests include MEMS and microfluidics devices, kinetic energy harvesting and associated power electronics, material integration for MEMS devices.

### **Jane Cornett, Analog Devices, Optimization of Chip-scale Thermoelectric Energy Harvesters for Room Temperature Energy Harvesting Applications**

Jane Cornett graduated from Colgate University with a B.A. in mathematics and physics in 2008. She received her doctorate in 2013 from the University of Maryland in Materials Science for her work on nanostructured thermoelectric materials. Since 2013, Jane has been a device engineer at Analog Devices with her major focus being development of ADI's chip scale thermoelectric energy harvester.

### **Brandon Lucia, Carnegie Mellon University, Reliable Software and Programming for Intermittent Energy-Harvesting Systems**

Brandon Lucia is an Assistant Professor of Electrical and Computer Engineering at Carnegie Mellon University. His work takes a cross-cutting approach to developing hardware and software computer systems, including work in the emerging area of intermittent, energy-harvesting computer systems and the design of reliable, efficient, programmable parallel computer systems. His cross-cutting computer systems research has led to a 2018 NSF CAREER Award, the 2018 ASPLOS Best Paper Award, three papers being selected as IEEE MICRO Top Picks in Computer Architecture (2009, 2010, 2016), a 2015 OOPSLA Distinguished Paper Award and an OOPSLA 2015 Distinguished Software Artifact Award, the 2015 Bell Labs Prize, a 2016 Google Faculty Award, three patents, and an appointment to the prestigious DARPA I2O Information Science and Technology (ISAT) study group. More information on his lab, which is supported in part by NSF and through cooperation with Intel, Google, SRC, and Disney Research, is at <http://intermittent.systems>.

### **Mehmet Ozturk, North Carolina State University, Flexible Thermoelectric Generators with Bulk Thermoelectric Materials and Stretchable, Low-Resistivity Liquid Metal Interconnects**

Mehmet C. Ozturk received his BS degree in Electrical Engineering in 1981 from Bosphorus University, Istanbul, Turkey. Immediately after receiving his PhD degree from NC State, Raleigh, NC also in Electrical

Engineering, he joined his department as an assistant professor. His research focused on enhancing the properties of nanoscale

CMOS devices through innovations in materials and device design. He was the first to propose the use of recessed SiGe source/drains in MOSFETs, now, a standard technology in state-of-the-art CMOS integrated circuits. Prof. Ozturk is also responsible for some of the early work on self-aligned germanosilicide contacts to SiGe alloys and

work function engineering for low-resistivity contacts through implantation of different species. He was named a fellow of the IEEE in 2009 for his contributions to Si and SiGe Epitaxy for CMOS devices. Prof. Ozturk is presently serving as the deputy director of the NSF Engineering Research Center, Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST). His current work focuses on thermoelectric energy harvesters optimized for converting body heat to electricity to create self-powered wearables and it involves novel materials and processes towards high performance, large-area flexible thermoelectric modules. Outside work, Prof. Ozturk enjoys playing his classical guitar.

### **Luis Martins, Boston Scientific Limited, COMPOSITION – Industry 4.0 IoT Device Retrofit and Energy Harvesting Use Cases**

Luis received a BEng in Biomedical Engineering sciences from the New University of Lisbon, Portugal, in 2010 and currently holds a MEng in Biomedical Engineering, obtained in 2012 from the same university. Throughout his career he worked both as a researcher and as an engineer in the medical device field, gaining significant experience in both industry and academic research. He has previously collaborated in technology transfers and scale-ups from R&D to pilot production, as well as in other H2020 and FP7 projects. He's currently working as a Research and Development Engineer at Boston Scientific, developing exploratory work in the urology division and acting as the primary site contact point for H2020 projects, serving as a conduit to company-wide expertise and focusing on the engagement of meaningful funding opportunities for the company.

### **Denis Pasero, Ilika, Review of Energy Storage Solutions for IoT Edge Nodes**

Denis Pasero joined Ilika Technologies in 2008, as a scientist specializing in battery technology, to manage commercial lithium ion projects. He became part of the Ilika team to apply his strong academic knowledge to commercial applications and saw the potential to be part of the development and success story of an enterprising smaller company with exciting technology and novel product ideas. Today, as Product Commercialization Manager, Denis interfaces between customers and technical teams.

Prior to that, Denis was a teacher in Mathematics and Science for two years, after gaining a PhD in Physical Chemistry from the University of Cardiff in 1997 and completing an assignment as post doctoral research associate at the University of Sheffield - specializing in lithium ion battery materials.

### **Pierre Mars, CAP-XX, Using Supercapacitors to Manage Your Power**

Pierre has over 35 years of hardware and embedded software design experience. He has been with CAP-XX for 17 years where he is responsible for development of new supercapacitor applications. Prior to joining CAP-XX he held senior technical positions with Racal Defence Electronics, Chubb Electronic Security, CAE Pty Ltd and Honeywell Industrial Control. He has had over 15 articles published on supercapacitor applications. Pierre has a B.E. Electrical (1st class honours), M. Eng. Sc. from the University of NSW, Australia, and an MBA from INSEAD, France. He is a member of the IEEE.

### **Thomas Fletcher, Cambridge Display Technologies, Progress in Printable Energy Harvesting and Storage Devices**

Thomas studied chemistry at the University of Southampton, graduating with a Masters degree in 2010. Joining CDT in 2012, he has worked on the inkjet printing of POLED displays and more recently on developing a printable flexible/conformable thermoelectric generator.

### **Roberto La Rosa, ST Micro, A System on Chip for Energy Harvesting and Wireless Power Transfer**

Roberto La Rosa is currently working as Design Manager and Smart Energy Applications Team Manager for STMicroelectronics Catania. Since joining STMicroelectronics in 1997 he has held a variety of assignments, including the design of high-frequency PLL's for clock generation and recovery, fiber-optic transceiver and system design, power management ICs, and other analog, digital and mixed-signal bipolar and CMOS circuit development projects. He currently is a Research Senior Staff Member at STMicroelectronics Catania. His current research interests include Ultra low power management, over the distance power transmission and Energy Harvesting.

Dr. La Rosa has published several papers on advanced techniques to null stand-by power consumption by using energy harvesting and holds several patents.

### **Katherine Kim, Ulsan National Institute of Science and Technology (UNIST), Power Circuitry Design Considerations for Photovoltaic Energy Harvesting Applications in Uneven Lighting Conditions**

Katherine Kim received the B.S. degree in electrical and computer engineering from Franklin W. Olin College of Engineering, Needham, MA, in 2007. She received the M.S. degree in electrical and computer engineering in 2011 and the Ph.D. degree in electrical and computer engineering in 2014, both from the University of Illinois, Urbana-Champaign, IL. She is an Assistant Professor of Electrical and Computer Engineering at the Ulsan National Institute of Science and Technology (UNIST) in Ulsan, Korea. Dr. Kim received the National Science Foundation's East Asia and Pacific Summer Institutes (EAPSI) Fellowship in 2010 and Graduate Research Fellowship in 2011. She is currently an Associate Editor for the IEEE Transactions on Power Electronics and serves as an IEEE Power Electronics Society (PELS) Member-At-Large for 2016-2018.

### **Seamus O'Driscoll, Tyndall National Institute, ULP Energy Harvesting PMIC for Smart Sensor Node**

Séamus joined Tyndall in 2016 as a Principal Investigator for Integrated Power Systems and is leading a number of research programs spanning power topology and silicon controller design for micro watt level energy harvesting through to multi-hundred MHz VRM design. Earlier career roles, at technical staff and leadership level, have included Silicon Systems Architect for Texas Instruments Ltd., Principal Design Engineer with Commergy Technologies Ltd. and Corporate Technology Engineer with Artesyn Technologies Ltd. He has released many professional power product designs with multiple industry “firsts” to the world’s leading communications and computer companies. Seamus is currently technical lead on MISCHIEF, an innovative multisource energy harvesting PMIC (power management IC) development for IoT applications funded by Enterprise Ireland and a funded research on GanOnCMOS, an EU H2020 project developing next generation high power density high frequency power solutions.

### **Peter Woias, IMTEK-University of Freiburg, Energy-autonomous Systems Based on Thermoelectric Energy Harvesting: application-oriented system design and integration**

Peter Woias has graduated in electrical engineering at the Technical University of Munich in 1988. In 1995 he received his doctorate from the TU Munich on solid state sensors for chemical analysis. After that he was a research group manager in microactuators and microfluidics and, later, head of a research department on micromechanics, actuators and fluidics at the Fraunhofer Institutes for Solid State Technology and for Integrated Circuits, both in Munich. Since 2000 Peter Woias is a full professor and head of the Laboratory for Design of Microsystems at the Dept. of Microsystems Engineering (IMTEK) of the Albert-Ludwig-University Freiburg. His actual research focuses on microfluidics for medical applications, micro energy harvesting, chemical micro process engineering, and silicon and polymer microfabrication. Since 2006, he is the manager and speaker of IMTEK’s Ph.D. training program on “Micro Energy Harvesting”. Since 2007, Peter Woias is a regular member of the International Steering committee and program committee of the PowerMEMS conference series.

### **Peter Spies, Fraunhofer IIS, Micro-Energy Management for Broadband Energy Harvesting Systems**

Dr. Peter Spies studied Electrical Engineering at the University of Erlangen / Germany and graduated with a Dipl.-Ing. degree in 1997. In 2010, he finished his PhD thesis on the topic of power saving in mobile communication devices.

Since 1998, he is with the Fraunhofer IIS, power efficient systems department. He was working on the field of multi-standard front-ends and system simulations for communication applications. Since 2001 he is group manager of the “integrated energy supplies” group where he is doing research and design on the field of power and battery management, energy transmission and energy harvesting. Focus of his group is integrated circuit and system design, development of thermal and vibration harvesting systems and complete power supplies implementation. Most important applications are wireless sensor networks and tracking systems.

### **Alex Weddell, University of Southampton / ARM, Energy Harvesting in Future Integrated IoT Devices**

Alex Weddell, from the University of Southampton, has been researching into systems, modelling and circuits for energy harvesting since 2004. His PhD focused on enabling reconfigurable multi-source energy harvesting systems for wireless sensor systems. He has contributed to a range of energy harvesting projects funded through consultancy, UK government or EU. He is currently a co-investigator on three projects in energy harvesting for the IoT and smart cities. He is a member of the Arm-ECS Research Centre, an award-winning collaboration between Arm and Southampton which has resulted in 10 chips fabricated and over 30 papers published over the past decade.

### **Stephen Savulak, United Technologies Research Center, Perspectives on Energy Harvesting for Aerospace Sensors**

Mr. Savulak has over 20 years of experience in power electronics, with a concentration in high voltage and high power topologies. In his current role, Mr. Savulak is responsible for the development of future power electronics for UTC's wide variety of building and aerospace products. While at UTRC, Mr. Savulak has developed switching converters for projects involving both ultra-low and high power applications, receiving company- conferred Outstanding Achievement Awards for his research work on a high power electrical energy storage system based on flow batteries, the custom DC power system for a new generation of UAV prototypes, and a high frequency GaN-based motor drive for projectile guidance. Prior to his current role, Mr. Savulak worked for Universal Voltronics as both a high voltage engineer and product manager, developing power supplies up to 500kV for x-ray, e-beam, and laser lithographic applications. Prior to that, he worked for Advanced Energy Industries creating power electronic subsystems used in advanced high frequency generators for the semiconductor manufacturing sector. Education: B.S., Electrical Engineering, Carnegie Mellon University.

### **Ivan O'Connell, Tyndall National Institute, Methodologies for Reducing ULP Device Power Consumption**

Dr. Ivan O' Connell is the Analog Mixed-Signal Principal Investigator at Microelectronic Circuits Centre Ireland (MCCI), hosted in the Tyndall National Institute. He joined MCCI in 2013 and is currently the Head of Group leading projects, proposals & industry engagement having grown this to 20 researchers since then. He is particularly interested in applications such as: Internet of Things, Biomedical, Smart Agri and Energy Harvesting. Prior to MCCI he was the Design Manager in ChipSensors, which was subsequently acquired by Silicon Laboratories. Whilst there he was instrumental in the development of their digital relative humidity and temperature sensor products and their subsequent commercialisation.

Ivan is currently collaborating with Tyndall's ICT4EE group in co-developing MISCHIEF, an innovative multi-source power management PMIC for IoT energy harvesting applications and is leading several IoT CMOS design projects under the CONNECT SFI (Science Foundation Ireland) research centre.

### **Francesco Carobolante, G2nd Systems, The Future of the Energy Harvesting Ecosystem**

Francesco Carobolante is CTO at G2nd Systems and held senior positions at Qualcomm, Fairchild and ST Microelectronics. He is an internationally renowned innovator and creator of many industry "firsts" in Mobile and Wireless Technologies, Motion Control, Power Management, RF, IoT, Signal Processing and Wireless Power Transfer. He developed and commercialized the first resonant wireless charging technology and founded the Alliance for Wireless Power (A4WP, now AFA) standards consortium.

He holds MSEE degrees from UCLA and University of Padova and has authored over 60 patents.

## **POSTERS**

### **Valeria Nico, University of Limerick, Multiple Degree-of-Freedom Vibrational Energy Harvester Multi-VIBE**

Valeria received a Bachelor's degree from the University of Perugia, Italy in 2011, where she worked on linear piezoelectric membranes for energy harvesting. In 2013 she was awarded the Master's degree from University of Perugia, Italy, with a thesis on nonlinear piezoelectric membranes for energy harvesting. She completed her PhD in vibrational energy harvesting at the University of Limerick in 2017 and is currently working as postdoctoral researcher in the University of Limerick on a commercialisation project to bring to the market the device that she developed during her PhD.

### **Heiko Reith, IFW Dresden, Integrated Micro-Thermoelectric Modules for Local Heat Management**

#### **MISSING**

### **William Ferguson, University of Exeter, Auxetic Enhancement of Vibration Energy Harvesting**

William is a postgraduate researcher based in the Energy Harvesting Group at the University of Exeter and affiliated with the Metamaterials Centre for Doctoral Training. His research is primarily in using auxetic materials and structures to increase the power output of vibration and strain energy harvesting, with a view for use in self-powered structural health monitoring devices.

### **Peter Woias, IMTEK-University of Freiburg, Thermoelectric Energy Harvesting for Powering Wireless Sensor Nodes: from low-temperature to high-temperature applications**

Peter Woias has graduated in electrical engineering at the Technical University of Munich in 1988. In 1995 he received his doctorate from the TU Munich on solid state sensors for chemical analysis. After that he was a research group manager in microactuators and microfluidics and, later, head of a research department on micromechanics, actuators and fluidics at the Fraunhofer Institutes for Solid State

Technology and for Integrated Circuits, both in Munich. Since 2000 Peter Woias is a full professor and head of the Laboratory for Design of Microsystems at the Dept. of Microsystems Engineering (IMTEK) of the Albert-Ludwig-University Freiburg. His actual research focuses on microfluidics for medical applications, micro energy harvesting, chemical micro process engineering, and silicon and polymer microfabrication. Since 2006, he is the manager and speaker of IMTEK's Ph.D. training program on "Micro Energy Harvesting". Since 2007, Peter Woias is a regular member of the International Steering committee and program committee of the PowerMEMS conference series.

#### **Watcharapong Paosangthong, University of Southampton, Performance Comparison Between Different Materials and Operation Modes of Triboelectric Nanogenerator**

Watcharapong Paosangthong is a PhD student in Smart Electronic Materials and Systems Research Group at the University of Southampton, UK. He received his Diplom-Physiker Univ. degree in Physics from the Technische Universität München, Germany in 2011 and his MSc degree in MicroElectroMechanical Systems from the University of Southampton, UK, in 2017. From 2012 to 2016, he worked as research assistant and process engineer at Thai Microelectronics Center, Thailand. His research interests include triboelectric generator, energy harvesting, sensor systems, e-textiles and MEMS.

#### **Ausrine Bartasyte, FEMTO-ST, ITN ENHANCE - Piezoelectric Energy Harvesters for Self-Powered Automotive Sensors: from Advanced Lead-Free Materials to Smart Systems (2017-2021)**

Ausrine Bartasyte is an associate professor—chair of excellence of Labex ACTION at the Institute FEMTO-ST, University of Bourgogne Franche-Comté (Besançon, France). A. Bartasyte has an experience of 17 years in deposition of epitaxial multifunctional oxides and their heterostructures (superconductors, mixed conductors, high-k dielectrics and ferroelectrics) by means of PI MOCVD and RF sputtering. She started to work on thin films during her undergraduate studies in Chemistry at Vilnius University in Lithuania and PhD in Grenoble INP, France (2007). She was a postdoctoral research assistant in Prof. A. M. Glazer's group at the University of Oxford, UK, working on the crystal growth of  $\text{LiNbO}_3$ – $\text{LiTaO}_3$  solid solutions. During her sabbatical leave to Harvard University, she optimized titanium oxide films for photonic applications. At present, her research is focused on Strain and Chemical engineering of structural and physical properties of alkaline niobate/tantalate single crystals, films, heterostructures & nanostructures for miniaturized and/or integrated devices with better performance in acoustics, optics and energy harvesting.

#### **James Rohan, Tyndall National Institute, Nanoscale Cathode Materials for High Power Microbatteries**

Dr. James Rohan leads the Electrochemical Materials and Energy research group at Tyndall National Institute. His research interests include electrochemical materials processing and device fabrication for micro/nanoelectronics, energy storage and sensor applications. He is a funded investigator in the Science Foundation Ireland Connect Research Centre and the EU H2020 Enables project microbatteries for wireless sensors. He is an active member of the Electrochemical Society and the Ireland representative of the International Society of Electrochemistry.

### **Raphaël Salot, CEA-Leti, EnSO (Energy for Smart Objects) EU Project**

Dr. Raphaël Salot is Head of the LETI Embedded Micro battery Laboratory. He holds a PhD in materials and electrochemical science. He is In CEA since 1996 as a research engineer and in charge of the micro-battery development since 2000. He now manages the R&D activities of CEA/LETI on lithium thin film batteries. He is involved in several National and European collaborative projects. He was coordinator of the FP7 – ICT project ‘e-STARS’ focused on innovative 3D-micro-batteries. He is now the coordinator of the ECSEL project ‘EnSO’. He is author of more than 30 patents in the field of energy storage.

### **Ruth Houlihan, Tyndall National Institute, Spatial Dependence of a Piezo-magnetic MEMS harvester Relative to the Electromagnetic Source**

Ruth Houlihan received the Mechanical Engineering degree from the National University of Ireland, Galway, in 1998; the master’s degree in engineering science from University College Cork, Ireland, in 2000; and the Ph.D. degree in micromechanical systems from the University of Southampton, U.K., in 2004. She has worked over the years in inertial, RF, and energy-harvesting MEMS devices as a Device Designer, a Process Developer, and a Modeler. In particular, she has focused on finite element and system-level modeling of MEMS, and on the test and analysis of reliability of MEMS. She has been a PI for Enterprise Ireland funded projects, and has worked on European projects and ESA funded projects in addition to industrial contracts. She is currently a Staff Research Scientist with Tyndall National Institute, Ireland.

### **Martin Kluge, Fraunhofer IPM / Imperial College / Airbus, Dynamic Thermoelectric Energy Harvesting in Aircraft**

Dipl.-Ing. (FH) Martin Kluge is a project manager at the Fraunhofer Institute for Physical Measurement Techniques IPM in Freiburg, Germany. Before joining to Fraunhofer in May 2016, Martin has gained more than 15 years of practical experience in industrial R&D in both aerospace and automotive industry. Today he is active in the fields of thermoelectrics and energy harvesting.

### **Gerd vom Bögel, Fraunhofer IMS, Wireless Sensor System for Industrial Applications Powered by Thermoelectric Generator**

Gerd vom Boegel received the diploma degree in electrical engineering from the University Duisburg in 1991. He joined the Fraunhofer Institute for Microelectronic Circuits and Systems in Duisburg working in the field of system design technique for embedded, wireless and transponder systems. He received the Dr.-Ing. degree from the University Duisburg in 1999. Since then he is working on energy harvesting topics, especially on RF energy harvesting. At present he is responsible for the business unit transponder and RF systems at the Fraunhofer Institute IMS.

### **Philip Schmidt, Fraunhofer IMS, Boost & Fly - RF Powering of Wireless Sensors for Industry 4.0**

Philip Schmidt received the Dipl.-Ing. degree in electrical engineering from the University Siegen in 2013. He joined the Fraunhofer Institute for Microelectronic Circuits and Systems in Duisburg working in the field of wireless and transponder systems. His Dr.-Ing. thesis focused on increasing the performance of radio frequency identification systems (RFID) operating in the near field. One of the aspects he investigated was a power optimized waveform for RFID carrier.

### **Tracy Brennan, Boston Scientific Limited, COMPOSITION – Conditional Monitoring and Asset Tracking Sensors for Industry 4.0**

Tracy received a BEng in Biomedical Engineering Sciences and an MEng in Biomedical Engineering from University College Dublin in 2017 and is currently working as a Process Development Engineer in the medical device field at Boston Scientific. She is currently the technical leader for the H2020's COMPOSITION project which aims to optimize the ecosystem for collaborative manufacturing processes.

### **Cian O'Shea, Tyndall National Institute, RECO2ST – WSN Power Modelling and Optimisation Tool for Retrofitting Intelligent Building Energy Efficiency Systems**

Cian O'Shea is a graduate of University College Cork with a Bachelor's Degree in Electrical & Electronic Engineering. Now working in Tyndall with the ICT 4 Energy Efficiency department, Cian is pursuing a Research Masters based on ReCO2ST, an EU Horizon 2020 project.

Cian's role in this project is to develop a tool that will allow for the ability to design a wireless sensor network with energy harvesting in mind, to either increase battery life or eliminate the need for batteries entirely.

### **Bobby Bornemann, Tyndall National Institute, MOEEBIUS – Low Power Multi-radio Wireless Sensor Platform Enabling Optimisation of Radios, Sensors and Energy Harvesting**

Bobby is a graduate of University College Cork with a Bachelor's Degree in Electrical & Electronic Engineering. Now working in Tyndall with the ICT 4 Energy Efficiency department, he is a researcher on 2 EU Horizon 2020 projects developing power management solutions for (i) COMPOSITION a factories of the future project where Tyndall develops and deploys energy harvesting powered sensors for asset tracking and condition monitoring and (ii) MOEEBIUS a building modelling project that develops ICT solutions to optimise heating and lighting for comfort and efficiency.

### **Oskar Olszewski, Tyndall National Institute / MCCI, MEMS Piezoelectric Vibrational Energy Harvester – Characterisation for MISCHIEF Platform Gen II**

Oskar Z. Olszewski received the B.Sc. degree in electronics from Gdynia Maritime Academy, Gdynia, Poland, in 2002; the M.Eng. degree in electronic engineering from the Cork Institute of Technology, Cork, Ireland, in 2004; and the Ph.D. degree in microelectronics from the University College Cork, Cork,

in 2010. He is currently a Research Engineer with Tyndall National Institute, Cork, where he is involved in MEMS technology research. His interests include device design and modeling, process development, and device characterization. In particular, he currently works on piezoelectric resonators, energy harvesters, micropumps, aerosol generators, and MEMS switches.

**Tim Daly, Tyndall National Institute / MCCI, MISCHIEF - Design Techniques for Ultra Low Quiescent Power Controller**

Tim is a graduate of University College Cork with a Bachelor's Degree in Electrical & Electronic Engineering. Now working in Tyndall with the ICT 4 Energy Efficiency department, Tim is pursuing a Research Masters based on MISCHIEF, an Enterprise Ireland funded project that develops a highly configurable high efficiency modular power management IC platform for IoT applications.

**Paul Roseingrave, Tyndall National Institute, EnABLES – EU Research Infrastructure Program 'Powering the Internet of Things'**

Paul has worked at Tyndall for over 25 years with expertise in materials engineering, telecoms, ICT and digital marketing. Paul specialized for several years in co-ordinating access to Tyndall laboratories through the Irish National Access Program and in more recent years has progressed to access co-ordinator in the EU Research infrastructure projects ASCENT (nanotechnology) and EnABLES (powering the Internet of things).

**Swatchith Lal, Tyndall National Institute, Micro-thermoelectric Cooler for the Thermal Management of Photonic Devices**

Swatchith Lal is a PhD student at Tyndall National Institute, Cork, Ireland. He received B.Tech in Mechanical engineering from Jawaharlal Nehru Technological University, India in 2012 and M.Tech degree in Industrial metallurgy from National Institute of Technology Warangal, India in 2015. His research interest includes thermoelectric materials and micro-thermoelectric device fabrication.

## DEMOS

**Shane Hollmer, Adesto, Non-volatile Serial Memory for Energy Harvesting Power Applications**

Shane Hollmer is a Co-Founder of Adesto Technologies and currently serves as its Vice President of Engineering. Mr. Hollmer has more than 19 years of experience in the semiconductor memory industry including engineering and engineering management positions at Advanced Micro Devices, Emosyn, Silicon Storage Technology, and Monolithic Power Systems.

Mr. Hollmer earned a B.S. degree in Electrical Engineering and Computer Sciences from the University of California, Berkeley, and an MBA from San Jose State University. He holds more than 50 patents the areas of non-volatile memory development and mixed signal design.

### **Mehmet Ozturk, North Carolina State University, Wearable Flexible Thermoelectric Generator Using Liquid Metal Interconnects and Bulk BiTe Legs**

Mehmet C. Ozturk received his BS degree in Electrical Engineering in 1981 from Bosphorus University, Istanbul, Turkey. Immediately after receiving his PhD degree from NC State, Raleigh, NC also in Electrical Engineering, he joined his department as an assistant professor. His research focused on enhancing the properties of nanoscale

CMOS devices through innovations in materials and device design. He was the first to propose the use of recessed SiGe source/drains in MOSFETs, now, a standard technology in state-of-the-art CMOS integrated circuits. Prof. Ozturk is also responsible for some of the early work on self-aligned germanosilicide contacts to SiGe alloys and

work function engineering for low-resistivity contacts through implantation of different species. He was named a fellow of the IEEE in 2009 for his contributions to Si and SiGe Epitaxy for CMOS devices. Prof. Ozturk is presently serving as the deputy director of the NSF Engineering Research Center, Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST). His current work focuses on thermoelectric energy harvesters optimized for converting body heat to electricity to create self-powered wearables and it involves novel materials and processes towards high performance, large-area flexible thermoelectric modules. Outside work, Prof. Ozturk enjoys playing his classical guitar.

### **Dushan Vuckovic, FORCE Technology (DELTA), Implementing Energy Harvesting Solutions Using Commercial Off-the-shelf Components**

Dusan Vuckovic holds a PhD in Energy harvesting powered wireless sensor network solutions and has been working in the field of energy harvesting for the past 8 years. Currently he is working as a senior specialist in Force Technology in Denmark where his primary research goal is bridging the gap between the research and the industry by helping companies start in the field of energy harvesting by using commercial off the shelf components.

### **Peter Spies, Fraunhofer IIS, BlueTEG – Self-powered Wireless Sensor**

Dr. Peter Spies studied Electrical Engineering at the University of Erlangen / Germany and graduated with a Dipl.-Ing. degree in 1997. In 2010, he finished his PhD thesis on the topic of power saving in mobile communication devices.

Since 1998, he is with the Fraunhofer IIS, power efficient systems department. He was working on the field of multi-standard front-ends and system simulations for communication applications. Since 2001 he is group manager of the “integrated energy supplies” group where he is doing research and design on the field of power and battery management, energy transmission and energy harvesting. Focus of his group is integrated circuit and system design, development of thermal and vibration harvesting systems and complete power supplies implementation. Most important applications are wireless sensor networks and tracking systems.

### **Gerd vom Bögel, Fraunhofer IMS, TEG Powered Wireless Sensor System for Process Monitoring and Control**

Gerd vom Boegel received the diploma degree in electrical engineering from the University Duisburg in 1991. He joined the Fraunhofer Institute for Microelectronic Circuits and Systems in Duisburg working in the field of system design technique for embedded, wireless and transponder systems. He received the Dr.-Ing. degree from the University Duisburg in 1999. Since then he is working on energy harvesting topics, especially on RF energy harvesting. At present he is responsible for the business unit transponder and RF systems at the Fraunhofer Institute IMS.

### **Philip Schmidt, Fraunhofer IMS, RF Powered Wireless Sensors for Industry 4.0**

Philip Schmidt received the Dipl.-Ing. degree in electrical engineering from the University Siegen in 2013. He joined the Fraunhofer Institute for Microelectronic Circuits and Systems in Duisburg working in the field of wireless and transponder systems. His Dr.-Ing. thesis focused on increasing the performance of radio frequency identification systems (RFID) operating in the far field. One of the aspects he investigated was a power optimized waveform for RFID carrier.

### **Bobby Bornemann, Tyndall National Institute, MOEEBIUS – Energy Harvesting Powered Multi-radio WSN Mote for Building Energy Optimisation**

Bobby is a graduate of University College Cork with a Bachelor's Degree in Electrical & Electronic Engineering. Now working in Tyndall with the ICT 4 Energy Efficiency department, he is a researcher on 2 EU Horizon 2020 projects developing power management solutions for (i) COMPOSITION a factories of the future project where Tyndall develops and deploys energy harvesting powered sensors for asset tracking and condition monitoring and (ii) MOEEBIUS a building modelling project that develops ICT solutions to optimise heating and lighting for comfort and efficiency.

### **James McCarthy, Tyndall National Institute, COMPOSITION – Conditional Monitoring Case Studies for Energy Harvesting Opportunities in Industry 4.0**

Currently conducting a MEng degree in electrical and electronic engineering from UCC through the Tyndall National Institute. My fundamental research involves the design of an ultra low power PMIC for energy harvesting applications. Additional research activities include design of a wireless acoustic sensor mote for predictive maintenance. Skills include mixed signal circuit design, simulation and layout, state space modelling, embedded system design.

### **Oskar Olszewski, Tyndall National Institute, Evaluation of Vibrational Piezo-MEMS Harvester That Scavenges Energy From a Magnetic Field Surrounding an AC Current-Carrying Wire**

Oskar Z. Olszewski received the B.Sc. degree in electronics from Gdynia Maritime Academy, Gdynia, Poland, in 2002; the M.Eng. degree in electronic engineering from the Cork Institute of Technology,

Cork, Ireland, in 2004; and the Ph.D. degree in microelectronics from the University College Cork, Cork, in 2010. He is currently a Research Engineer with Tyndall National Institute, Cork, where he is involved in MEMS technology research. His interests include device design and modeling, process development, and device characterization. In particular, he currently works on piezoelectric resonators, energy harvesters, micropumps, aerosol generators, and MEMS switches.

### **Denis Pasero, Ilika, Autonomous Wireless End Nodes Powered by Solid State Batteries and Energy Harvesting**

Denis Pasero joined Ilika Technologies in 2008, as a scientist specializing in battery technology, to manage commercial lithium ion projects. He became part of the Ilika team to apply his strong academic knowledge to commercial applications and saw the potential to be part of the development and success story of an enterprising smaller company with exciting technology and novel product ideas. Today, as Product Commercialization Manager, Denis interfaces between customers and technical teams.

Prior to that, Denis was a teacher in Mathematics and Science for two years, after gaining a PhD in Physical Chemistry from the University of Cardiff in 1997 and completing an assignment as post doctoral research associate at the University of Sheffield - specializing in lithium ion battery materials.

### **Peter Haigh, Tyndall National Institute, COMPOSITION –Asset Tracking Case Studies for Energy Harvesting Opportunities in Industry 4.0**

Peter is a chartered engineer with over 25 years of industrial and academic experience in RF, telecoms and ICT. He has worked for Harris, M/ACOM, Ericsson and Analog Devices, where he specialized in low power radio advanced technologies. He is now a principal engineer in the ICT4EE group at Tyndall as technical lead on team developing power management solutions for IoT devices.

### **Cian O'Shea, Tyndall National Institute, ROWBUST WSN Deployment Assistance Tool**

Cian O'Shea is a graduate of University College Cork with a Bachelor's Degree in Electrical & Electronic Engineering. Now working in Tyndall with the ICT 4 Energy Efficiency department, Cian is pursuing a Research Masters based on ReCO2ST, an EU Horizon 2020 project.

Cian's role in this project is to develop a tool that will allow for the ability to design a wireless sensor network with energy harvesting in mind, to either increase battery life or eliminate the need for batteries entirely.

### **Roberto La Rosa, ST Micro, Powering Battery-Free Systems with PV Cell**

Roberto La Rosa is currently working as Design Manager and Smart Energy Applications Team Manager for STMicroelectronics Catania. Since joining STMicroelectronics in 1997 he has held a variety of assignments, including the design of high-frequency PLL's for clock generation and recovery, fiber-optic transceiver and system design, power management ICs, and other analog, digital and mixed-signal

bipolar and CMOS circuit development projects. He currently is a Research Senior Staff Member at STMicroelectronics Catania. His current research interests include Ultra low power management, over the distance power transmission and Energy Harvesting.

Dr. La Rosa has published several papers on advanced techniques to null stand-by power consumption by using energy harvesting and holds several patents.

#### **Pierre Mars, CAP-XX, Solar Cell Energy Harvester with Supercapacitor**

Pierre has over 35 years of hardware and embedded software design experience. He has been with CAP-XX for 17 years where he is responsible for development of new supercapacitor applications. Prior to joining CAP-XX he held senior technical positions with Racal Defence Electronics, Chubb Electronic Security, CAE Pty Ltd and Honeywell Industrial Control. He has had over 15 articles published on supercapacitor applications. Pierre has a B.E. Electrical (1st class hon), M. Eng. Sc. from the University of NSW, Australia, and an MBA from INSEAD, France. He is a member of the IEEE.

#### **Katherine Kim, Ulsan National Institute of Science and Technology (UNIST), Differential Power Processing Converter Design for Photovoltaic Wearable Applications**

Katherine Kim received the B.S. degree in electrical and computer engineering from Franklin W. Olin College of Engineering, Needham, MA, in 2007. She received the M.S. degree in electrical and computer engineering in 2011 and the Ph.D. degree in electrical and computer engineering in 2014, both from the University of Illinois, Urbana-Champaign, IL. She is an Assistant Professor of Electrical and Computer Engineering at the Ulsan National Institute of Science and Technology (UNIST) in Ulsan, Korea. Dr. Kim received the National Science Foundation's East Asia and Pacific Summer Institutes (EAPSI) Fellowship in 2010 and Graduate Research Fellowship in 2011. She is currently an Associate Editor for the IEEE Transactions on Power Electronics and serves as an IEEE Power Electronics Society (PELS) Member-At-Large for 2016-2018.

#### **David Newell, NUI Galway, A High Efficiency Switched Supercapacitor Energy Management Circuit for Energy Harvesting Powered Wireless Sensor**

David Newell is a final year PhD student specialising in the area of power electronics for ultra low-power low-voltage energy management for energy harvesting sources. David completed his undergraduate degree in Electrical and Electronic Engineering at National University of Ireland, Galway (NUIG). He is completing his PhD at the Power Electronic Research Centre at NUIG, Ireland. His research interests include low-power, low-voltage power electronics, digital control systems for energy harvesters and energy harvesters. David worked for a dye-sensitised solar cells (DSSCs) manufacturing company in Dublin, Ireland.