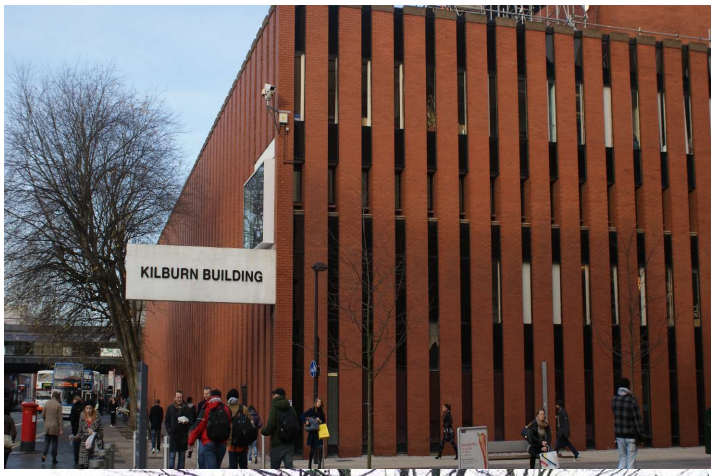
3rd TWIN-RELECT Training School on Fault-Tolerant AI Systems

Training Event on Technical and Collaborative Skills

Manchester, January 14-16, 2026

Funded by the European Union

UK Research and Innovation



Atlas Room

Kilburn Building

Enter the Kilburn Building through the side entrance (the one facing the city centre, see picture), go up to the first floor using the stairs, turn left and take another set of stairs, turn slightly left then take the corridor on the right (running alongside the external glass wall), and walk to the end until you reach the Atlas Room. It is also well signposted.

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The goal of TWIN-RELECT project is to boost the scientific and innovation capacity of University of Thessaly in the design of reliable electronic systems through strategic networking with three advanced partners:

- **IHP - Institute for Innovative Microelectronics (Germany)**
- **National Center for Scientific Research – CNRS (France)**
- **University of Manchester (United Kingdom)**

The 3rd TWIN-RELECT Training School and the 3rd TWIN-RELECT Research Management and Administration Workshop received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No. 101160182, as well as from the United Kingdom Research and Innovation under project number 10116095. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union and of UKRI.

Partners

The University of Thessaly, founded in 1984, has expanded across several cities in Greece, offering 8 Schools, 37 Departments, and 71 postgraduate master's programs. The CAS Lab, part of the EECE Department, was established in 2016 at the Efremoglou Building in Volos and coordinates the TWIN-RELECT project.

The University of Montpellier, established in 1220, is one of the oldest universities in the world. It was reunified in 2015 and ranks among the top 200 universities globally, securing 55th place in the Reuters Most Innovative Universities 2018 and 98th in the University Ranking by Academic Performance 2021–2022.

The National Center for Scientific Research (CNRS) is represented in the project by the IES (Institute of Electronics and Systems), a joint research unit with the University of Montpellier. The IES RADIAC team, specializing in electronics reliability in radiation environments, is involved in developing radiation sensors, simulation tools, and failure analysis methods.

The Leibniz Institute for High-Performance Microelectronics (IHP) specializes in fault-tolerant circuit design for safety-critical applications. The institute, based in Frankfurt (Oder), Germany, has advanced tools for circuit testing and is involved in the EU-funded MORAL project, developing rad-hard microcontrollers for space Applications.

The University of Manchester's Advanced Processor Technologies (APT) group focuses on brain-inspired computing technologies and on neuromorphic systems in particular, with solutions for both large-scale neuroscience applications as well as for edge AI devices. An International Center on Neuromophic Computing is currently being established.

TECHNICAL PROGRAM

Day	Morning	Afternoon
Wednesday January 14: Reliable Electronic Design	*Opening Keynote* **9:30 – 10:30 Neutron Beams for Irradiation Applications at the Rutherford Appleton Laboratory** ***Carlo Cazzaniga (STFC Rutherford Appleton Laboratory, UK)*** *Hot topic: Space* **10:30 – 11:15 Design and Validation of Chips for Space Applications** ***Milos Krstic (IHP Microelectronics)*** **11:15 – 11:30 Coffee Break** *Session A: Experimental and Formal Techniques for Fault Analysis* **11:30 – 12:00 Experimental Analysis of Single Event Transients in Digital Circuits** ***Marko Andjelkovic (IHP Microelectronics)*** **12:00 – 12:30 SeAL: A Provably Complete Fault-Injection Tool for Navigating Fault Tolerance in QDI Circuits** ***Raghda Elshehaby (TU Wien)*** **12:30 – 13:00 HARV: a Radhard Microcontroller for Dependable Applications** ***Douglas Almeda dos Santos (University of Montpellier)*** **13:00 – 14:00 Lunch**	*Hot topic: AI Verification* **14:00 – 14:45 Bit-Precise Neural Network Verification** ***Edoardo Manino (University of Manchester)*** *Session B: Reliability of AI Accelerators* **14:45 - 15:15 Assessment and enhancement of hardware reliability in AI accelerators** ***Jaan Raik and Mohammad Hasan Ahmadilivani (Taltech)*** **15:15 – 15:30 Coffee Break** **15:30 – 16:00: Enabling cycle-accurate HW/SW co-design for AI systems with EMBER** ***Alessandro Veronesi (IHP Microelectronics, collaboration with Univ. of Manchester)*** *Hands-on activity* **16:00 – 17:30 Hands-on activity on Fault simulation with EMBER** ***Alessandro Veronesi (IHP Microelectronics)*** **17:30 Closure**

Day	Morning	Afternoon
Thursday January 15: Neuromorphic Computing Day	*Tutorial Talks* **9:45 – 10:30 Tools for Spiking Neural Networks: an Overview** ***Oliver Rhodes (University of Manchester)*** **10:30 – 11:15 Neuromorphic Hardware Platforms: an Overview** ***Davide Bertozzi (University of Manchester)*** **11:15 – 11:30 Coffee Break** *Visit* **11:30 – 12:00 Visit to the SpiNNaker machine** ***Andrew Rowley (University of Manchester)*** *Lunchtime Keynote* **12:00 – 13:00 Safe and Reliable Neuromorphic Computing** ***Haralampos Stratigopoulos (Sorbonne Université, CNRS, LIP6)*** **13:00 – 14:00 Lunch**	*Tutorial Talk* **14:00 – 14:30 An Ultra-Low Cost Asynchronous Network-on-Chip for AER Routing** ***Davide Bertozzi (University of Manchester)*** *Hot topic: Reliable AER Routing* **14:30 – 15:15 Cross-Layer Analysis of Permanent Faults in Asynchronous NoCs for Neuromorphic Computing** ***Giuseppe Chessa (University of Manchester*** **15:15 – 15:30 Coffee Break** *Hands-on activity* **15:30 – 16:30 SNN Training and Simulation with snnTorch** ***Luca Peres (University of Manchester)*** **16:30 – 17:30 SNN-Hardware Fault Co-Simulation** ***Giuseppe Chessa (University of Manchester)*** **17:30 Closure** **19:30 - 21:30 Social Event** **Dinner at Zouk Restaurant** *Address:* *5, The Quadrangle, Chester St, Manchester M1 5QS*

ROOM FOR THIS DAY: IT407

From the Kilburn Building, go to the first floor and take the skybridge to the IT Building. Turn right, then left, and walk down the hallway until you reach IT407.

Day	Morning	Afternoon
Friday January 16: **Technical and Collaborative Skills**	*Training on soft skills* **9:30 – 11:30 Collaboration and Team Skills Workshop – Part I** ***Ruth Norris, Charlotte Stockton-Powdrell (program co-leaders of the "Teams Build Dreams" programme)*** **11:30 – 11:45 Coffee Break** *Lunchtime Keynote* **11:45 – 13:00 SpiNNaker: Technology and Project Leadership** ***Steve Furber (University of Manchester)*** **13:00 – 14:00 Lunch**	*Training on soft skills* **14:00 – 16:30 Collaboration and Team Skills Workshop – Part II** ***Ruth Norris, Charlotte Stockton-Powdrell (program co-leaders of the "Teams Build Dreams" programme)*** **16:30 Closure**

KEYNOTE SPEECHES

Neutron Beams for Irradiation Applications at the Rutherford Appleton Laboratory

Carlo Cazzaniga (STFC Rutherford Appleton Laboratory, UK)

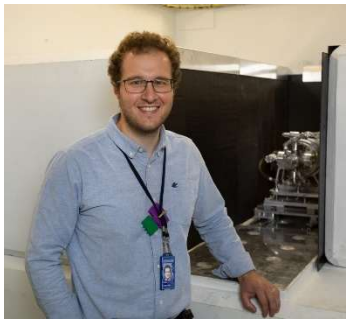
Wednesday, January 14, 2026

Abstract - The Rutherford Appleton Laboratory (RAL) hosts a diverse array of neutron beams at the ISIS spallation neutron source, which has numerous applications in fundamental and applied science. This presentation begins by introducing ISIS, highlighting its capabilities for irradiation experiments. Special attention is then given to ChipIR, a beamline with an atmospheric-like fast neutron spectrum, designed for the irradiation of electronics. Additionally, we will introduce thermal neutron beamlines: EMMA has a water-moderated spectrum that has been used for irradiation experiments with low energy neutrons. A significant recent expansion is the NILE facility, where compact DT and DD neutron generators are housed. These generators are capable of producing monoenergetic neutrons at energies of 14 MeV and 2.5 MeV, respectively. Notably, these generators operate independently of the ISIS source, enhancing our facility's flexibility and capacity for specialized experiments.

The primary application that is discussed is the study of radiation effects on electronics, or Single Event Effects testing, an area of growing importance for industry as electronic systems become more prevalent in safety-critical applications. This research is vital in the aerospace sectors, but also increasingly at ground level, where we witness the deployment of increasingly scaled electronics, autonomous vehicles with more functionality, systems often making use of Commercial Off-The-Shelf components with no built-in radiation hardening. The electrification of automotive industry and AI and network infrastructure are also increasingly pushing industry to reliability testing.

As a final note, applications of neutron irradiation to be discussed include neutron activation analysis, with examples of studies of cultural heritage and engineering. I will show contributions to nuclear fusion research, and the development of detectors for particle physics.

These applications demonstrate the broad utility of RAL neutron beams for industry, technology development, and academic research sector.



Carlo Cazzaniga *received the Ph.D. in physics from the University of Milano Bicocca Italy in 2014. He is an expert of neutron irradiation experiments, fast neutron spectroscopy, detectors and instrumentation. He is working at the ISIS spallation neutron source of the Rutherford Appleton Laboratory (UK), where he is responsible for ChipIr, an atmospheric-like neutron beam for the irradiation of microelectronics. He is working to expand the irradiation capabilities at the ISIS neutron and muon source, developing in recent years a facility with mono-energetic neutron fields.*

Safe and Reliable Neuromorphic Computing

Haralampos Stratigopoulos (Sorbonne Université, CNRS, LIP6)

Thursday, January 15, 2026

Abstract - Neuromorphic computing, based on Spiking Neural Networks (SNNs), is an emerging computational paradigm designed to address a wide range of tasks—including visual sensing and perception, robotic control loops, brain–computer interfaces, and audio processing—while offering low power consumption and fast inference compared to conventional von Neumann architectures and traditional artificial neural networks. Today, there is significant activity in developing VLSI implementations of SNNs, with several large-scale hardware platforms already available for research. Although SNNs are often assumed to inherit the remarkable fault tolerance of the biological brain, recent fault-injection studies have shown that certain hardware-level faults can still have critical effects. This talk will review dependable SNN hardware design, with a particular focus on reliability, testing, and security.

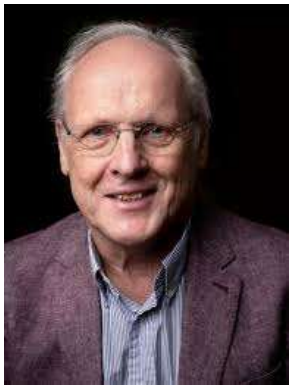
Haralampos-G. Stratigopoulos *received the Diploma degree in Electrical and Computer Engineering from the National Technical University of Athens, Greece, in 2001, and the Ph.D. degree in Electrical Engineering from Yale University, USA, in 2006. He is currently a Research Director with the French National Centre for Scientific Research (CNRS) at the LIP6 Computer Science Laboratory of Sorbonne University, France. His main research interests include neuromorphic computing, hardware security, and reliability of integrated circuits. He has served on the Technical Program Committees for the Design, Automation, and Test in Europe Conference (DATE), Design Automation Conference (DAC), IEEE International Conference on Computer-Aided Design (ICCAD), IEEE European Test Symposium (ETS), IEEE International Test Conference (ITC), IEEE VLSI Test Symposium (VTS), and several others international conferences. He has also served as an Associate Editor for IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, IEEE Transactions on Circuits and Systems I: Regular Papers, and IEEE Design & Test.*

SpiNNaker: Technology and Project Leadership

Steve Furber (University of Manchester)

Friday, January 16, 2026

Abstract - The SpiNNaker project at the University of Manchester delivered a machine incorporating over a million ARM processor cores with a communications fabric optimised for large-scale brain modelling applications running in biological real time. The machine supported an open neuromorphic computing service under the auspices of the EU Flagship Human Brain Project (HBP) continuously from April 2016, and was for several years the world's largest neuromorphic computing platform, a position only recently ceded to Intel's Hala Point. A second generation SpiNNaker2 system was co-developed within the HBP by the University of Manchester and the Technical University of Dresden incorporating lessons learnt from the SpiNNaker1 service. This year TU Dresden has built a 5 million core SpiNNaker2 system for data centre scale neuromorphic and AI applications. SpiNNaker2 is being actively commercialised by SpiNNcloud Systems GmbH with a focus on deploying mainstream AI and hybrid models, which is especially important following recent algorithmic breakthroughs in mainstream AI whose full potential is hard to realise without brain-inspired architectures. The keynote will review the unique technical features that make the SpiNNaker programme a one-of-a-kind neuromorphic computing endeavour, spanning from its pioneering architecture to its unprecedented scalability. Finally, the keynote will cover not only the system's core innovations but also the organisational and leadership challenges of running a large, multidisciplinary research team.

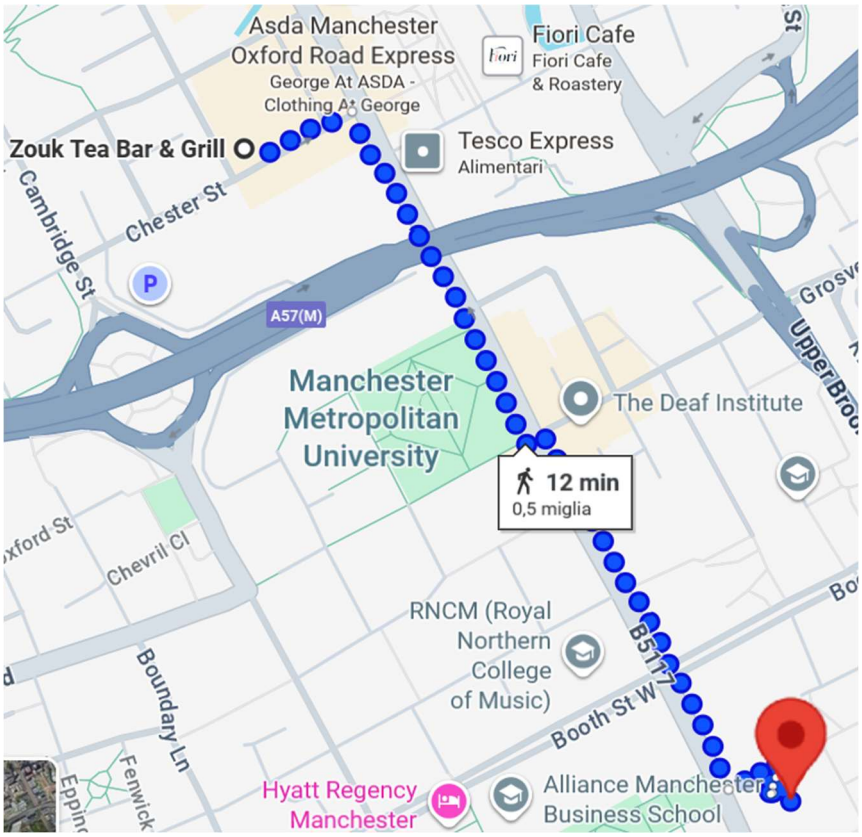


Steve Furber *CBE FRS FREng is Professor Emeritus in the Department of Computer Science at the University of Manchester, UK. After completing a BA in mathematics and a PhD in aerodynamics at the University of Cambridge, UK, he spent the 1980s at Acorn Computers, where he was a principal designer of the BBC Microcomputer and the ARM 32-bit RISC microprocessor. Over 300 billion ARM-powered chips have since been manufactured, powering much of the world's mobile and embedded computing. He moved to the ICL Chair of Computer Engineering at Manchester in 1990 where he led research into asynchronous and low-power systems and, more recently, neural systems engineering, where the SpiNNaker project delivered a computer incorporating a million ARM processors optimised for brain modelling applications.*

Social Event

ZOUK TEA BAR

Address: 5, The Quadrangle, Chester St, Manchester M1 5QS



Map from Kilburn Building to the Restaurant

Entrance of the Restaurant