L-Università ta' Malta

UM RESEARCH EXPO 2024

PROGRAMME & ABSTRACTS

Wednesday 29 May 2024

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UM Research Expo 2024

An unprecedented amount of research is being carried out at the University of Malta (UM) across many areas, yet this research rarely gets the exposure it deserves. Research Expo 2024 (UMRE24) is intended to give UM researchers the opportunity to showcase their research activities to the wider UM community, to encourage the sharing and cross-pollination of ideas, and to celebrate the success we have achieved thus far. UMRE24 also incorporates the traditional Doctoral School Symposium – allowing us to also celebrate the up-and-coming research of doctoral students.

Organising Committee

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Prof. Nicholas Vella

Event and Programme Coordination

Ms Noeleen Mifsud

Design and Layout
Marketing, Communications and Alumni Office

Programme

08:00 – 08:45

WELCOME COFFEE + REGISTRATION

08:45 – 09:15

INTRODUCTION + WELCOME SPEECHES

VENUE: M.A. Grima Hall
Prof. Inġ. Simon G. Fabri (Pro-Rector for Research and Knowledge Transfer)
Hon. Keith Azzopardi Tanti (Parliamentary Secretary for Youth, Research and Innovation)
Hon. Andy Ellul (Parliamentary Secretary for Social Dialogue)
Hon. Clifton Grima (Ministry for Education and Sport)

09:15 – 10:15

PLENARY SESSION 1

CHAIR: Prof. Inġ. Simon G. Fabri | **VENUE:** M.A. Grima Hall
See pages 15–17 for Abstracts

09:15 – 09:25
Turning the Clock Against Cancer
Dr Analisse Cassar (Faculty of Medicine and Surgery)

09:25 – 09:35
Don't Believe Your Eyes!: What Visual Illusions Can Tell Us About the Brain
Prof. Ian Thornton (Faculty of Media and Knowledge Sciences)

09:35 – 09:45
Scirearly Project: Reducing Early School Leaving and Underachievement
Prof. Suzanne Gatt (Faculty of Education)

09:45 – 09:55
Energy Efficient AI/ML Techniques for 6G Terrestrial and Non-Terrestrial Mobile Communication Networks
Prof. Inġ. Saviour Zammit (Faculty of Information and Communication Technology)

09:55 – 10:05
Ocean Governance in an Era of Climate Change
Prof. Simone Borg (Faculty of Laws)

10:05 – 10:15
Training Entrepreneurial Intuition
Prof. Leonie Baldacchino (Edward de Bono Institute for Creative Thinking and Innovation)

10:15 – 10:40

KEYNOTE ADDRESS 1

VENUE: M.A. Grima Hall

"Artistic Research Needs Ethics Like a Rip in the Canvas": Is Free Artistic Research Compatible with Academic Research Ethics?
Prof. Robin A. Nelson (Professor Emeritus of Theatre, Intermedial Performance and Practice Research, Royal Central School of Speech and Drama, University of London, UK)

10:40 – 11:30

NETWORKING COFFEE

VENUE: Sacra Infermeria Hall

11:30 – 13:10

PARALLEL SESSIONS 1

Presentations – Doctoral candidates

See pages 21–44 for Abstracts

DOCTORAL STREAM DS 1.1 – DS 1.5

CHAIR: Prof. Mario Aquilina | **VENUE:** Syndicate Room 8

11:30 – 11:50
The Irrational in Pier Paolo Pasolini's Cinema
Ms Ilaria Labbate (Faculty of Arts)

11:50 – 12:10
André Jolivet's Cinq Incantations and Chant de Linos: Analysis, Historical Context and Performance
Ms Clara Galea (School of Performing Arts)

12:10 – 12:30
Considering Aesthetics: The Ecce Homos of Mario Minniti
Ms Meredith Taylor (Faculty of Arts)

12:30 – 12:50
The Transformation of Antiquities – Identifying Changing Attitudes and Behavioural Traits in the Creation of the Historic Monument in Malta
Mr Jonathan Borg (Faculty of Arts)

12:50 – 13:10
A Semantico-Pragmatic Study of Linguistic Preformation in Epistolary Mystical Discourse: The Correspondence of Saint Elisabeth of the Trinity
Mr Ludwig Camilleri (Faculty of Arts)

DOCTORAL STREAM DS 2.1 – DS 2.5

CHAIR: Dr Marie-Louise Mangion | **VENUE:** David Bruce Hall

11:30 – 11:50
A Proposed Methodology for Evaluating New Business Ventures
Inġ. Joseph A. Bartolo (Edward de Bono Institute for Creative Thinking and Innovation)

11:50 – 12:10
Power to the Creditors: Odious Debt and Tunisia's Democratic Responsiveness
Mr Joseph M. Debono (Faculty of Arts)

12:10 – 12:30
Examining the Relationship Between Loneliness, Personality Traits and Social Media Use
Ms Christine Spiteri (Faculty for Social Wellbeing)

12:30 – 12:50
The Role of Parental Responsibilities in Decision-Making Among Maltese Part-Time Doctoral Students
Ms Edel Cassar (Faculty for Social Wellbeing)

12:50 – 13:10
The Language Skills of 5–8-Year-Old Bilingual Children with a History of Maltreatment: Pilot Study Implications for Trauma-Informed Intervention
Ms Estelle Zahra (Faculty of Health Sciences)

DOCTORAL STREAM DS 3.1 – DS 3.5

CHAIR: Prof. Odette Vassallo | **VENUE:** Sacra Infermeria Hall

11:30 – 11:50	**Exploring the Notion of Academic Oral Presentation as a Form of Assessment** Ms Jeanette Theuma (Centre for English Language Proficiency)
11:50 – 12:10	**A Multi-Disciplinary Exploration of Academic Expectations in High-Quality Writing** Ms Analisa Scerri (Centre for English Language Proficiency)
12:10 – 12:30	**Exploring the Experience of Learning Support Educators in Malta** Ms Pearl Marie Vella Haber (Faculty of Education)
12:30 – 12:50	**The Adaptation of an Aphasia Test for Maltese–English Bilingual Adults** Ms Lorraine Vassallo (Faculty of Health Sciences)
12:50 – 13:10	**Selfless Motherhood: Eastern European and Sub-Saharan African Migrant Women's Perceptions of Pregnancy and Maternity Care in Malta** Ms Christie Hili (Faculty of Health Sciences)

DOCTORAL STREAM DS 4.1 – DS 4.5

CHAIR: Prof. Joseph Cacciottolo | **VENUE:** M.A. Grima Hall

11:30 – 11:50	**Combinational Therapy Targeting the PI3K/Akt/mTOR Pathway in Non-Small Cell Lung Cancer Spheroids** Mr Nathan Vella (Faculty of Medicine and Surgery)
11:50 – 12:10	**Investigating the Molecular Mechanisms of Combination Therapy on Drug-Resistant Chronic Myeloid Leukaemia** Mr Antonio Polidano Vella (Faculty of Medicine and Surgery)
12:10 – 12:30	**Heterogeneity in Breast Cancer** Ms Elaine Borg (Faculty of Medicine and Surgery)
12:30 – 12:50	**ALS Fly Models to Understand How Gene Disruption Leads to Disease** Ms Sylvana Tabone (Faculty of Medicine and Surgery)
12:50 – 13:10	**The Prevalence of Common Eye Diseases and Visual Impairment in Malta: Preliminary Data from The Malta Eye Study** Mr David Agius (Faculty of Medicine and Surgery)

DOCTORAL STREAM DS 5.1 – DS 5.5

CHAIR: Prof. Inġ. David Zammit Mangion | **VENUE:** Vassalli Hall

11:30 – 11:50	**An Occupational Therapists' Perspective on the Impact of Additive Manufacturing on Users' Experience with Wearables for Paediatric Habilitation** Mr Matthew Bonello (Faculty of Engineering)

11:50 – 12:10	**The Impacts of Industrial Safety on Environmental Sustainability in Human–Robot-Collaboration within Industry 5.0** Ms Amberlynn Bonello (Faculty of Engineering)
12:10 – 12:30	**Investigating Hybrid Turbo-Electric Propulsion Systems (HTEPS) for Regional Aircraft** Mr Aman Batra (Institute of Aerospace Technologies)
12:30 – 12:50	**Artificial Intelligence in the Mitigation of Automation Failures in Complex Aircraft** Ms Cynthia Koopman (Institute of Aerospace Technologies)
12:50 – 13:10	**The Role of AI in Addressing Complex Policy Challenges: An Exploration of the Use of AI in Tackling Wicked Problems in Public Policy** Mr Gian Paul Gauci (Faculty of Economics, Management and Accountancy)

DOCTORAL STREAM DS 6.1 – DS 6.5

CHAIR: Prof. Luciano Mule'Stagno | **VENUE:** Girolamo Cassar

11:30 – 11:50	**A Study on the Effect of Thin Object Shading on the Performance of Photovoltaics** Mr Matthew Axisa (Institute for Sustainable Energy)
11:50 – 12:10	**Seaweed Farming in Belize: A Mixed-Methods Exploration of Adaptation Strategies, Challenges, and Potential Contributions to Climate-Resilient Blue Economies in Small Island Developing States (SIDS)** Ms Ruth Julianna Gutierrez-Corley (Islands and Small States Institute)
12:10 – 12:30	**Improving Air Quality in Pedestrian Zones Using Passive Barriers with Vegetation** Mr Jeremy Sacco (Faculty for the Built Environment)
12:30 – 12:50	**Experimental Analysis of the Hydraulic Energy Conversion in a Hydro-Pneumatic Energy Storage System** Mr Luke Aquilina (Faculty of Engineering)
12:50 – 13:10	**Understanding Salt-Induced Deterioration Processes in the Pore Network of Globigerina Limestone** Ms Rosangela Faieta (Faculty of Science)

13:10 – 14:10	**LUNCH** **VENUE:** Sacra Infermeria Hall
14:10 – 14:35	**KEYNOTE ADDRESS 2** **VENUE:** M.A. Grima Hall **Navigating the Cutting Edge: Lessons from the Trenches of Managing Research and Innovation** Mr Kannan Pashupathy (Former Director of Global Engineering, Research and Product Management at Google, and current Board Member at Solidaridad)

14:35 – 15:25

PLENARY SESSION 2

CHAIR: Prof. Nicholas Vella | **VENUE:** M.A. Grima Hall

See pages 47–49 for Abstracts

14:35 – 14:45

Diversity in Isolation: Dissecting the Drivers of Endemic Plant Richness on Mediterranean Islands and Archipelagos
Prof. Sandro Lanfranco (Faculty of Science)

14:45 – 14:55

Exploring the Development of Epistemic Stance on a Multilingual Continuum
Prof. Odette Vassallo (Centre for English Language Proficiency)

14:55 – 15:05

Creating a Chatbot in Maltese
Dr Claudia Borg (Faculty of Information and Communication Technology)

15:05 – 15:15

Bacteriophage Display Accelerates the Discovery of Antiviral Antibodies
Prof. David Saliba (Faculty of Health Sciences)

15:15 – 15:25

Graphene-Based Aerogels for the Filtration of Micro and Nanoplastics
Dr Inġ. Anthea Agius Anastasi (Faculty of Engineering)

15:25 – 16:10

POSTER STREAM + COFFEE

VENUE: Sacra Infermeria Hall

This session will commence with the presentation of the Outstanding Doctoral Thesis Awards to Dr Thérésia Penda Choppy (Islands and Small States Institute) and Dr Inġ. Ryan Bugeja (Institute for Sustainable Energy) by Prof. Nicholas Vella (Director, Doctoral School), followed by networking with the poster presenters.

See pages 51–116 for Abstracts

16:10 – 17:30

PARALLEL SESSIONS 2

Presentations – Academics/Researchers

See pages 119–148 for Abstracts

EXPO STREAM ES 1.1 – ES 1.8

CHAIR: Prof. Rebecca Dalli Gonzi | **VENUE:** Sacra Infermeria Hall

16:10 – 16:20

Outliers – A Particular Skorba Phase Pottery Fabric
Dr Inġ. John Charles Betts (Faculty of Arts)

16:20 – 16:30

Mapping Maltese Families Through Genealogy: Works in Progress
Dr Charles Farrugia (Faculty of Media and Knowledge Sciences)

16:30 – 16:40

Investigation of Environmental Conditions at the Mnajdra Megalithic Temple Using Computational Fluid Dynamics Modelling and Artificial Intelligence and Machine Learning
Mr Mantas Valantinavicius (Faculty for the Built Environment)

16:40 – 16:50	**Preserving Our Past, Sustaining Our Future: Harnessing Earth Observation for Heritage Building Conservation** Prof. JoAnn Cassar (Faculty for the Built Environment)
16:50 – 17:00	**Endangered Cultural Heritage in Conflict Zones: A Case Study of the Current Russia–Ukraine War** Dr Marc Kosciejew (Faculty of Media and Knowledge Sciences)
17:00 – 17:10	**No country for (Fictional) Terrors? The Unrecognised Gothic in Italian Literature** Dr Fabrizio Foni (Faculty of Arts, Institute of Anglo-Italian Studies)
17:10 – 17:20	**Identity in Western Libya** Mr Ranier Fsadni (Faculty of Arts)
17:20 – 17:30	**Chinese Messaging to the Global Community** Dr Nicole Talmacs (Faculty of Media and Knowledge Sciences)

EXPO STREAM ES 2.1 – ES 2.8

CHAIR: Prof. Valerie Sollars | **VENUE:** Syndicate Room 8

16:10 – 16:20	**Fostering Creativity and Imagination in Primary School Students: A Proposed Framework** Dr Margaret Mangion (Edward de Bono Institute for Creative Thinking and Innovation)
16:20 – 16:30	**Narrative Enquiry of a Student's Lived Experience of the Transition from Bachelors to Masters Dissertation Writing** Dr Natalie Schembri (Institute of Linguistics and Language Technology)
16:30 – 16:40	**Seven Educators Implementing the Emergent Curriculum in a Maltese ECEC Context (0–7 Years)** Dr Charmaine Bonello (Faculty of Education) | *Co-researchers*: Prof. Carmen Dalli; Dr Anna Baldacchino
16:40 – 16:50	**The Essay Today** Prof. Mario Aquilina (Faculty of Arts)
16:50 – 17:00	**University Academic Lectureship Pathways: Privilege or Pain?** Dr Maria Cutajar (Faculty of Education)
17:00 – 17:10	**A Field Experiment on Gamification of Physical Activity – Effects on Motivation and Behaviour Change** Dr Elaine Marie Grech (Faculty of Economics, Management and Accountancy)
17:10 – 17:20	**My Accent is Better than Yours** Prof. Holger Mitterer (Faculty of Media and Knowledge Sciences)
17:20 – 17:30	**AI meets the Maltese Courts: Safe use of AI to imProve efficiency using the Small Claims Tribunal as a model (AMPS)** Dr Ivan Mifsud (Faculty of Laws)

EXPO STREAM ES 3.1 – ES 3.7

CHAIR: Prof. Inġ. Kenneth P. Camilleri | **VENUE:** David Bruce Hall

16:10 – 16:20	**Understanding the Effect of Grown-In Defects in Silicon on Solar Cell Efficiency** Dr Jinta Mathew (Institute for Sustainable Energy)
16:20 – 16:30	**Subjective Wellbeing in Malta – An Interactive Online Data Dashboard** Prof. Marie Briguglio (Faculty of Economics, Management and Accountancy)
16:30 – 16:40	**Researching Hate Speech from a Discourse-Analytic Perspective** Prof. Stavros Assimakopoulos (Institute of Linguistics and Language Technology)
16:40 – 16:50	**Analysing Human Smuggling Through Social Media Content Analysis** Dr Aitana Radu (Faculty of Media and Knowledge Sciences)
16:50 – 17:00	**Everyday Extremism Ecological Scale** Prof. Gordon Sammut (Faculty of Media and Knowledge Sciences)
17:00 – 17:10	**Creating an Innovative Green Business Model Canvas** Prof. Sandra M. Dingli (Edward de Bono Institute for Creative Thinking and Innovation)
17:10 – 17:20	**Small Islands, Big Challenges: Coordinated Responses to Climate and Health Risks** Dr Luca Nguyen (Islands and Small States Institute)

EXPO STREAM ES 4.1 – ES 4.8

CHAIR: Dr Claudia Borg | **VENUE:** Vassalli Hall

16:10 – 16:20	**Pain Reduction through Enhanced Conditioning and Intelligent Simulation Environments (P.R.E.C.I.S.E)** Mr Liam Bugeja Douglas (Faculty of Information and Communication Technology)
16:20 – 16:30	**Advancing CACTUS: A Gaze-Native Web Browser Project for Constraint-Free Multi-Modal Access to Communication Technology** Dr Chris Porter (Faculty of Information and Communication Technology)
16:30 – 16:40	**Satellite4Health Project and Future Research Ideas** Prof. Lalit Garg (Faculty of Information and Communication Technology)
16:40 – 16:50	**Laser Shock Peening: The Next Step in Enhancing the Surfaces of Automotive Gears** Mr Matthew Curmi (Faculty of Engineering)
16:50 – 17:00	**Detection of Resident Space Objects and Fast Radio Bursts with the Northern Cross** Prof. Alessio Magro (Institute of Space Sciences and Astronomy)
17:00 – 17:10	**Surface Engineering of Wire Arc Additively Manufactured Magnesium for Satellites** Prof. Inġ. Glenn Cassar (Faculty of Engineering)
17:10 – 17:20	**Nuclear Fusion Vacuum Vessel Inner Shell Thermo-Mechanical Analysis** Prof. Inġ. Pierluigi Mollicone (Faculty of Engineering)

17:20 – 17:30	**Micromanufacturing: Challenges and Opportunities** Dr Inġ. Pierre Vella (Faculty of Engineering)

EXPO STREAM ES 5.1 – ES 5.8

CHAIR: Prof. Inġ. Maurice Apap | **VENUE:** Girolamo Cassar

16:10 – 16:20	**Advancing Marine Transportation Through Additive Manufacturing and Surface Engineering** Prof. Inġ. Ann Zammit (Faculty of Engineering)
16:20 – 16:30	**Trajectory Generation for Emergency Landings of Commercial Aircraft** Dr Inġ. Brian Zammit (Faculty of Engineering)
16:30 – 16:40	**ASTRA – AI-Enabled Tactical FMP Hotspot Prediction and Resolution** Dr Leander Grech (Institute of Aerospace Technologies)
16:40 – 16:50	**Innovative Strategies for Decarbonizing Maritime Transportation: A Case Study of Alternative Fuel Integration in Shipboard Power Systems** Dr Younes Boujoudar (Faculty of Engineering)
16:50 – 17:00	**Human–Machine Interface R&I for Large Transport Aircraft at UM** Prof. Inġ. David Zammit Mangion (Institute of Aerospace Technologies)
17:00 – 17:10	**Microelectromechanical System Gripper for Biomedical Applications** Inġ. Thomas Sciberras (Faculty of Engineering)
17:10 – 17:20	**UM Research Innovations for Local and Global Plastic Manufacturing Industry** Prof. Arif Rochman (Faculty of Engineering)
17:20 – 17:30	**Using Nature's Resources to Make Composites More Sustainable** Dr Brian Ellul Grech (Faculty of Engineering)

EXPO STREAM ES 6.1 – ES 6.8

CHAIR: Prof. Richard Muscat | **VENUE:** M.A. Grima Hall

16:10 – 16:20	**Impact of Methylation Enzymes in Colorectal Cancer** Prof. Byron Baron (Centre for Molecular Medicine and Biobanking)
16:20 – 16:30	**A Novel Methodology to Produce Bioactive Peptides** Prof. Gary Hunter (Faculty of Medicine and Surgery)
16:30 – 16:40	**Decoding ALS in Malta: Flying Towards a Better Future** Prof. Ruben Cauchi (Faculty of Medicine and Surgery)
16:40 – 16:50	**Phage Display Identifies Antibodies Targeting Tumour Associated Antigens** Ms Mariana Grima (Faculty of Health Sciences)

16:50 – 17:00	**New Cage-Based Imine and Ester Linked COF as a Smart Nanocarrier Drug Delivery System** Prof. Ulrich Baisch (Faculty of Science)
17:00 – 17:10	**The Mechanical Properties of Monosodium Urate** Dr Michelle Vella Wood (Faculty of Science)
17:10 – 17:20	**Elucidating the Cause of Long COVID Muscle Weakness Using the Fly Model System** Dr Paul Herrera (Faculty of Medicine and Surgery)
17:20 – 17:30	**Characterising and Correcting Artifacts and from Functional MRI Preprocessing, for the Analysis of Spaceflight Neuroimaging Data** Dr Claude J. Bajada (Faculty of Medicine and Surgery)
17:30 – 17:35	**CONCLUSION** **VENUE:** M.A. Grima Hall

ABSTRACTS

Plenary Session 1

CHAIR: **Prof. Inġ. Simon G. Fabri** | VENUE: **M.A. Grima Hall**

Turning the Clock Against Cancer

Dr Analisse Cassar

Department of Anatomy, Faculty of Medicine and Surgery

Central to our understanding of cancer pathology is its stem cell-like behaviour—characterised by relentless proliferation and high multidrug resistance. The greatest success story in Cancer treatment has the use of ATRA-differentiation therapy on Acute Promyelocytic Leukemia, turning a once 90% fatal disease into one with a 70% cure rate. By employing differentiation therapy, our innovative strategy directly confronts the cancer's proliferative nature by aiming to 'age' the cancer cells, thus stripping them of their stem cell-like properties and their ability to evade drug treatments.

Our method hinges on the utilisation of distinctive natural compounds, selected for their ability to induce differentiation in cancer cells, pushing them towards a more mature and less aggressive state. This process is further enhanced by the integration of specific epigenetic modifiers, which alter the chromatin architecture of cancer cells, making them more amenable to the effects of differentiation induced by our natural products.

The dual application of these natural agents and epigenetic modulation has achieved significant results against leukemia, osteosarcoma, and neuroblastoma, offering a hope for improved disease outcomes and enhanced survival rates.

This innovative treatment exhibits low toxicity levels, making it an ideal option for elderly patients and those with existing comorbidities. By offering an effective yet gentle treatment alternative, this project not only represents a significant advance in cancer therapy but also paves the way for more compassionate, patient-centric approaches to combating this pervasive disease, offering new hope to those who need it most.

Don't believe your eyes!: What visual illusions can tell us about the brain

Prof. Ian Thornton

Department of Cognitive Science, Faculty of Media and Knowledge Sciences

As well as being entertaining, visual illusions have a long history as useful probes into the functioning of the visual system, and the brain more generally. In this short presentation, I will begin by showing some famous illusions that clearly demonstrate the way our brains "construct" the world around us. I will then discuss an ongoing project within the Department of Cognitive Science, where we use illusions to study the perception of object localisation and object boundary ownership. To accompany the talk, I will provide links to online demos where the effects discussed can be further explored.

Scirearly Project: Reducing Early School Leaving and Underachievement

Prof. Suzanne Gatt

Department of Early Childhood and Primary Education, Faculty of Education

Scirearly (**scirearly.eu**) is a Horizon research project focusing on children who struggle to learn basic skills at and drop out from school early across Europe. This problem is more common among children from socially and financially disadvantaged, or from migrant, refugees or Roma families. This project focuses on underachievement and those factors which lead to children in compulsory school to underachieve. The research attempts to understand what social determinants lead to underachievement through a series of systematic reviews of international literature. It also involved policy reviews on ESL. Research also involves identifying best practices of case studies of successful schools which enable children to learn the basic skills and which promote their psychosocial wellbeing. The project gives particular attention to the early years and the importance of quality early years to prevent children from underachieving.

The project is coordinated by the University of Deusto (Spain), with 10 partners from Ireland, Finland, Denmark, Greece, Portugal, and Malta, bringing together Universities, Parent association and NGOs concerned with early school leaving. Prof. Suzanne Gatt, Dr. Rosienne Camilleri, and Dr. Charmaine Bonello from the Department of Early Years and Primary Education, Faculty of Education are the researchers from the University of Malta involved in this research.

This project has currently completed its first year of research. The presentation will present what research has currently been carried out so far, initial research results and implications on how findings can be used to support schools and policy makers to combat underachievement, reducing early school leaving.

Energy Efficient AI/ML Techniques for 6G Terrestrial and Non-Terrestrial Mobile Communication Networks

Prof. Inġ. Saviour Zammit

Department of Communications and Computer Engineering, Faculty of Information and Communication Technology

The integration of Artificial Intelligence (AI) and Machine Learning (ML) with next generation 6G mobile communication networks represents a pivotal evolution towards achieving unprecedented levels of network performance, including enhanced capacity, reduced latency, and improved reliability. Our combined efforts, incorporating projects such as TEKAID6G and SMARTEN6G, aim to advance Beyond 5G and 6G technologies through innovative, energy-efficient, AI/ML-driven strategies in both terrestrial networks (TNs) and non-terrestrial networks (NTNs). TEKAID6G, a collaborative initiative between the University of Electronic Science and Technology of China and the University of Malta, supported by the MCST- and MOST-brokered SINO-Malta research fund, focuses on integrating AI/ML with 6G terrestrial networks. This project emphasises sustainability and the development of energy-efficient methodologies for 5G-Advanced and 6G systems. Additionally, the SMARTEN6G project, funded by the MCST and the European Space Agency, explores the potential of NTNs, including satellites, High Altitude Platforms (HAPs), and Unmanned Aerial Vehicles (UAVs). It employs AI/ML at the network edge to enhance coverage and achieve sustainable development goals. This presentation will highlight the creation of two versatile testbeds for researching AI/ML applications in TNs and NTNs, serving as open-source resources for showcasing energy-efficient applications and fostering the training of future engineers. Our discussion will encapsulate the synergistic approach to leveraging AI/ML for optimizing both terrestrial and non-terrestrial 6G networks, underscoring the critical role of energy efficiency in the evolution of Beyond 5G and 6G mobile communications and including Digital Twin methodologies.

Ocean Governance in an Era of Climate Change

Prof. Simone Borg

Department of Environmental and Resources Law, Faculty of Laws

The climate-ocean nexus has been subject to increasing scientific attention for decades. Countries struggle to grapple with the complexity of these scientific reports and their recommendations calling for an urgent need to take cross cutting preventive and remedial measures. Political-legal fora are struggling to catch up with this burgeoning wealth of information to provide adequate law and policies for ocean governance in an era of climate change. My legal research presented at key meetings at the International academic level maps the applicable legal framework and suggests how to address legal gaps to minimise the negative impacts climate change has upon the ocean, its resources and its uses. The transfer of complex and voluminous scientific knowledge into legal and policy actions is crucial to harness, mitigate and, as far as possible, remedy in an integrated manner, climate change impacts upon the ocean. An effective legal regime for ocean governance in an era of climate change, must also entail fair and equitable legal options for adaptation to negative impacts.

Training Entrepreneurial Intuition

Prof. Leonie Baldacchino

Edward de Bono Institute for Creative Thinking and Innovation

Entrepreneurs face a variety of uncertain situations, and they are often required to make decisions without adequate time and information. Under such conditions, 'gut feeling' or intuition – which is a rapid, holistic and affectively charged mode of cognition – may be more effective than logical analysis – which is slower, detail-oriented and rational. Research indicates that entrepreneurs are largely capable of engaging in analysis, even if they are inexperienced. However, entrepreneurs with domain-relevant experience are generally better able to employ intuition than novices, since intuition emerges from domain-specific expertise. This may suggest that entrepreneurs need to wait until they gain experience to develop their intuition, but the literature indicates that there are ways of enhancing the ability to engage in effective intuitive processing. This presentation shall outline the development, piloting and evaluation of an entrepreneurial intuition training programme, comprising six steps: (1) recognise intuition, (2) explore intuition, (3) enable intuition, (4) strengthen intuition, (5) challenge intuition, and (6) blend intuition with analysis. The training programme builds upon the author's ongoing research on intuition and cognitive versatility in entrepreneurship, and includes learning outcomes, training content and practice activities. It was piloted over three sessions with a sample of 12 participants, and evaluated through a mixed methods approach with the training participants and five entrepreneurship educators. Overall, the feedback was positive and indicated that the training programme's learning outcomes were largely achieved.

Keynote Address 1

"Artistic Research Needs Ethics Like a Rip in the Canvas": Is Free Artistic Research Compatible with Academic Research Ethics?

Prof. Robin A. Nelson

Professor Emeritus of Theatre, Intermedial Performance and Practice Research, Royal Central School of Speech and Drama, University of London, UK

In this keynote for the University of Malta's Research Expo, 2024, Prof. Robin Nelson explores a tension between an oft-desired "artistic freedom" in creative practice and the inevitable constraints entailed by "academic" arts research in today's incorporated HE institutions. An established champion of "Practice Research/Artistic Research", Prof. Nelson's additional experience as a university research director will afford insights into several perspectives. With reference to some contentious examples, he explores the room for manoeuvre between, on the one hand, practitioner-researchers wishing to be free to do as they wish and, on the other, the hard-line, bureaucratic disposition of some Research Ethics Committees, to enforce rules and protocols in an Enlightenment, scientific-rational tradition. Though the emphasis is on Arts Practice Research, the debate has resonances wherever a "blue skies" disposition towards research meets requirements for Research Design and Research Outcomes. Ultimately, he proposes a compromise with a plea for adjustments on all sides, informed by a Levinasian approach to ethics wherein each encounter must be sensitively addressed.

Parallel Sessions 1

Presentations – Doctoral Candidates

Doctoral Stream DS 1.1 – DS 1.5

CHAIR: **Prof. Mario Aquilina** | VENUE: **Syndicate Room 8**

The Irrational in Pier Paolo Pasolini's Cinema

Ms Ilaria Labbate
Faculty of Arts

Pier Paolo Pasolini has deeply impacted the development of Italian cinema and Western culture. By reflecting on Pasolini and analysing the common theme of spirituality in his cinematic works, in conjunction with his deep knowledge of the Classics and his keen attention toward ancient civilisation and culture, the research proposes to create new insights into his worldview as an intellectual.

Firstly, light will be shed on Pasolini's works in relation to the sacred and the 'irrational'. Specifically, the similarities between his 'cinema of poetry' and Ernesto De Martino's anthropological works on magic and folklore, showing the connections between ceremonies occurring in southern Italy and magic rituals performed by ancient Mediterranean cultures, will be investigated. In this regard, Pasolini and De Martino shared a common 'modus operandi', one captured by the contemporary revival of the occult and Eastern mysticism taking place in Italy during the 1960s and 1970s.

Secondly, an investigation into Pasolini's cinema and contemporaneous British folk horror will be identified in Pasolini's films in this same period. Several typical elements, such as rural isolated landscapes and pagan rituals appear thematically in Pasolini's later films, and separately, his take on religious cults also confirms his determination to investigate the role of the 'irrational' in society.

A new alternative reading of Pasolini is therefore being proposed, one which recognises his efforts to bring to our collective attention the presence of the 'divine' and irrational subconscious for the secular Westerner audience.

André Jolivet's Cinq Incantations and Chant de Linos: Analysis, Historical Context and Performance

Ms Clara Galea
School of Performing Arts

This paper presents findings related to the French composer André Jolivet (1905–1974) and the question of his literary and cultural standing. It discusses historical events, philosophical developments, and colonial encounters in early twentieth-century France that influenced the direction of Jolivet's career and musical style, and then present the main analytical findings from a study of two works by Jolivet: Cinq Incantations (1936) and Chant de Linos (1944). Embodied analysis of the two works provides insight into Jolivet's approach towards writing for flute, while considerations of their performative element show how these analytical findings may be applied in practice. Another observation is the significant change in Jolivet's approach to writing for the flute, which not only provides insight into the evolution of his style, but also into the relationship between this aspect of his compositions and their level of success. A thus-far unstudied topic of research, this opens avenues for further study.

Considering Aesthetics: The Ecce Homos of Mario Minniti

Ms Meredith Taylor
Faculty of Arts

Mario Minniti plays an enigmatic role in the scholarship of fellow artist Michelangelo Merisi da Caravaggio. The exact nature of Minniti's relationship with the master is the subject of continued academic debate, particularly whether the Sicilian artist was a proficient copier of works by Caravaggio. Very little is known about Mario Minniti's time in Malta, though it is hypothesised that he might have made several trips to the island from his native Sicily. Because Minniti, outside of Sicily is often considered a minor artist, his biographical and archival information is incomplete and the best records available are his surviving works. Malta is home to three masterful works by Minniti, perhaps the most notable being the Ecce Homo. Minniti's mature work is often marred by inconsistent quality with intermittent hallmarks of the artist's mature style. Mario Minniti's Ecce Homo distinguishes itself among the artist's mature works in its overt observance of Caravaggism, which is largely diminished, if not absent, in the majority of his surviving oeuvre. By examining three works of the same subject, two attributed to Mario Minniti, and one by Caravaggio, a base line can be established for the artist's mature style and artistic relationship with Caravaggio. Examinging the similarities and differences between the Minniti's themselves and the works by Minniti versus the work by Caravaggio, a larger conversation as to Minniti's validity in his role as Caravaggio's copyist can be scrutinised.

The Transformation of Antiquities – Identifying Changing Attitudes and Behavioural Traits in the Creation of the Historic Monument in Malta

Mr Jonathan Borg
Faculty of Arts

The doctoral research explores the processes through which antiquities were transformed into historic monuments in the Maltese Islands from the early 16th century until the enactment of the first legislation protecting antiquities by a Maltese parliament in 1925. Malta offers an interesting perspective to what is essentially a European phenomenon. Located on the periphery of Europe, Malta was ruled by a non-native power for the entire period under consideration. At the same time the islands were characterised by an influential indigenous class of urbanised educated elite who thought of themselves as European and were mostly Italianate in their disposition. Whilst the antiquities, which constitute the empirical material in this research, come from Malta, the study contextualises this discourse within the European experience and identifies the historical, socio-cultural and political circumstances that shaped the transformation of antiquities into historic monuments.

The study, which adopts a methodology constructed on the principles of Grounded Theory, examines the metamorphosis of antiquities by tracing the historic trajectories of a select number of objects. The biographies of these objects that are etched from varied primary and secondary sources form the empirical basis to observe the actions associated with the transformation of antiquities into historic monuments. The broad temporal approach adopted in this study is necessary to elicit the reasons for which an object was singled out and treated differently because change can be slow and imperceptible in the short term. This paper presents a preliminary analysis of the attitudes and behavioural patterns that have been identified to date as central in the transformation, manipulation, and reuse of antiquities.

A Semantico-Pragmatic Study of Linguistic Preformation in Epistolary Mystical Discourse: The Correspondence of Saint Elisabeth of the Trinity

Mr Ludwig Camilleri

Faculty of Arts

Elizabeth of the Trinity (1880–1906) is known as one of the leading mystical figures of the early twentieth century. The period she spent in the Discalced Carmelite monastery of Dijon (1901–1906) is marked by letters that she sent to a variety of correspondents. In this semantic-pragmatic study, the central question concerns the pre-formed elements that were cardinal in the enunciation of a discourse considered mystical and written in the form of letters. The focus is primarily on quotations and allusions, collectively called references. Their role as pre-formed units is analysed in the context of the enunciation of an epistolary mystical discourse by Elisabeth of the Trinity. This problem raises a number of underlying questions that require an interdisciplinary approach. Firstly, it is necessary to define what is meant by mystical discourse. A philosophical discussion of the limits of human language and the main sources for Elizabeth follows. Secondly, the stylistic qualities of the epistolary genre, preferred by Elisabeth, are outlined. This genre, whose form is historically pre-constructed, has advantages that make it useful as a framework for mystical discourse. These two aspects lead to an analysis of the quotations and allusions, i.e. the pre-formed elements, in the corpus of letters. How can these pre-formed units be classified according to the type of reference that they are, the letter section in which they are found in and their source? Which values do they evoke in order for them to aid Elizabeth in the construction of different personas of herself in front of different recipients?

Doctoral Stream DS 2.1 – DS 2.5

CHAIR: **Dr Marie-Louise Mangion** | VENUE: **David Bruce Hall**

A Proposed Methodology for Evaluating New Business Ventures

Inġ. Joseph A. Bartolo
Edward de Bono Institute for Creative Thinking and Innovation

Data from the U.S. Business Employment Dynamics database, tracking 21 million establishments, reveals that 50% of businesses cease trading within their first five years. This research investigates the universal consistency of these survival rates across different global areas and economic climates. Addressing the critical challenge of early-stage business failures, this study introduces a methodology for evaluating business ventures. It delves into the "jockey and horse" continuum, assessing the critical interplay between founders and their business models. This approach aims to discern the potential of start-ups accurately and early, creating a useful tool for mitigating risk.

Leveraging insights from an analysis of 464 CB Insights case studies on failed enterprises and employing the Value Plan framework by Smith and Wragg (2021), this research advances traditional business evaluation methods. It integrates a sophisticated categorisation from the Value Plan, identifying and addressing a consistent 40% of avoidable risks in business ventures. This methodological innovation not only enhances the potential precision of venture assessments but also contributes to the academic discourse on entrepreneurial risk management. This research employs "chunking", a cognitive mechanism used by chess masters, to aid in the early assessment of start-ups. This approach serves as a diagnostic tool, paralleling the effectiveness of methods utilised by business angels and venture capitalists over the past forty years. This approach enhances the precision of early-stage start-up assessments through mentoring sessions, aiming to improve decision-making accuracy and mitigate the risk of founder self-harm. This methodology improves start-up assessment, by enabling evidence-based decisions for any enterprise.

Power to the Creditors: Odious Debt and Tunisia's Democratic Responsiveness

Mr Joseph M. Debono
Faculty of Arts

Following the ouster of Tunisian President Ben Ali in 2011, high rates of public debt – much of it believed to have narrowly served the ousted regime – became a central grievance among protesters. Debt-servicing aggravated budget deficits, drained Tunisia's currency reserves, hampered social and infrastructural investments and eventually compelled further borrowing to service past debts. Yet throughout the transition era, successive governments shunned democratic demands for a debt-audit, aimed at determining the 'odious' and thus pardonable portion of Tunisia's external debt under international law. This paper examines why democratically elected governments refrained from taking this popular, and on the face of it, feasible policy path. Using Case Studies in conjunction with Process Tracing and drawing on Structural Power theory, this paper argues that Tunisia's rejection of a debt-audit clearly constituted a responsiveness deficit during the transition period, which led to an erosion of trust in democratic institutions and the popularly sanctioned democratic backsliding under President Saied in 2021–2022.

Examining the Relationship Between Loneliness, Personality Traits and Social Media Use

Ms Christine Spiteri
Faculty for Social Wellbeing

Loneliness is a subjective experience that arises from the perception that one's social needs are not being met by the quantity or quality of one's social relationships. Despite the widespread use of digital technologies to mitigate feelings of distance and satisfy our need for connectedness, the distressing feeling of loneliness is reportedly on the rise. This quantitative research study seeks to address this modern-day paradox. The relationship between the individual experience of loneliness, personality traits, and social media use among a cross-sectional sample (n=591) was examined through the use of structured questionnaires. Descriptive and inferential statistical analysis was then conducted to identify any relationships between the main variables. Statistically significant relationships between personality traits and social media use, personality traits and loneliness, and social media use and loneliness were observed. Positive significant relationships between trait neuroticism and all forms of loneliness was established. Respondents scoring high in neuroticism also attributed higher emotional connection to social media use. This suggests that personality traits may be more insightful when studying problematic/social media use, and designing interventions, as opposed to the metric of screen-time. These results will be used to inform the qualitative phase of this mixed methods research project.

The Role of Parental Responsibilities in Decision-Making Among Maltese Part-Time Doctoral

Ms Edel Cassar
Faculty for Social Wellbeing

Over the past five years, Malta has seen a significant increase in doctoral students, particularly among women, who now make up the majority of students at the doctoral level. This paper presents an investigation of the experiences of women with parental responsibilities enrolled in part-time doctoral programmes, compared to their male counterparts. The study used a constructivist grounded theory approach and was conducted between April 2021 and January 2024. This paper focuses on the impact of parental responsibilities upon the students' decisions about when and how to take up doctoral studies; how to manage their time; what support structures to create and draw upon; and the extent to which they integrate in academic life. These findings illustrate that despite a welcome reversal of the gender imbalance in doctoral enrolment, men and women still face different realities. By examining the increased tensions that arise when female doctoral students juggle multiple roles, the study makes two important contributions. First, it confirms the need to promote gender equity in general, and within the broader higher education landscape. Second, it substantiates the importance to maintain and improve adequate support structures for part-time students with parental responsibilities.

The Language Skills of 5–8-Year-Old Bilingual Children with a History of Maltreatment: Pilot Study Implications for Trauma-Informed Intervention

Ms Estelle Zahra

Faculty of Health Sciences

To date, the linguistic profiles of Maltese primary school aged children with a history of childhood maltreatment remain unknown. Although literature indicates a negative relationship between childhood maltreatment and language development, studies present different linguistic profiles (Alvarado et al., 2023, Hyter, 2021). This may be due to methodological differences or to diverse linguistic contexts. The current mixed-methods research study aims to document the language profiles of children aged 5–8 years with childhood maltreatment histories in the Maltese bilingual context, and to compare any differences to to those recorded in the literature using a causal-comparative approach. It also aims to identify current practices across entities working with this population group, and to explore and develop models of good practice across entities, using constructive grounded theory through a series of semi-structured interviews. Child participants with and without childhood maltreatment histories completed an age-appropriate multilingual narrative assessment. Professionals in the field were interviewed. Preliminary mixed-methods cross-sectional pilot study findings indicate complexities around recruitment of participants with a history of maltreatment in view of the sensitive nature of the topic. Complexities around grouping of participants based on associated risk factors were revealed. Piloting grounded theory provided contextual knowledge considered fundamental in ensuring that future emerging theories fit into the context "without force" (Nunes et al., 2010, p. 73). This pilot project shed light on the feasibility of the main study to be conducted in partial completion of the first author's M.Phil./Ph.D. studies, investigating the appropriacy and feasibility of recruitment, data collection and data analysis procedures.

Doctoral Stream DS 3.1 – DS 3.5

CHAIR: **Prof. Odette Vassallo** | VENUE: **Sacra Infermeria Hall**

Exploring the Notion of Academic Oral Presentation as a Form of Assessment

Ms Jeanette Theuma
Centre for English Language Proficiency

At university, academic oral presentations (AOPs) are a popular method of assessment, often determining, or partially determining, a student's progress through their course. However, there seems to be a lack of research into academic and student expectation of AOPs and whether these two expectations align. Research into undergraduate AOPs carried out recently has centred around various linguistic aspects: similarities and differences between novice presenters and expert speakers (Viera and Williams, 2020); students' linguistic accommodation in AOPs (Zareva, 2020); genre feature shifts in AOPs across different disciplines (Hu & Liu, 2018); and linguistic influences on multilingual students (Nausa, 2013). Other studies have considered AOPs as an assessment tool, analysing students' self-assessment (Aryadoust, 2015) or measuring students' second-language competence (Baumgarten, 2014). Another limited set of studies focus on the academics' attitudes, influence and grading processes. However, there appears to be a dearth of research on how academics and their students reconcile their expectations in order to ensure a positive assessment outcome. This study aims to explore how subject experts envisage and set expectations for their students' AOPs and the way in which their students conceptualise their AOPs and attempt to contextualise these into the assessment process. In my presentation, I aim to discuss the current research on undergraduate AOPs and explain how my study proposes to add to the pool of knowledge in this area. I will address some of the methodological challenges of a study of this type and share my proposed approach to gathering and processing the data.

A Multi-Disciplinary Exploration of Academic Expectations in High-Quality Writing

Ms Analisa Scerri
Centre for English Language Proficiency

While academic writing plays an important role in shaping students' academic success in Higher Education, what is expected of good academic writing is not always easy to determine. This study seeks to understand this phenomenon through an interview-based research with discipline specific academics. Through the analysis of interviews and with reference to participant-selected examples of students' written work, this research aims to investigate the expectations of discipline specific academics in relation to high-quality student writing. This is intended to shed light on the various concerns and examples of good-quality writing linked to such expectations, both within and across disciplines. Understanding the expectations of these academics, who serve as the primary audience for novice academic writers, is an area of research which has received limited attention in academic literacy.

Adopting a grounded theory approach in tandem with a corpus-based analysis, this multi-disciplinary study seeks to outline the parameters of high-quality writing as perceived by UM academics spanning various disciplines; the latter are based on Nesi and Gardner's (2012) classification of the 4 broad academic disciplines. The presentation will report on a preliminary analysis of the pilot, which was based on the first set of interviews selected from one of the eight disciplines that will be addressed in the study. I will discuss the challenges in adapting the original methodological framework and the analytical tools explored in the process. Significant changes have been introduced as a result of the pilot and the presentation will outline the projected impact of these major adjustments.

References: Nesi, H. and Gardner, S. (2012) 'Families of genres of assessed writing' in H. Nesi and S. Gardner (Eds). Genres across the Disciplines: Student Writing in Higher Education (pp: 21- 56). Cambridge: Cambridge University Press.

Exploring the Experience of Learning Support Educators in Malta

Ms Pearl Marie Vella Haber
Faculty of Education

Through my research, I aim to shed light on the crucial role of Learning Support Educators (LSEs) in the Maltese educational system. Titled 'Exploring the Experience of Learning Support Educators – An ethnographic study in two Maltese primary schools', this study delves into the lived experience of LSEs within the school environment. Mainly, this research is an exploration of how LSEs and teachers share and navigate the education space.

The significance of LSEs in inclusive education cannot be overstated, and understanding their daily challenges and successes is vital for optimizing their contribution. By employing institutional ethnography, I plan to immerse myself in the field, conducting a thorough examination of LSEs' roles in two Maltese primary schools. This method will allow me to explore the intricate webs of social relations and institutional practices that shape their experiences.

Through interviews, observations, and document analysis, I intend to capture the nuanced ways LSEs navigate the educational landscape alongside teachers. The study seeks to uncover collaborative practices, potential conflicts, and the impact of institutional structures on their roles.

By presenting my findings at the annual doctoral symposium, I aim to contribute valuable insights to the broader conversation on inclusive education. This research not only benefits the academic community but also has practical implications for policymakers, educators, and professionals involved in shaping the educational landscape in Malta and beyond.

The Adaptation of an Aphasia Test for Maltese–English Bilingual Adults

Ms Lorraine Vassallo
Faculty of Health Sciences

Background: Aphasia is an acquired impairment of language resulting from focal brain lesions in the language dominant hemisphere. In bilingual persons with stroke (BPwS), recovery of the two languages can vary discordantly, necessitating comprehensive testing in both languages (Paradis, 2014), with a linguistically and culturally equivalent instrument. Research statement: A standardised, psychometrically robust aphasia assessment tool in Maltese is not available. The study aims to translate, adapt and innovate such an instrument for Maltese – English bilinguals.

Method and approach: The research project is divided into three phases: (1) translation/adaptation of the Brisbane Evidence-Based Language Test (Rohde et al, 2020) into Maltese, known as the Maltese-English Aphasia Assessment (MEAA) (completed); (2) the pilot [Step 1a, N = 20; Step 1b, N = 20] and normative study [N = 80] (currently ongoing); (3) the main study [N =100] when MEAA will be administered to BPwS and bilingual persons with aphasia (BPwA) as a result of stroke (commencing mid-2024). A demographic and language background questionnaire (DLBQ) will determine language history. Performance in Maltese and English is assessed on MEAA's 49 tasks (5 subtests).

Data and results: Preliminary analysis of data (N = 42) provides baseline performance of neurotypical Maltese bilinguals, ex. auditory comprehension [Eng (M = 32.21, SD = 5.59) and Mlt (M = 33.00, SD = 5.19)] and verbal expression [Eng (M = 80.86, SD = 16.77) and Mlt (M = 73.29, SD = 8.50)].

MEAA, normed on the Maltese population, will lead to diagnostic classification of language impairment in Maltese BPwS.

Selfless Motherhood: Eastern European and Sub-Saharan African Migrant Women's Perceptions of Pregnancy and Maternity Care in Malta

Ms Christie Hili

Faculty of Health Sciences

This study addressed the dearth of research identified following a systematic review of the literature by exploring how Eastern European (EE) and sub-Saharan African (SSA) women perceive and experience pregnancy and maternity care as migrants in Malta. An interpretative phenomenological analysis methodology was adopted. Data collection commenced following ethical clearance and involved one-to-one in-depth interviews with a purposive sample of twelve EE (Bulgarian, Romanian, and Serbian) and eight SSA (Eritrean and Nigerian) women. The audio-recorded interviews were transcribed verbatim and analysed by close, line-by-line analysis.

Using Hall's (1976) Cultural Iceberg Model as a guide, this study unravelled a multitude of perceptions held by the two populations. Participants shared common beliefs particularly regarding safety in pregnancy being the topmost priority. Pregnancy kindled selflessness where the child's health was prioritised over their own. EE migrant's perceptions towards normalising medicalisation of pregnancy contrasted SSA women's beliefs towards normality. The EE group perceived pregnancy as a period dominated by an overwhelming state of hypervigilance, whereas SSA women expressed profound religious devoutness and considered children to be a "gift" from God which often led to disagreement with the local management of pregnancy.

These findings shed light on the internal and subconscious parts of EE and SSA women's culture which ultimately determined their prenatal behaviours and their views towards maternity care. This research highlighted the need to contextualise information about pregnancy and maternity services within the Maltese healthcare system when providing perinatal education to migrants. The provision of cultural competence training for health professionals is suggested.

Doctoral Stream DS 4.1 – DS 4.5

CHAIR: **Prof. Joseph Cacciottolo** | VENUE: **M.A. Grima Hall**

Combinational Therapy Targeting the PI3K/Akt/mTOR Pathway in Non-Small Cell Lung Cancer Spheroids

Mr Nathan Vella

Faculty of Medicine and Surgery

Background: Lung cancer is a major cause of death, with the non-small cell (NSCLC) subtype claiming a 5-year survival rate of only 15%. Deregulation of the PI3K/Akt/mTOR pathway and overexpression of translationally controlled tumour protein (TCTP) are classically occurring NSCLC events which both lead to eIF4E hyperactivity, therefore promoting tumour progression.

Aim: We aimed to analyse the efficacy of AZD2014, a compound which inhibits the key pathway members, mTORC1 and mTORC2, as well as TCTP gene knockdown in three NSCLC cell line models which are representative of the three main NSCLC subtypes.

Methods: Cells seeded in tissue culture plates, were treated with various concentrations of AZD2014, and transfected with different amounts of a TCTP-targeting antisense oligonucleotide (ASO), independently and in combination. Cell viability was analysed at 24, 48, 72 and 96h post-treatment. Healthy mammalian cells were similarly studied, in order to establish efficacious but non-toxic concentrations. The results obtained were subsequently translated to spheroid 3D cultures, since these are more biomimetic models. Spheroids were developed and studied in terms of their morphological characteristics, cell viability, necrotic core formation, proliferative areas, ATP production and cytoxicity for up to ten days post-treatment.

Results: AZD2014 alone did not induce a significant decrease in cell viability. However, a significant inhibition of spheroid growth and a decrease in cellular ATP levels was observed. Analysis of the combinatory result data is currently underway.

Conclusions: These results point towards a cytostatic role of AZD2014 in NSCLC and highlights the significance of exploiting this novel combinatory therapy, which is currently being further studied.

Investigating the Molecular Mechanisms of Combination Therapy on Drug-Resistant Chronic Myeloid Leukaemia

Mr Antonio Polidano Vella

Faculty of Medicine and Surgery

The project aims to develop the treatment for chronic myeloid leukaemia (CML) using combination therapy and to expand available knowledge on cellular drug-effects and drug resistance. CML involves the hyperproliferation of myeloid cells in the bone marrow following the formation of the Philadelphia chromosome. This leukaemia may be controlled using mono-therapeutic drugs, namely imatinib, however, an escalating clinical challenge lies in the acquired resistance to this drug. In a preliminary in vitro project using imatinib-resistant CML cells (K562-IR) (Polidano Vella, 2020), epigenetic modifying drugs in combination with imatinib increased susceptibility to the imatinib, hence re-sensitising cells to the drug. K562-IR cells were grown in genetically unique clonal populations which were individually subjected to various drug combinations, including FDA-approved epigenetic modifiers, differentiating agents, and imatinib, to determine the most effective treatments for different colonies. Genetic sequencing of each colony identified the retention of the BCR-ABL fusion gene, and further regions are being sequenced to discover or confirm more resistance-inducing mutations. Following combination treatments, viability assays expose anti-proliferative effects while differentiation studies, including studies on Cluster of Differentiation (CD) markers, indicate haematopoietic differentiation. Notably, different cell colonies

exhibited varied responses to the treatments, implying variations in drug-resistant mechanisms. Most treatments showed low lethality on healthy white blood cells, thus proving potential for clinical applicability. Quantitative polymerase chain reactions, and Chromatin immunoprecipitation (ChIP) will be employed to elucidate mechanistic pathways and epigenetic modifications respectively. This comprehensive approach will provide valuable insights on the cancer and give new hope to CML patients.

Heterogeneity in Breast Cancer

Ms Elaine Borg

Faculty of Medicine and Surgery

Breast cancer has a high incidence and mortality in women worldwide. Intra-tumoural and inter-tumoural heterogeneity have been recognised to cause diagnostic challenges, drug resistance and disease recurrence. Immunohistochemistry has played a pivotal role in breast cancer treatment, with targeted treatment tailored to presence or absence of three main receptors: oestrogen receptor (ER), progesterone receptor (PR) and human epidermal growth factor receptor 2 (HER2). In this study, intra-tumoural proteomic heterogeneity was analysed for ER, PR, HER2, Ki67, E-Cadherin and pAkt, pS6k, the latter two being important members of the PI3K/mTOR pathway. Genomic heterogeneity was assessed using a 33-plex Quantigene™ RNA Assay on locally resourced FFPE breast cancer tissue with confirmed intra-tumoural heterogeneity and control group with morphological homogeneity. This study showed statistically significant difference in protein and mRNA expression between two areas with different morphology in the same tumour. Intra-tumoural morphological heterogeneity showed a statistically significant increase in differential expression in Vimentin which is a recognised marker of epithelial-mesenchymal transition associated with increased migration and invasion of breast cancer cells and contributes to drug resistance.

Literature review shows that a good proportion of breast cancer research was carried out on cell-lines, cell culture of primary cells or patient-derived xenografts with limited regard to tissue architecture. In this study, two ex-vivo culture techniques of primary breast cancer to maintain 3D structure using Ham F-12 and Matrigel® were tested with the latter showing superior results when compared to literature. Understanding cancer biology will allow for precision medicine and individualise management of breast cancer.

ALS Fly Models to Understand How Gene Disruption Leads to Disease

Ms Sylvana Tabone

Faculty of Medicine and Surgery

Amyotrophic lateral sclerosis (ALS), the most common form of motor neuron disease, is characterised by the progressive degeneration of upper and lower motor neurons in the brain and spinal cord. Over the years, ALS pathogenesis has linked with multiple genetic factors. Rare damaging variants in the D-amino acid oxidase (DAO) gene have associated with ALS including multiple cases from Malta. DAO encodes a protein that catabolises D-amino acids, including D-serine, which indirectly controls motor neuron function. Making use of the Drosophila model system, this work aimed at confirming the link between DAO and ALS. The well-conserved Drosophila orthologue of DAO, Daao1, was downregulated through RNAi-mediated knockdown driven by a gene-switch system. Firstly, RT-qPCR confirmed efficiency of Daao1 knockdown. Disrupted Daao1 in Drosophila muscles and brain induced motoric deficits. Additionally, a temporal-control system investigated whether adult-specific Daao1 disruption has consequences on motor function and survival. These findings provide compelling information about the in vivo function of the Daao1 gene, confirming DAO as ALS-linked. A prevalent hypothesis suggests that downregulated DAO leads to intoxicating D-serine levels, resulting in uncontrolled NMDA receptor function hence motoric dysfunction. The presence of this mechanism is being tested through genetics and immunofluorescent staining of Drosophila brains. Ongoing work is also addressing whether additional Maltese ALS patients carry deleterious DAO variants. To this end, this investigation aids in thoroughly understanding the consequences of DAO gene disruption on neuromuscular function, with obtained knowledge allowing for the identification of targeted therapies beneficial for a large percentage of Maltese ALS patients.

The Prevalence of Common Eye Diseases and Visual Impairment in Malta: Preliminary Data from The Malta Eye Study

Mr David Agius

Faculty of Medicine and Surgery

Purpose: The Malta Eye Study (TMES) is a cross-sectional study of the adult population of Malta to determine the prevalence of common eye disease and visual impairment (VI).

Methods: A randomised sample of 1,800 Maltese individuals aged 50–80 years, stratified by age, sex and locality, was used for this study. The validated tools of measurement included the National Eye Institute Visual Function Questionnaire, the EQ-5D-5L, the Ocular Surface Disease Index and the Quick Mild Cognitive Impairment Score for assessments of visual function, quality of life, dry eye symptoms and cognitive impairment, respectively. Other tools of assessment involved anthropometrics, visual acuity, Visionix®, Goldmann tonometry, slit lamp examination, fundus photography, swept source optical coherence tomography (ssOCT) scanning of the macula and disc as well as ssOCT angiography. A saliva sample was also collected for future genetic analysis.

Interim Results: Since the study is still ongoing, this report is based on a preliminary analysis of 2234 individuals invited between September 2021 and September 2022. 705 (31.6%) individuals attended the study and were representative of the population of Malta aged 50–80 by age and sex. The prevalence of VI in either eye was 23.5% (95% CI 20.5%-26.9%) and the ratio of unilateral to bilateral VI was 3:1. The causes of VI were uncorrected/undercorrected refractive error (41%), amblyopia (18%), cataract (13%), age-related macular degeneration (4%), pathological myopia (4%), glaucoma (3%) and diabetic retinopathy (2%).

Conclusions: Vision screening programmes are commendable efforts to further decrease the prevalence of amblyopia and vision loss from the main causes of VI. The completion of a fully representative data set shall identify risk factors, associations, and allow comparisons with international data.

Doctoral Stream DS 5.1 – DS 5.5

CHAIR: **Prof. Inġ. David Zammit Mangion** | VENUE: **Vassalli Hall**

An Occupational Therapists' Perspective on the Impact of Additive Manufacturing on Users' Experience with Wearables for Paediatric Habilitation

Mr Matthew Bonello

Faculty of Engineering

Additive manufacturing (AM) is becoming more widely used to develop consumer products, from functional devices to static artefacts. It also brings about various benefits which when used appropriately can enhance user-product interaction and overall product acceptance. Previous studies were conducted to deduce the relation of AM characteristics with User eXperience (UX) elements in the case of wearables for paediatric habilitation. The scope of building these relations is to provide design engineers with the right knowledge on how to take advantage of the benefits of AM to enrich the interaction of the users with such devices. In line with this work, this presentation describes a validation study conducted to evaluate these AM-UX relations, formalised in a set of design recommendations. Semi-structured interviews were organised with occupational therapists to gather insights from their perspective, as the healthcare professionals interacting with these devices, collecting constructive feedback and quantitative data, to quantify the degree of effectiveness of these AM-UX relations. Concurrently, user attributes that the design engineers should consider when designing for this population of children with diverse needs could be deduced. This validation study helped to establish that AM characteristics, such as the ability to mass customise, surface texture, generative and consolidated designs, can affect the overall UX and the resulting acceptance rate by the users. Additionally, future work is briefly discussed to validate further the efficacy of these recommendations with primary users of these wearables, i.e. children with cerebral palsy. Ultimately these recommendations will be incorporated into a design support tool for engineers to generate more user-adherent wearables for paediatric habilitation via AM.

The Impacts of Industrial Safety on Environmental Sustainability in Human–Robot Collaboration within Industry 5.0

Ms Amberlynn Bonello

Faculty of Engineering

As the Industry 5.0 paradigm evolves to the forefront of research directions, a dissonance emerges between smart and sustainable elements. This stems from the misbalance of priorities appointed during the engineering design process. Selection of technology driven features, such as collaborative robots and IoT devices are often implemented at the expense of other criteria such as environmental sustainability. This observation is investigated on a workstation designed for human-robot collaboration (HRC), but with limited regard to the energy consumption and carbon footprint incurred during its life cycle. Consequently, this research work attempts to understand the consequences of design decisions for HRC safety (physical and cognitive) on environmental sustainability. The impacts of various HRC workstation scenarios (including various safety features and components) are evaluated using environmental metrics while Design for Environmental Sustainability (DfES) is adopted to close the rift between safety and sustainability. This work uses material substitution and dematerialisation to compensate for the negative impacts resulting from smart HRC features, achieving a reduction of 10% in both energy consumption and carbon footprint when compared to the same workstation not having undergone the DfES exercise. This paves the way for academia and industrial designers seeking to strike a balance between human-centric and environmentally sustainable HRC.

Investigating Hybrid Turbo-Electric Propulsion Systems (HTEPS) for Regional Aircraft

Mr Aman Batra
Institute of Aerospace Technologies

This research studies and explores Hybrid Turbo-Electric Propulsion Systems (HTEPS) for regional aircraft. As climate change effects are being felt, there is urgent need to reduce emissions and address sustainability. Transportation industry contributes immensely to it and aviation adds upto 3% global greenhouse-emissions. COVID-19 pandemic affected aviation severely but ICAO post-COVID-19 forecasts 3.6% yearly growth. In European Union, Flightpath-2050 and Green-Deal strategies drive this recovery with in-flight CO_2, NO_x and noise reduction goals. To achieve these goals, electric, hydrogen-based and sustainable aviation fuel-based aircraft are being researched worldwide.

Electric propulsion has advantages like low environmental effects, however battery energy-density above 800 Wh/kg is required to sustain Airbus-A320/Boeing-737 sized aircraft with 1,111 km range. With current battery energy-density (200–250 Wh/kg) and value doubling every 23 years, it will take five decades to achieve electrification-targets. In near future, electric propulsion would be unable to achieve range-endurance as present aircraft.

To fill this gap, HTEPS is proposed with electric powertrain and gas turbine working concurrently. While it would produce some emissions, HTEPS is effective in sensitive near-airport areas during take-off/landing or when flying through saturated-atmospheric regions for reducing contrails.

This research emphasises on theoretical derivation of parameters like range and endurance for hybrid-electric aircraft. Sensitivity analysis performed on these equations shows impact of coefficients of lift-drag, payload-empty weights, efficiencies, etc. Important relation between power-required and cruise-airspeed is studied. Above-mentioned analysis is implemented on short-haul regional aircraft (ATR-72) case study. Research also aims to produce technological roadmap for scaling application to large HTEPS aircraft.

Artificial Intelligence in the Mitigation of Automation Failures in Complex Aircraft

Ms Cynthia Koopman
Institute of Aerospace Technologies

In commercial aviation, automation systems are increasingly being introduced into the cockpit, aimed at improving safety and reducing pilot operations. However, these automation systems can make the cockpit environment more complex, as the pilot is required to depend on these new systems. This complexity and the increased disconnect between pilot and automation systems become apparent when failures occur. To address this problem, this research introduces an AI expert to analyze all systems and assist the pilot in improving situational awareness. This additional AI system aims to create a comprehensive method to identify when failures occur, which data are correct, and what actions should be taken to remain or regain stable flight. The safety critical aspect in this application requires the AI expert to be highly reliable, which is addressed using a novel method. Reinforcement learning techniques were used to create a deep understanding of the interaction between control commands, cockpit systems, and the surrounding environment of the aircraft. This deep understanding of the AI system was created by limiting human bias and focusing on maximizing transfer learning abilities to result in reliable behavior in unforeseen circumstances. In this research, the proposed method was analyzed for stall recovery, used in conjunction with an autoencoder to address failures, and extended by introducing adversarial training. The results

showed that the proposed method allows the AI expert to gain an understanding that leads not only to a reliable response in unforeseen circumstances but also to aircraft control that enables more capabilities compared to human control.

The Role of AI in Addressing Complex Policy Challenges: An Exploration of the Use of AI in Tackling Wicked Problems in Public Policy

Mr Gian Paul Gauci

Faculty of Economics, Management and Accountancy

The research explores the integration of Artificial Intelligence (AI) into decision-making processes within the sphere of public policy, focusing on its potential to address wicked problems and the barriers to successful implementation.

The study investigates the dynamics and implications of AI adoption in the public policy domain. The first question delves into the extent to which AI integration contributes to resolving wicked problems inherent in public policy. Wicked problems pose significant challenges for policymakers. AI holds promise in enhancing decision-making through data analysis, and predictive modelling. By leveraging AI technologies, policymakers aim to gain insights, optimise resource allocation, and design more effective strategies to tackle complex societal issues. The research examines case studies and empirical evidence to assess the impact of AI integration on problem-solving effectiveness and policy outcomes.

The second research question investigates the barriers and difficulties hindering the successful implementation of AI in the public policy context. Despite its potential benefits, AI adoption faces various challenges related to technical limitations, ethical considerations, regulatory frameworks, and public acceptance. Concerns regarding algorithmic bias, privacy infringement, accountability, and transparency necessitate careful deliberation and regulatory oversight. Organisational resistance, resource constraints, and skill gaps present obstacles to the effective deployment of AI solutions in public policy settings.

The study synthesises existing literature, policy documents, and expert views to identify key barriers and propose strategies for overcoming implementation challenges. It offers insights to policymakers, researchers, and practitioners seeking to harness the potential of AI while navigating its complexities and implications for governance and society.

Doctoral Stream DS 6.1 – DS 6.5

CHAIR: **Prof. Luciano Mule'Stagno** | VENUE: **Girolamo Cassar**

A Study on the Effect of Thin Object Shading on the Performance of Photovoltaics

Mr Matthew Axisa
Institute for Sustainable Energy

Photovoltaics have consistently dominated the renewable energy landscape, driven by the continual decrease in PV module costs and global surging demands. However, local development trends, favoring taller buildings over land expansion, have resulted in limited roof spaces in apartment blocks, obstructing widespread renewable energy integration. This study delves into the critical need to address spatial constraints in modern Maltese roof spaces, particularly the hindrance posed by thin objects to a PV system's maximum potential.

Contrary to previous findings suggesting negligible performance loss from various thicknesses of thin objects like wires, poles, and rods, outdoor experimentation on PV modules and single solar cells in this study reveals a substantial impact, especially for thin objects greater than 3.2mm. The research demonstrates a significant dependency on the distance between the thin object and the PV source for the resultant power loss. Utilizing the image dataset acquired during outdoor experimentation along with an innovative image processing method, this study develops a new approach to quantifying shadow intensity, with the rate of change proving crucial in determining performance loss.

Moreover, this research introduces an algorithm correlating shadow rate of change with power loss percentage, validated through field experimentation. This establishes an image processing tool capable of quantifying the effects of thin object shading from simple imagery, providing valuable insights into the detrimental impact of thin object shading on photovoltaic performance. This information guides the development of solar cells to mitigate losses caused by thin object shading and aids homeowners in deciding whether to remove, retain, or relocate the thin object causing shading.

Seaweed Farming in Belize: A Mixed-Methods Exploration of Adaptation Strategies, Challenges, and Potential Contributions to Climate-Resilient Blue Economies in Small Island Developing States (SIDS)

Ms Ruth Julianna Gutierrez-Corley
Islands and Small States Institute

Seaweed farming, considered a pivotal strategy for supplementary livelihoods and climate adaptation in Small Island Developing States (SIDS), encounters challenges due to increased climatic and non-climatic hazards, impacting both its productivity and practices. This study employs a mixed-methods approach, combining qualitative elite interviews with regulatory authorities (N=6), participatory focus group discussions (N=4), and quantitative household surveys (N=18) with seaweed farmers in Belize.

The results reveal that seaweed farming activities resemble community-based (CbA) and ecosystem-based (EbA) adaptation strategies, though not necessarily recognised as such. Therefore, it represents an autonomous form of adaptation strategies in seaweed farming communities along the coast of the Caribbean SIDS, specifically Belize. This integration showcases the potential of marine resources to support resilient and climate-friendly practices within the broader framework of the blue economy in traditional fishing communities. However, insufficient guidance from the official regulatory framework can potentially lead to maladaptation in the long term.

This exploration provides insights that may inform policy measures for enhanced climate adaptation resilience in the context of artisanal seaweed farming operations in the blue economy of SIDS and similar regions. The research aims

to contribute to the body of knowledge on climate change adaptation and sustainable livelihoods by providing novel evidence in the context of SIDS, which is an under-researched area of study.

Improving Air Quality in Pedestrian Zones Using Passive Barriers with Vegetation

Mr Jeremy Sacco

Faculty for the Built Environment

Automobile emissions will most likely still be the predominant source of pollution in the immediate future despite the gradual penetration of electric vehicles. One way of minimising pedestrian exposure to these pollutants is to passively divert away the pollutants from the pedestrian zone. In this research, the aerodynamics of roadside barriers and their impact on improving air quality within the pedestrian zone were explored. Full scale wind measurements were performed in an urban street canyon and then used to validate a Computational Fluid Dynamics (CFD) model in OpenFOAM. A no barrier case was then numerically compared to a simple vegetative barrier by using a tracer gas (based on the diffusive properties of NO_2 since it is one of the more harmful gaseous emissions in urban environments). The vegetation was modelled as a force term using well established equations. Simulations were run in steady state and the Reynolds Averaged Navier Stokes (RANS) based on the Renormalisation Group (RNG) k-ϵ model was used for turbulence. The results were then aggregated and analysed for the complete case, as well as isolations for elevations that correspond to both average child and average adult heights. This was done in order to validate both the effects of the barrier within the street canyon and to obtain a long term average concentration field as part of our results. We note changes between the mean and max concentrations of the scenarios in both the windward and leeward sides of the road; the former showed a minor increase in concentration and the latter showed a decrease. This research shows that passive barriers can be used to mitigate pollution exposure to both children and adults but their positioning in street canyons should be carefully considered depending on predominant wind directions.

Experimental Analysis of the Hydraulic Energy Conversion in a Hydro-Pneumatic Energy Storage System

Mr Luke Aquilina

Faculty of Engineering

A Hydro-Pneumatic Energy Storage (HPES) system is currently being developed by a research team at the UM to help integrate renewable energy sources into electrical power grids. The energy storage system being developed is a mechanical-type energy storage system which stores energy hydro-pneumatically. The HPES system being developed is comprised of two sections: i) the Pressure Containment System, which consists of pressure vessels within which compressed air (pneumatic energy) is stored, and ii) an Energy Conversion Unit (ECU), which houses the different hydraulic and electrical components used to covert electrical power supplied from the grid into stored pneumatic energy, and vice-versa, through the use of a liquid piston. An HPES ECU is currently being developed by a team at UM as part of the EU-funded MUSICA* project. The work being presented covers experiments conducted on the ECU to evaluate and analyse the performance of the HPES system being developed. The experiments focus primarily on the performance of the HPES system during charging and discharging cycles, with a particular emphasis on the performance of the hydraulic

pump and turbine used during the compression and expansion processes respectively. Results obtained from these experiments on the full-scale ECU have indicated that the HPES system may achieve good charge and discharge cycle efficiencies. The experiments also highlighted the importance of an adequate control system, as well as importance of the correct sizing and selection of particular electrical and hydraulic components.

* This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement number 862252.

Understanding Salt-Induced Deterioration Processes in the Pore Network of Globigerina Limestone

Ms Rosangela Faieta

Faculty of Science

The Globigerina Limestone is an internationally recognised Heritage Stone, widely used in the Maltese building and monuments. The particular porosity of this stone makes it vulnerable to the presence of environmental factors such as sea aerosol and relative humidity fluctuations. The decay is commonly manifested by the presence of flaking, powdering, alveolar weathering (honeycombing) and loss of surface material.

The deterioration originates from the interaction of multiple complex physical and chemical processes. Among these, the crystallisation of various inorganic salts is recognised as one of the major causes of decay. Thermo-hygrometric variations influence the kinetics of salt crystallisation causing precipitation and dissolution cycles on the stone surface or inside the pore matrix. Repeated cycles generate a succession of salt phases which can cause destructive stresses on the pore structure of the heterogeneous stone.

The presentation will outline the main steps of a new Ph.D. project which aims to address the problem of understanding the salt-induced stone deterioration through the analysis of the complex porous structure of a specific type of local Globigerina Limestone (franka type), performing chemical analysis and simulations of salt crystallisation inside the porous network of the stone.

Final purpose of the research project is to reach a higher level of understanding of the mechanisms of soluble salt decay, which can then be used to extrapolate to similar limestones commonly found in the Mediterranean, and an in-depth comprehension of the impact of environmental variations in the mechanisms of crystal formation and dissolution in the pore matrix of stone.

Keynote Address 2

Navigating the Cutting Edge: Lessons from the Trenches of Managing Research and Innovation

Mr Kannan Pashupathy

Former Director of Global Engineering, Research and Product Management at Google, and current Board Member at Solidaridad

The last 10 years in ICT have been a whirlwind of progress and transformative impact looking at research and development in Artificial Intelligence, Networking, Security, Natural Language Processing, Computer Vision, Data & Analytics, Mobile and Quantum Computing and more. They have reshaped how we understand machines, data and, perhaps, even ourselves and have had far-reaching consequences for every company, university and industry.

Coming from the perspective of a leader at one of the largest corporate ICT research labs in the world during this decade, in this keynote talk Kannan Pashupathy will share some of the lessons that he learned that may be pertinent to university researchers and administrators who want to see their work be useful to a broad and global audience, as we look forward to deeper and faster innovations in the next decade.

Plenary Session 2

CHAIR: **Prof. Nicholas Vella** | VENUE: **M.A. Grima Hall**

Diversity in Isolation: Dissecting the Drivers of Endemic Plant Richness on Mediterranean Islands and Archipelagos

Prof. Sandro Lanfranco

Department of Biology, Faculty of Science

Effective conservation of island floras requires a 'benchmark' of expected relative species richness to compare results against. The framework for this process is provided by the theory of island biogeography that predicts island area and proximity to a mainland as being fundamental drivers of species diversity. The relative contribution of endemic species would then be expected to constitute a proportion of the maximum species richness, although the relationship may be non-linear between islands.

Previous observations on the proportion of endemic species in several Mediterranean islands indicated a predictable trend with area but suggested an 'endemicity deficit' for some islands, such as Malta. This study aimed to refine these predictions by collecting data on variables other than the two fundamental ones. These included a re-evaluation of proximity, and also included topographic diversity and human population density. 'Proximity' to a mainland was calculated through the progressive integration of land areas at varying radii from the centre of an island whilst 'topography' was estimated by recording the variance of elevation over a systematic sample of locations within an island. This was done for Crete, Corsica, Cyprus, Sardinia, Malta, Sicily, the Tuscan Archipelago, and the Balearics.

GLM models related the proportion of endemic species to the selected constraints, with results indicating that "topography" and "area" explained more variation in the number of endemic species than "proximity" and "human population density". Contrastingly, the proportion of endemic species on an island was best explained by "proximity" and "topography".

Exploring the Development of Epistemic Stance on a multilingual continuum

Prof. Odette Vassallo

Centre for English Language Proficiency

'Multilingualism is continuous, gradient and probabilistic' (Ortega 2019, p. 26), dependent on experience with multiple languages, resulting in one rich linguistic dynamic repertoire. In order to counter problems with monolingual bias and native speakerism, where one language variety carries an elevated status over another, Ortega discourages bilingualism and monolingualism as binary categories, and proposes an overarching view of multilingualism on a continuum.

The presentation explores this continuum as it is manifested by bilingual speakers whose experience of two languages, Maltese and English, differs in great measure, in social and educational contexts. It argues how native speakerism encourages a dichotomous view of English: its historical role and influence from Maltese is at odds with the ELT driven ideology that encourages a monolingual assessment of English. Through the lens of 'epistemic stance', subjective and intersubjective linguistic usage (Gablasova et al., 2015) across developing written and spoken repertoires will be described. Language usage changes across different age groups and over a range of tasks.

Epistemic stance will be discussed using a corpus of English usage of Maltese young people, designed to create an empirically-based national Framework of Competence in English (ForCE). The corpus is a collection of spoken and written data, from 14–25-year-olds, reflecting stages of education, age range, and linguistic attainment, across individuals and groups who are 'bilingual and/or bidialectal to different degrees' (Vella, 2012, p.532). It serves two main functions: (1) to produce evidence of English usage and (2) to offer an empirical basis for informing pedagogy in a bilingual context.

Creating a Chatbot in Maltese

Dr Claudia Borg

Department of Artificial Intelligence, Faculty of Information and Communication Technology

This work describes the approach taken to develop a chatbot capable of communicating in Maltese in the financial domain. The chatbot is a task-oriented dialogue system and thus the core element of our work is on intent classification, ensuring that the chatbot understands the user's request and provides the correct response. An initial dataset was created based on user stories, which were developed by the industry partner familiar with the onboarding system. The initial dataset had 935 utterances written in English and these were manually translated to Maltese. Given the small size of this dataset and its limitations in the formulation of the requests, it was important to augment the data by including other ways of expressing the same intended meaning. Thus, we used Generative AI approaches, in particular ChatGPT-3.5, to produce different versions of the same user request resulting in 18,677 utterances. These were manually checked for syntax and semantics. Following this, we wanted the system to handle incorrect orthography and thus implemented a set of rules that cause misspellings, e.g., removing the 'għ' or replacing 'ġ' with g. The final dataset contained a total of 36,383 requests. The intent classifier is developed by finetuning BERTu (Micallef et al., 2022) on this data, achieving 96% accuracy. The model is integrated in a framework to enable cloud access and integration to industry requirements.

Bacteriophage display accelerates the discovery of antiviral antibodies

Prof. David Saliba

Department of Applied Biomedical Science, Faculty of Health Sciences

The COVID-19 pandemic and the emergence of other highly contagious viruses have unleashed a profound threat to both global health and economies, underscoring the urgent call for swift and potent antiviral therapeutic breakthroughs. A compelling approach involves the creation of neutralising antibodies designed to intercept and block the binding of viral surface proteins to human host cell receptors, providing a promising advancement in the battle against infectious diseases.

We utilised a Nobel prize winning technique called bacteriophage display to rapidly discover and validate high affinity antibodies that selectively target SARS-CoV-2 and ZIKA viral envelope proteins. We screened a bacteriophage library that displays one billion different antibody variants to hone into highly specific anti-SARS-CoV-2 and ZIKA antibodies.

We determined the DNA sequences of candidate antibodies that bind to various surfaces of the SARS-CoV-2 and ZIKA envelope proteins. Standard computational tools were then employed to translate the nucleotide sequences into the corresponding amino acid sequences.

By performing Nanopore Third Generation Sequencing of the population of antibodies that bind to different targets we are comprehensively determining the landscape of antiviral antibodies.

This research represents an important step towards addressing the pressing need for effective antiviral therapies. With further development and optimisation, these novel antibodies could potentially serve as powerful weapons in our ongoing battle against emerging infectious diseases.

Graphene-based aerogels for the filtration of micro and nanoplastics

Dr Inġ. Anthea Agius Anastasi

Department of Metallurgy and Materials Engineering, Faculty of Engineering

The excessive and escalating production and use of plastics, aggravated by poor waste management practises, have led to widespread plastic pollution. The wide distribution of micro and nanoplastics (MNPs) – plastic particles smaller than 5 mm in size – coupled with the difficulty in detecting these across diverse environments has raised serious concerns on their potential toxicity and adverse environmental impacts. Addressing the imperative need to mitigate human exposure to such MNPs, this study is dedicated to developing graphene-based foams to act as filters for the effective removal of MNPs from aqueous solutions. We are actively exploring diverse synthesis techniques to fabricate nanostructured graphene-based filters with optimal efficacy.

Preliminary findings from filters synthesised through a template-assisted method have demonstrated a commendable capability in effectively extracting nanoplastics from water sources. In pursuit of a more sustainable and eco-friendly methodology, the study is actively engaged in the production of graphene-based aerogels through a wet chemical approach, eliminating the reliance on sacrificial templates. In this alternative synthesis route, a meticulous assessment is being conducted to evaluate the structural integrity and filtration efficiency of the aerogels achieved through two distinct drying techniques: freeze-drying and supercritical point drying. The research places particular emphasis on regulating the size and distribution of pores within the aerogels, a critical aspect that significantly influences the optimisation of MNP filtration efficiency. As the research progresses, these multifaceted investigations aim not only to advance effective MNP removal technologies but also to the broader goal of promoting environmentally sustainable practices in material synthesis.

Poster Stream

VENUE: **Sacra Infermeria Hall**

A1. Optimal Electrode Configuration Selection for Electrooculography-based Eye-Gaze Tracking under Varying Illumination Conditions

Dr Inġ. Nathaniel Barbara

Centre for Biomedical Cybernetics

Eye-gaze tracking may offer an alternative communication modality to traditional keyboards, mice and touchscreens, particularly benefitting individuals lacking fine motor skills or facing mobility impairments. Our team has been exploring the feasibility of using electrooculography (EOG) as an alternative eye movement recording technique for eye-gaze tracking compared to the more prevalent video-based eye-gaze trackers that use cameras to estimate the user's gaze. Specifically, EOG involves the recording of electrical bio-signals that are generated by the human eyes using electrodes attached in periorbital positions around the eyes. After securing funding for the EyeTrack project under the MCST Research Excellence Programme, our team is investigating fundamental aspects of using EOG for gaze estimation. Our ongoing research challenges the state-of-the-art four-electrode setup used for EOG signal acquisition by investigating the impact of different electrode configurations and on the resulting gaze estimation accuracy. Preliminary results indicate that superior gaze estimation performance with electrode configurations other than the conventional setup may be achieved. This investigation is relevant both from a hardware point-of-view, as it establishes the most cost-effective hardware complexity required, and from a signal processing perspective, identifying the channel combinations that yield optimal gaze estimation performance. Additionally, prompted from conflicting literature on whether EOG signals are unaffected by changes in background illumination, the EyeTrack project aims to systematically study the effect of illumination on EOG signal characteristics and to propose suitable compensation methods, with the aim of enhancing the reliability of EOG for gaze estimation.

A2. SMARTGAZE – Control of Devices using EOG-Based Eye Gaze Tracking for a Smart Home Environment

Dr Tracey Camilleri

Department of Systems and Control Engineering, Faculty of Engineering

Controlling devices around one's environment has become increasingly seamless, whereby through control interfaces such as remote controls or touch screens, an individual is able to change the control settings of a device by the simple click of a button or an icon. This type of environment control is however not always suitable for individuals with mobility impairments.

SmartGaze presents an innovative approach to address this challenge by offering an alternative control modality through electrooculography (EOG)-based eye gaze tracking. This involves the use of electrodes integrated in a head-mounted wearable device, to capture the electrical signals corresponding to eye movements. The system tracks in real time the user's position within a smart home environment and monitors the head orientation to ascertain the user's intent to interact with a device. Subsequently, the user can execute one or more pre-defined eye gestures to control desired functions of the device. This work is being conducted in collaboration with Aġenzija Sapport, and the system is planned to undergo testing by both healthy individuals and persons with mobility impairments.

By harnessing the natural gaze interaction inherent in human-device interactions, SmartGaze thus aims to promote independence and enhance the quality of life for individuals with mobility impairments. This technology not only allows such individuals to navigate their smart home environment with ease but also fosters a sense of empowerment and autonomy.

SmartGaze is funded by the Malta Council for Science and Technology under the Smart Cities Programme 2022.

A3. Computational Model and Physical Validation of Inflatable Soft Load-Bearing Elastomeric Implant for Knee Osteoarthritis

Prof. Arif Rochman

Department of Industrial and Manufacturing Engineering, Faculty of Engineering

Currently, medical treatments for early-stage knee osteoarthritis provide limited benefits, merely stalling joint degeneration until interventions like Total Knee Replacement. One potential solution proposes a soft, load-bearing elastomeric device that can be implanted into the damaged knee joint and inflated using minimally invasive arthroscopic techniques. A multi-physics computational model has been developed to analyse the performance of such load-bearing inflatables within the knee joint. Utilising MRI scans of healthy human knees, three-dimensional (3D) models of knees were generated for the analysis. Employing an explicit finite element method, the model accounts for rapid loading rates and typical gait cycle loads. A fluid-to-structural interaction was integrated to accurately replicate loading conditions on the inflatable polymeric device. Two biomedical-grade elastomers, potential materials for the device, underwent analysis. Hyperelastic material models were calibrated, based on tests including uniaxial tensile, compression, planar shear, and volumetric compression tests, as linear models proved inadequate. Simulation indicates that the inflatable device, more effectively distributes loads across the knee joint surfaces, when compared to natural human anatomy, with pressures on the device falling within acceptable mechanical limits of the elastomers. Initial prototypes of the device were developed through injection moulding processes and a knee movement simulator rig was built to mimic flexion/extension knee movement and apply appropriate body load cycling. Soft (thiel-embalmed) cadaver knees were attached to the knee simulator and tested, validating the finite element/volume model and the proof-of-concept of a soft inflatable elastomeric load-bearing knee device. Consequently, this demonstrates promise for further testing and patent application.

A4. Pneumatic Control for Sustainable Compressed Air Systems

Mr Massimo Borg

Department of Industrial and Manufacturing Engineering, Faculty of Engineering

Over the years, sustainable development has gained more and more importance in the industrial sector, with the aim of combatting the adverse impacts caused by excess emissions, and to achieve a carbon-neutral industry. Innovations in pneumatic systems, which are setups utilising compressed air to drive equipment, have also been tackled within this scope. This is of paramount importance as although these setups are widely adopted in industry, they are highly inefficient due to the frequent presence of faults, such as leaks. Furthermore, these faults are often left unattended due to the associated downtime which is incurred when repairing them. Although numerous optimisation methods have been explored, none have considered how these techniques can be used to mitigate the adverse impacts of fault. To address these shortcomings, tests were performed on a multi-actuator setup, exploring different pressure and flowrate control adjustments, with the objective of reducing the excess consumption, whilst minimally impacting production output. Results proved promising with significant consumption reductions recorded. For instance, whilst inducing a 1 mm leak, pressure and flowrate alterations decreased consumption by 16% and 11%, respectively. This was achieved, whilst minimally reducing production output by 2–5%, highlighting that such savings outweighed these reductions. It is envisaged that this study will incentivise further work in this area, which will not only improve the sustainable performance of compressed air systems but will contribute to a greener industrial sector.

A5. Intelligent Optimisation Techniques for Smart and Sustainable Compressed Air Systems

Ms Jasmine Mallia

Department of Industrial and Manufacturing Engineering, Faculty of Engineering

Compressed Air Systems (CASs) are widely used in the automation industry; however, these tend to suffer from a multitude of unnoticed faults, mainly leaks. These losses correspond to an increase in energy consumption and financial expenses, having a direct negative impact on the system's sustainable performance.

Fault characterisation and optimisation for production facilities is one of the main research areas within the context of Industry 4.0. The main aim of such approaches, which are reliant on big data and machine learning, is the detection of faults to improve a system's manufacturing and energy performance. Going a step beyond this, to mitigate the system's loss of performance, it may be optimised to operate under fault conditions. Within this scope, there exists the need to support decision-making during the maintenance processes, due to the difficulty of the human mind to identify the ideal mitigating solution, amongst thousands of possible combinations.

Therefore, this research aims to develop a smart system which utilises intelligent optimisation algorithms, such as the Genetic Algorithm and the Particle Swarm Optimisation, to identify an ideal control solution within faulty CASs. The results of applying these intelligent optimisation algorithms to a typical CASs show that the proposed optimisation approach reduces air consumption during faulty operation. Additionally, this occurs whilst still maintaining the system's productivity, by minimising the change in cycle time.

Thus, this approach contributes a suitable CA control strategy when experiencing a pneumatic fault, which has a direct positive effect on the operational energy performance and costs.

A6. An Islanded Offshore Hydrogen Production Plant with Integrated Energy Storage for Maltese Waters

Dr Oleksii Pirotti

Institute for Sustainable Energy

Offshore wind power is perceived to be a future key player for achieving a decarbonised Blue economy and it has an important role in any future electricity generation mix which seeks to reduce greenhouse gas (GHG) emissions to mitigate climate change. Green Hydrogen (H2) is dubbed the fuel of the future. Its production chain consists of various processes, including seawater desalination by reverse osmosis (RO), electrolysis, and compression for storage and transport. The project "Hydro Pneumatic Energy Storage for Offshore Green Hydrogen Generation – HydroGenEration" is seeking to co-locate wind power as an offshore renewable energy technology with offshore Hydrogen production, storage and vessel refuelling to decarbonise the maritime transport sector.

Offshore floating wind power will always remain an intermittent renewable energy (RE) source, which is even more sporadic in a Central Mediterranean context. Wind power plants pose particular challenges, whether connected to smaller electrical grids or in supplying power to off-grid processes. This is where energy storage fits in; storage decouples the electrical demand from the supply, and can smoothen variability and mitigate intermittency. So, while offshore wind power would appear to be a good match for also decarbonising and electrifying an offshore H2 production system, the latter would benefit from electrical power stabilisation. This is where intermediate energy storage becomes indispensable. In this case,

the energy storage system of choice is the University of Malta's own patented Floating Liquid Piston using Seawater under Compression (FLASC) technology.

The HydroGenEration concept is currently investigated further by means of desk-based techno-economic feasibility studies which explore synergies and optimisation of an offshore system with the FLASC technology integrated between an intermittent offshore renewable energy source and a co-located H2 production plant operating Central Mediterranean deep waters.

A7. Investigation and Material Characterisation of Additively Manufactured Ti-6Al-4V Graded Lattice Structures

Ms Kersty Jo Zammit

Department of Metallurgy and Materials Engineering, Faculty of Engineering

With the aerospace sector's increasing need for reducing emissions to meet sustainable development goals, strategies to reduce mass have become paramount. Lattices are structures with engineered porosity aimed at replacing solid components to reduce component mass and have garnered increased attention. However, stress concentrations between solid and porous sections will arise with an abrupt transition between lattice structures and design features in components such as holes. This work focuses on the generation of lattice structures through additive manufacturing, investigating the material performance of graded lattice structures. Specifically, this research explores lattice cell topologies manufactured through Laser-Powder Bed Fusion (L-PBF) with Ti-6Al-4V, focusing on a gyroid unit cell applying various graded designs to achieve varying strength-to-weight ratios with a smooth variation in both porosity and resulting mechanical properties. The obtained lattices will be investigated using compression, tensile and axial fatigue testing to determine the mechanical performance of monolithic and accompanying graded conditions in varying configurations.

A8. Design and Analysis of a High-Performance, In-Hub Electrical Machine for the Drivetrain for the Formula SAE Race Car

Mr Christian Dalli

Department of Electrical Engineering, Faculty of Engineering

The ever-increasing push towards greener transport is leading the industry towards ever more power-dense and torque-dense electrical machines. This is particularly important for traction applications in the automotive industry especially when it comes to race cars, which are known for their lightweight design, high power output and rapid response capabilities. The proposed research is focused on creating a cutting-edge electrical machine with exceptional performance characteristics which would then be utilised as the drivetrain for the FSAE UM Racing Team. Integrated drive machines have demonstrated their value by reducing weight, lowering manufacturing costs and enhancing overall efficiency. Therefore, they present the ideal choice for a racing car application.

The focus of this research is mainly placed on the design, analysis and implementation of the electrical machine, and the procedure taken to ensure that the motor reaches the required specifications. This research diverges from the current trend

of using gearboxes and advocates for the advantages of direct drive. As of yet, there is still no research from other FSAE teams regarding the combination of both In-Hub motor design as well as direct drive. All the decisions taken, from material selection to slot-pole configurations and modelling methods are discussed and justified.

A9. Structural Integrity Assessment of the DEMO Fusion Reactor Divertor Following the RCC-MRx Design Code

Prof. Inġ. Martin Muscat

Department of Mechanical Engineering, Faculty of Engineering

The DEMO fusion reactor Divertor design group within the EUROfusion consortium use RCC-MRx as the main analysis code for the Divertor's structural integrity assessment. Previous analysis was carried out using a Finite Element Analysis post processing script following the Design by Elastic Analysis rules. During 2023 work was carried out to verify the post processing script and to highlight difficulties in code interpretation encountered whilst using the RCC-MRx elastic design methodology. The difficulties mainly arose in areas of stress singularities, because of non-axisymmetric geometry and loading, because of the component walls being thick rather than thin and due to limited material data for Eurofer97 steel (which is the DEMO Divertor main material). The discussions and conclusions summarise the interpretation and complications encountered in the application of the RCC-MRx rules for a typical nuclear fusion reactor component such as the DEMO divertor design. An additional outcome of this research emphasised the need to further develop the Finite Element Analysis post processing script and to incorporate best practice in implementing the RCC-MRx elastic Design by Elastic Analysis rules for the Divertor components. This tool development would improve the assessment reliability and productivity in order to suggest timely Divertor design modifications.

A10. A Developed PMSM Design Procedure Applying a Fast Analytical Thermal Method for the Aerospace Application

Ms Xuewen Lian

Institute of Aerospace Technologies

This research introduces an advanced design procedure for a high-performance electrical machine, integrating both electromagnetic and thermal design aspects. By coupling these crucial design procedures, thermal calculations can be conducted concurrently with sensitivity analysis iterations. Consequently, instead of being derived separately after completing the electromagnetic design phase, the temperature profile of the electrical machine's nodes can be obtained post-sensitivity analysis. Employing a rapid thermal modeling technique significantly reduces computational costs and operating times. This model utilises matrix arithmetic as a sophisticated adaptation of the traditional lumped parameter thermal network (LPTN). This approach not only saves considerable time, particularly during sensitivity analyses that may involve numerous calculations but also allows for flexible adjustment of model parameters throughout the design process. Additionally, iterative calculation of copper losses, the primary source of heat in the PMSM slot area, is employed to achieve precise steady-state temperatures. The design procedure is exemplified through a 24-slot 8-pole high-speed PMSM, with temperature profiles of various PMSM designs provided for comparison.

A11. A Preliminary Data-Driven Framework to Design Smart and Sustainable Take-Away Food Packaging

Ms Tamasine Camilleri

Department of Industrial and Manufacturing Engineering, Faculty of Engineering

Smart packaging provides additional benefits, over the basic functions of traditional packaging, as a result of increasing consumer expectations for safety and quality, while sustainable goals demand to reduce environmental impacts. Since the COVID-19 pandemic, a rapid increase in take-away orders has been recorded. For this reason, it is essential that take-away food packaging is designed to minimise the negative impacts on the three pillars of sustainability (environment, economy, and society). Sustainable design aims to optimise packaging lifetime, where the integration of smart functions within take-away food packaging promotes the packaging's effective usage time and reduces disposal due to obsolescence.

Furthermore, consumer values determine smart packaging acceptance. Big data analytics allows for the collection of multi-dimensional user data, which contributes to an improved user-experience when interacting with the packaging. For these reasons, designers must adopt a user-centered design (UCD) approach to develop smart and sustainable take-away packaging (SUSTAIN). Studies were conducted with packaging life-cycle stakeholders (food packaging designers, restaurant operators, and consumers) to identify stakeholder requirements. From these studies, framework requirements were established. A literature review resulted in identifying a gap in data-driven design support systems to guide designers when developing SUSTAIN. This inspired the development of SUSTAIN-MULTI-UCD framework, which supports a multi-UCD approach to SUSTAIN in the task clarification design stage. A take-away pizza packaging case study was employed to demonstrate framework capabilities. The contribution of this paper lies in the application of big data analytics in data-driven UCD of SUSTAIN, with potential use in other food packaging applications.

A12. Development and Performance Testing of a Novel Active Vacuum Venting System for Sustainable Injection Molding

Ms Sarah Mifsud

Department of Industrial and Manufacturing Engineering, Faculty of Engineering

Injection molding involves the formation of plastic components by injecting molten material into a mold. Air traps during this process can lead to various quality issues, including functional problems like high residual stresses causing part failure and aesthetic issues such as sink marks or burn marks on the part surface. Addressing these problems is crucial for ensuring the production of high-quality manufactured parts. Traditional methods, such as using passive venting, brings with it design constraints and may be insufficient. An alternative solution is the use of active vacuum venting systems (AVVSs), where air is evacuated from a tightly-sealed-mold by use of a vacuum. However, the current AVVSs are bulky, energy intensive, costly, and require intensive machining to obtain a sealed mold. To overcome these challenges, this study proposes a seamlessly integrable novel AVVS for injection molding. This system requires minimal mold space and machining, making it relatively cost-effective. To validate the efficacy of the proposed AVVS, a case study part susceptible to air traps was designed and validated using Moldflow simulation software. A mold was machined and assembled, incorporating cavity pressure and temperature sensors. As intended, initial molding experiments without the vacuum system resulted in quality issues such as severe burn marks and sink marks, emphasising the necessity for an AVVS. The performance of the novel AVVS was evaluated by analysing the air evacuation rate from the mold, decrease in injection pressure, corresponding energy consumption, and the overall part quality during molding.

A13. Effect of Parametric Modifications and Post-Processing on Surface Properties for Ti-6Al-4V Manufactured using Electron Beam Powder Bed Fusion

Dr Andre Giordimaina

Department of Metallurgy and Materials Engineering, Faculty of Engineering

Electron beam powder bed fusion (EB-PBF) can produce highly complex parts with near-net-shape and minimal waste. EB-PBF parts made from light and high-performance materials such as Ti-6Al-4V have been used in the transportation and energy sectors to produce lightweight parts that can significantly improve energy efficiency and reduce fuel consumption without compromising structural strength. However, parts made using EB-PBF have a relatively high surface roughness compared to traditionally wrought and machined parts. This is partly due to the pre-heating stage, in which powder melting and sintering occurs in addition to the step effect inherent to the additive manufacturing process together with the roughness generated by the melt pool dynamics during solidification. In this work, changes in the beam parameters are investigated to improve the surface properties of EB-PBF produced parts. In conjuncture with this investigation, post-processing techniques, such as chemical immersion will also be utilised to further reduce the surface roughness.

A14. Coordination and Control of Multi-Robot Systems

Inġ. Rachael Nicole Duca

Department of Systems and Control Engineering, Faculty of Engineering

Surveillance and search and rescue applications require optimal coverage of a given environment. The research focus of the proposed work is the optimal coverage of an environment using a multi-robot system, subject to a number of practical constraints, such as energy limitations, different hardware capabilities and environmental constraints. This work proposes a holistic framework that unlike other works in literature, may be applied to practical, optimal coverage applications involving a number of problem constraints.

A15. medicX-KE: Knowledge-Driven AI for Pharma

Dr Charlie Abela

Department of Artificial Intelligence, Faculty of Information and Communication Technology

The contribution of pharmacists to patient care is evolving from the traditional role of dispensing medicine to that of providing pharmaceutical services within a multidisciplinary healthcare context.

An important component for this transformation towards a holistic patient-centric approach is the availability of relevant and up-to-date information about medicinal products that leverages on a robust data collection mechanism. Over the past decade, Knowledge Graphs (KGs) have revolutionised the organisation and utilisation of vast biomedical data. Powered by Artificial Intelligence (AI) and advanced inferencing techniques, KGs unlock the potential to derive valuable insights, discover hidden relationships and enable data-driven decision-making.

As part of the medicX-KE project we have designed and constructed a KG that is tailored for the pharmaceutical landscape. Interviews with a group of pharmacists were conducted to understand their needs and to get feedback on

the suitability of the KG. A medicX prototype has been developed, that leverages on the KG as a centralised repository by integrating data from several authoritative sources including DrugBank, the British National Formulary and the Malta Medicines Authority database. We have furthermore used Natural Language Processing techniques to extract information from published research and used this information to enrich the KG.

The prototype has also been complimented with predictive and explainable features that leverage research advances on Graph Neural Networks. Currently we are investigating problems resulting from polypharmacy with a special focus on drug-drug interactions. However, in the future we want to be able to extend medicX to support research for drug repurposing.

A16. A Scaled Approach for Software Monitors under Cyber Attack

Prof. Christian Colombo

Department of Computer Science, Faculty of Information and Communication Technology

While software monitors can help assure us that our most sensitive software systems are safe, one still needs to prepare for different scenarios, including those where the system is incrementally taken over by an attacker.

In ongoing research, we are looking into ways of protecting the monitor: as a first precaution, we run the monitor in a safer environment, as separate as possible from the rest of the system. If intruders successfully infiltrate the main system, we wouldn't want them to automatically get access to the monitoring system. Yet, if attackers manage to gain full control of the software system, there is little that can be done to stop them from corrupting the monitoring system as well.

In our latest work, we are storing our monitoring system output within a tamper-evident file system. What this means is that even if all else fails and the attacker is able to modify the monitoring system output, at least our file system would be able to distinguish between genuine and tampered monitor output.

How is this even possible? The trick is to use cryptography: we generate a key in the form of a long random sequence of characters. We keep a copy of this key in the safest place possible and intertwine it with the monitor output when it is being stored. This intertwining gives us the ability to audit the monitoring data at a later stage.

A17. AI@UM

Prof. Matthew Montebello

Department of Artificial Intelligence, Faculty of Information and Communication Technology

The Department of Artificial Intelligence (AI) at the University of Malta, established in 1993, fosters a dynamic environment for dedicated resident AI academics and over 100 students to engage in cutting-edge research and education in various AI subfields, including Machine Learning, Deep Learning, Digital Games, Virtual Reality, Augmented Reality, Robotics, Fintech, Big Data, Creative Technologies, Text Processing, IoT, Data Science, AI in Education, and Computer Vision. The department has established itself as the leading force in shaping the future of AI in Malta and beyond tackling real-world challenges, contributing to national strategies, and generating top AI professionals. Apart from equipping students with the theoretical and practical skills to thrive in the AI domain, the AI department collaborates with local industry partners to ensure the cutting-edge R&D has a direct impact on societal progress. By nurturing AI talent and fostering innovation,

the department aspires to spearhead one of the university's research clusters, AI@UM, that aims to facilitate both national and international research cooperation in AI while establishing greater collaboration between academia, Government, and businesses. Through its work the cluster will promote the use of ethical principles, transparent and testable algorithms, and inclusive AI as it becomes a national access point for AI competence.

A18. Explainability of Graph Neural Networks for Anomaly Detection

Mr Gabriel Calleja

Faculty of Information and Communication Technology

The imminent arrival of the European Union's Artificial Intelligence Act (EU AI Act) necessitates a critical examination of explainable AI techniques, particularly in domains like anomaly detection where interpretability is paramount.

Graph Neural Networks (GNNs) excel at modelling complex relationships within graph-structured data, making them well-suited for detecting anomalies in interconnected systems like social, biomedical, financial and cybersecurity networks. Nevertheless, the dynamic nature of some of these networks as well as the "black box" nature of these models complicate grasping the rationale behind their results, raising concerns about fairness, accountability, and transparency, as emphasised by the EU AI Act.

Due to the novelty of GNNs, recognising how data is manipulated during message passage and aggregation is very important. This research explores existing explainability approaches like gradients/features-based, perturbation-based, decomposition, and surrogate models which are pivotal. These approaches explain how GNNs attribute significance to features within complex graph structures and how data manipulation impacts predictions. Nevertheless, GNN based anomaly detection is challenging in a number of ways.

1. First the limited research in designing and implementing explainable GNN models.
2. A lack of investigation of suitable embedding spaces and loss functions, a crucial area needing focused attention.
3. Tackling the issue of class imbalance in model training by devising and implementing effective mitigation strategies to boost model accuracy.
4. Navigating the complexities associated with heterogeneous (dynamic graphs), particularly addressing the challenges introduced by incorporating the temporal dimension.

A19. Tokenisation in Machine Translation Matters: The Impact of Different Tokenisation Approaches for Maltese

Mr Kurt Abela

Department of Artificial Intelligence, Faculty of Information and Communication Technology

Automatic/machine translation is a difficult problem, particularly for low-resource languages such as Maltese. The study explores tokenisation, which is the method used to split and segment the input data to better train a machine translation system. Various tokenisers are used, to better understand their effectiveness on languages that are morphologically-rich such as Maltese. This study places a particular focus on the Maltese-English language pair. We evaluate tokenisers such as Sentence Piece, Moses Tokeniser, OpenNMT Tokeniser, and a regex tokeniser designed for Maltese called MLRS Tokeniser.

Different machine translation approaches and architectures are considered, including models trained from scratch and fine-tuned pre-trained models including mBART-50 and NLLB.

To train and evaluate our models, we intended to use the OPUS-100 dataset, which is a public dataset and is well known within the machine translation community. However, it was noted that there are a number of orthographic errors in the Maltese documents. These errors were inconsistent throughout the dataset as well, meaning in some cases the sentences were correct and in some cases they were incorrect. This can lead to models trained on this dataset to get lower performance. Therefore, we rectify these issues using the MLRS Tokeniser and release an update version of this dataset. We show that after fixing the inconsistencies in the dataset, results increase performance by up to 6 BLEU points over models trained on the original OPUS-100. Finally, we show that using Sentence Piece is crucial to increasing performance. However, using Sentence Piece alone provides better results than pairing it with other traditional word-level tokenisers.

A20. Securing the Future: Quantum Key Distribution and Post-Quantum Cryptography

Dr Inġ. Christian Galea | *Co-researchers:* **Mr Aaron Abela**, **Mr Ryan Debono**

Department of Communications and Computer Engineering, Faculty of Information and Communication Technology

Cryptographic security faces a critical challenge from the imminent capabilities of quantum computers, which can efficiently break traditional schemes like those relying on factoring large numbers or solving discrete logarithm problems. Quantum Key Distribution (QKD) and Post-Quantum Cryptography (PQC) emerge as pivotal solutions to safeguard data in this quantum-threatened landscape.

PQC refers to cryptographic algorithms and protocols that are designed to remain secure even in the era of quantum computers. Hence, PQC is mostly software-based and can thus be implemented fairly quickly. However, the uncertainty of resilience against future quantum algorithms and technological advancements remains a concern.

On the other hand, QKD is a method of secure communication that utilises principles of quantum mechanics to establish a shared secret key between two parties in a way that is inherently (and provably) secure against any computational or eavesdropping attacks. The security of QKD is based on the fundamental principles of quantum mechanics such that any attempt to intercept the quantum key can be detected, ensuring the confidentiality of the shared key. While QKD provides a secure method for key exchange, it is not designed for encrypting the actual communication data, which is typically done using classical cryptographic algorithms. Hence, the combined use of PQC and QKD will likely be required for comprehensive data security.

This talk introduces the pressing threats posed to data and communication security by cryptographically-relevant quantum computers, and the pivotal role played by QKD and PQC in fortifying the resilience and security of our digital future.

A21. Creating Datasets for AI NLP Systems from Translations in a New Frontier: Observations, Challenges and Proposition of Guidelines

Dr Marthese Borg

Department of Artificial Intelligence, Faculty of Information and Communication Technology

This work describes the observations and challenges encountered insofar, while also proposing the importance of methodologies to be adopted, when creating datasets for Artificial Intelligence (AI) Natural Language Processing (NLP) systems specifically through translation of previously existing datasets. The availability of datasets for AI NLP models in Maltese is still severely limited, particularly concerning colloquial and everyday language usage. Consequently, one viable approach for generating new datasets involves the translation of existing datasets from English. However, translating for AI NLP systems introduces a novel frontier from a linguistic perspective, as a key requirement for 'golden standard' datasets tends to be the need for parallel data. This approach enables the AI NLP model to trace the equivalent of one entity to another. However parallel data can have errors, like misaligned sentences, bad sentence segmentation, bad encodings, wrong or mixed language etc. Other challenges are encountered when translating from languages which are relatively different to each other linguistically such as English and Maltese due to the diversity in morphology, word order, etc. Here challenges encompass gender-specific considerations, lexical and usage nuances, localisation details, as well as the translation of metaphors and figurative language, etc. Creating guidelines for such instances is imperative to ensure accuracy, consistency and validity both in the datasets themselves and also transparency in the methods with which they were created.

A22. Automated Content Generation in Intelligent Tutoring Systems: Enhancing Personalised Education and Evaluating Educator Attitudes

Mr Andrew Emanuel Attard

Department of Artificial Intelligence, Faculty of Information and Communication Technology

This research investigates automated content generation in Intelligent Tutoring Systems (ITS) to enhance personalised education and academic performance. ITS are computer programs that provide a personalised education to students by delivering instructional materials. Creating tailored and effective instructional materials for an ITS is a resource-intensive process, often requiring expert involvement.

We propose automated content production as a solution to efficiently generate learner-specific materials, enhancing learning efficacy and ITS scalability. The advantage of this approach is that it ensures consistent, up-to-date educational materials and addresses educator shortages and diverse student locations.

Once the solution was developed, it was empirically tested amongst educators via a questionnaire. The results are promising and feature a high acceptance rate, with 84% of the respondents expressing their satisfication vis-a-vis the content generated. According to 82% of the respondents, the content generated is accurate and 83% of the respondents surveyed indicated that they would use the proposed system in their classroom. As student engagement is essential to learning, we gauged the potential for the proposed system to be engaging to students, 86% of respondents indicated that this would be the case.

Despite these clear advantages, however, ethical challenges, such as data privacy and bias, are identified. Future work will focus on implementing data redaction techniques to prevent personal data from being sent to AI models and a reward model combined with human feedback to mitigate these issues.

A23. Transliterating Maltese to boost Cross-Lingual Transfer

Mr Kurt Micallef

Department of Artificial Intelligence, Faculty of Information and Communication Technology

Multilingual models are often the initial starting point for low-resource languages such as Maltese. Their appeal primarily stems from their impressive cross-lingual transfer capabilities, even when the target language is never "seen" by the model. That said, Muller et al. (2021) show that whenever a language is written in a different script than that of a related language, performance particularly degrades. However, they further show that this can be mitigated by applying transliteration.

Therefore, being related to Arabic, in this work we build a transliteration system for Maltese into Arabic script. A key challenge lies with transliterating Maltese, since it has evolved independently of Arabic for a significant number of years. Moreover, any gains obtained by moving closer to Arabic are diminished due to moving farther away from its non-Arabic influences, such as Italian and English. By performing a small readability experiment on transliterated Maltese, a native Arabic speaker can read words of Arabic origin with ease, but other words prove to be challenging.

Hence, we propose applying transliteration conditionally based on word etymology. For example, consider this sentence and corresponding word etymologies: Il-/Arabic karozza/Non-Arabic għandha/Arabic speed/Non-Arabic fenomenali/Non-Arabic. Texts would be processed such that words of Arabic origin are transliterated, keeping every other word as is. We also experiment with mixing transliterations and translations in a single sentence. The results from a quantitative evaluation on downstream tasks match these intuitions. Etymology-based transliteration gives better results with multilingual model fine-tuning compared to transliterating or translating everything.

A24. Dynamic Quality-Diversity Search

Mr Roberto Gallotta

Institute of Digital Games

Evolutionary search via the quality-diversity (QD) paradigm can discover highly performing solutions in different behavioural niches, showing considerable potential in complex real-world scenarios such as evolutionary robotics. Yet most QD methods only tackle static tasks that are fixed over time, which is rarely the case in the real world. Unlike noisy environments, where the fitness of an individual changes slightly at every evaluation, dynamic environments simulate tasks where external factors at unknown and irregular intervals alter the performance of the individual with a severity that is unknown a priori. Literature on optimisation in dynamic environments is extensive, yet such environments have not been explored in the context of QD search. This paper introduces a novel and generalisable Dynamic QD methodology that aims to keep the archive of past solutions updated in the case of environment changes. Secondly, we present a novel characterisation of dynamic environments that can be easily applied to well-known benchmarks, with minor interventions to move them from a static task to a dynamic one. Our Dynamic QD intervention is applied on MAP-Elites and CMA-ME, two powerful QD algorithms, and we test the dynamic variants on different dynamic tasks.

A25. Imitation Learning using Adversarially Refined Reinforcement Learning

Dr Maria Kaselimi
Institute of Digital Games

This work introduces an adversarially refined reinforcement learning technique designed to emulate human behavior within sequential environments of video games. Human behavior, characterised by stochasticity and multimodality, exhibits structured correlations across action dimensions. In contrast, conventional modeling choices in behavior cloning are constrained in their expressiveness and may inadvertently introduce bias into the cloned policy. Our proposed generative adversarial imitation learning algorithm adopts a guided learning approach, wherein the learner actively receives guidance and feedback from experts throughout the training process. In particular, we train a policy to imitate an expert's behavior by providing rewards that are based on the feedback from a discriminator.

The reward for the policy is computed based on the output of the discriminator. The objective is to maximise the reward for the policy, encouraging it to generate trajectories that are indistinguishable from those of the expert. Our method is evaluated under two different scenarios. In the initial case, we leverage a pre-trained agent, initially trained on bot data, and integrate expert-human knowledge to craft human-like agents with refined capabilities. In the second scenario, we enhance the agent's behavior by training it on human trajectories and incorporating the knowledge of top-performing players, resulting in the creation of human-like agents with improved scores and an enhanced assist-kill-death ratio.

A26. Large Language Models as Game Orchestrators

Mr Marvin Zammit
Institute of Digital Games

Automated Game Generation is an ambitious research goal due to the intricate interplay of various components such as graphics, audio, rules, and levels. While procedural content generation techniques have shown promise for individual facets, synthesizing them into coherent games remains daunting due to the complex constraints they impose on each other. This study proposes the use of Large Language Models (LLMs) as mediators between procedural content generators for different game facets. Specifically, it explores how LLMs can be used to coordinate individual content generators to produce cohesive assets for games. This work tries to assess the effectiveness of LLMs in orchestrating automated game generation, by gauging their ability to harmonise inputs from multiple content generators while maintaining coherence in the final product. The findings reveal that LLMs serve as effective mediators, able to guide different content generators into creating functional game structures, scenarios, and assets. The inherent language comprehension of LLMs facilitates seamless integration of human input, empowering game designers to shape the final product through semantic prompts, promising to streamline the creative process and enhance control over automated systems. However, challenges like the precise management of assets, and specific output formatting require further exploration to realise their full potential. In summary, this study demonstrates the feasibility of using Large Language Models to orchestrate automated game generation. By leveraging their capabilities, game designers can harness the power of automated systems while retaining creative control over the final product.

A27. Affect-Driven Reinforcement Learning

Mr Matthew Barthet
Institute of Digital Games

This project explores a novel paradigm in reinforcement learning where human behavior and emotions are using as reward signals for training gameplaying agents. This concept aims to train agents which not only behave optimally, but can also alter their behavior in order to exhibit desired affective responses, better realising the strong connection between the way we act and feel. Leveraging the powerful Go-Explore algorithm, we demonstrate how emotion is capable of being used as a facilitator for better decision-making during training, and can be used to form powerful reward functions to create a diverse array of agents. This approach challenges the typical supervised learning methods used in Affective Computing by viewing the problem from an RL lens. Furthermore, the project aims to use these affect-driven agents as part of an experience-driven procedural content generator, allowing level designers to quickly generate game content which elicits the desired behavior/ affective responses from their player base. By testing across multiple games and reward functions, the research seeks to understand the nuanced impact of combined behavior and affect signals on agent performance and content generation. The significance of this research lies in its potential to revolutionise affective computing and game design, offering insights into the creation of more immersive and emotionally engaging gaming experiences.

A28. Simulator-Free Visual Domain Randomisation via Video Games

Mr Nemanja Rasajski
Institute of Digital Games

Domain randomisation is an effective computer vision technique for improving transferability of vision models across visually distinct domains exhibiting similar content. Existing approaches, however, rely extensively on tweaking complex and specialised simulation engines that are difficult to construct, subsequently affecting their feasibility and scalability. This paper introduces BehAVE, a video understanding framework that uniquely leverages the plethora of existing commercial video games for domain randomisation, without requiring access to their simulation engines. Under BehAVE (1) the inherent rich visual diversity of video games acts as the source of randomisation and (2) player behavior—represented semantically via textual descriptions of actions—guides the alignment of videos with similar content. We test BehAVE on 25 games of the first-person shooter (FPS) genre across various video and text foundation models and we report its robustness for domain randomisation. BehAVE successfully aligns player behavioral patterns and is able to zero-shot transfer them to multiple unseen FPS games when trained on just one FPS game. In a more challenging setting, BehAVE manages to improve the zero-shot transferability of foundation models to unseen FPS games (up to 22%) even when trained on a game of a different genre (Minecraft).

B1. Disseminating Technocratic Narratives: Public Policies on Digital Infrastructure in Small Jurisdictions

Mr Ben Biedermann

Islands and Small States Institute

After small states led the way in regulating digital asset services, digital identity is becoming an important cornerstone for furthering cohesion policy goals of the European Union (EU). The importance of this initiative is reflected in the formation of the eIDAS Expert Group, tasked with specifying the European Digital Identity Wallet at the intersection of EU regulation and technology. In the group, all EU member states, both large and small, are directly involved without delegating their involvement. Together with the sparse coverage of small jurisdictions in the World Bank's Identity for Development (ID4D) dataset, the representation of places like Malta or the Marshall Islands is not equal to large states. For example, there is almost no research on digital identity in the Marshall Islands. Yet, the jurisdiction has a strong need for digital identity to identify ultimate beneficial owners of domiciled decentralised autonomous organisations (DAOs) under its DAO Act. Moreover, twenty recognised small jurisdictions are not covered by the ID4D dataset. Reviewing the evidence from smaller jurisdictions' perspective questions the EU eIDAS Expert Group's equal representation principle, as smaller states such as Malta and Latvia have limited capacity to dedicate public servants to technological policymaking in supranational entities. Therefore, this research investigates the procurement of digital infrastructure(s) in small jurisdictions by asking: What characterises the technological decision-making processes for digital identity systems in small jurisdictions? A mixed-method approach combines document analysis with multivariate data analysis for developing a maturity index that serves as a tool for policy makers.

B2. Archives and Emotions: An International Interdisciplinary Dialogue

Dr Valeria Vanesio

Department of Library Information and Archive Sciences, Faculty of Media and Knowledge Sciences

This international, interdisciplinary project discusses if and how emotions matter(ed) to both the people whose histories are documented by archives and to those working with the documents these contain. It puts archivists and historians—scholars and practitioners from different settings, geographical provenance, and stages of career—in conversation with one another to examine the interplay of a broad range of emotions and archives, traditional and digital, across national and disciplinary borders, and the social and civic consequences of taking emotions into account.

Such dialogue is crucial, urgent, and overdue. Assumptions of objectivity and emotionless impartiality have long garnered a high status and a sort of neutral high ground to both archives and academic archival research. In recent years, assumptions of emotionless objectivity have rightly been challenged and accepted ways of writing history broadened. The project delves into some of the ways in which this has been and is being done. It provides an overview of how archivists have increasingly been acknowledging the impact of emotions on processes of appraisal and management, for instance, and how historians in turn have recognised the fact that the sources at their disposal have been filtered through emotional dynamics and have an emotional fallout on people and societies at large.

The project includes an edited volume under contract with Bloomsbury, conference organisation and presentations, an interdisciplinary workshop with students.

B3. Cyclical Change in Metacognition Across the Menstrual Cycle

Dr Nicole D'Amato Caruana
Faculty of Media and Knowledge Sciences

This study investigates changes in metacognition across the menstrual cycle among naturally-cycling women. Metacognition, the ability to reflect on and regulate one's own cognitive abilities, is crucial in understanding subjective cognitive impairments often reported without objective performance changes. Despite its importance, research on menstrual cycle-related metacognition is limited. This study aims to fill this gap by investigating metacognitive changes and their association with physical and emotional symptoms. Participants (n=121) completed the Daily Online Metacognitive Evaluation (DOME), a novel questionnaire developed specifically for this study, which included measures of physical and affective symptoms. Over the course of two full menstrual cycles, 7,172 questionnaires were collected. Multi-level modelling and structural equation modelling techniques were employed to analyze within-person individual differences and the relationship between cognitive, physical, and affective changes. The results evidence a menstrual effect on metacognition and demonstrate that individual variations in cyclical change are consistently significant and hold greater importance than average levels of change. Looking at co-variations: cognitive, physical, affective, and headache symptom type changes were correlated but distinct. This study presents the first systematic documentation of metacognitive changes in the context of the menstrual cycle, shedding light on underlying causal mechanisms and informing menstrual symptom classifications. Notably, the evidence of symptom covariation supports the reclassification of metacognitive symptoms as primary symptoms alongside physical and affective symptoms, rather than as behavioural accessory symptoms as currently listed in the DSM-5. Beyond clinical implications, these findings hold significance in shaping social policies, such as those pertaining to menstrual leave.

B4. Night Parade of 100 Demons

Dr Costantino Oliva | *Co-researchers:* **Mr Fabrizio Calì and Mr Marvin Zammit**
Institute of Digital Games

"Night Parade of 100 Demons" is a new research-based mobile game intended to demonstrate the musicality of game players. It features four mini-games, each one tackling diverse musical modalities: through an intuitive interface, players are encouraged to engage with game mechanics with surprising musical results. The game prioritises extemporaneous creativity and spontaneous participation, emphasizing the value of simple forms of musicking, and the unique musical affordances of digital games.

The musical interactions of the game are situated in a Japanese setting. "Night Parade of 100 Demons" references a traditional Japanese motif of the same name, which generally features a riotous performance by an array of yokai spirits. The yokai, which in recent years have transitioned from tradition to modernity, offer a fitting setting to the musical explorations afforded by the game, promoting a mischievous, rebellious attitude toward musicality. The game is based on recent research on yokai, incorporating cultural values in a playful setting.

The project is in an advanced stage of development, and early results have already been validated during a dedicated playtest held in March 2023 at Ritsumeikan University, Kyoto. During the proposed poster sessions, participants will be able to play the game on dedicated tablets: thanks to its welcoming design, the game is immediate and with a very low entry barrier, affording moments of extemporaneous musicking.

B5. Representation Learning for Affect Modeling

Mr Kosmas Pinitas
Institute of Digital Games

Affective computing is the multidisciplinary field that focuses on the development of computational models that effectively capture manifestations of emotions. However, finding a mapping from affect manifestations to affect values is not a straightforward process due to the inherent bias and subjectivity of humans. The subjective nature of the task at hand is reflected into both the quality of the collected data and the intricacies of modeling processes. This work delves into this fascinating field aiming to address qualitative and quantitative data limitations while pushing the boundaries of affect modeling within the context of digital games and beyond.

B6. Music Analysis from a Performer's Point of View

Ms Julia Miller
School of Performing Arts

In what ways a performer's analysis of a musical score is different from other forms of musical analysis?

For a performer the finality of the score is in its execution; accordingly, whatever interpretation is undertaken has that as its overarching goal. The performer has an inward interest in the score, i.e., in its internal structure, and how the work is supposed to sound and be conveyed to the audience; but also, an outward interest, i.e., with particular emphasis on the performing technicalities that are embedded in the work. Performance is also interpretation, where due importance is also given to the instrument, the audience, and the space of performance. These considerations could mean that the score taken from a performer's point of view could yield to a varying interpretation from the more "theoretical" musicologists' interpretation (Cook, 2013). In my presentation of the Ballade op. 6 by Amy Beach, I will illustrate how a performer's analysis – specifically my analysis – of a musical score is done and what are the main driving points behind such an analysis. I will outline briefly recent musicological analytical tools and explain how they offer fresh approaches to a performer's approach to interpreting and outline the challenges that a performer will necessarily keep at the forefront of her thoughts when approaching a score to perform.

Resource: Cook, Nicholas. 2013. Beyond the Score: Music as Performance, (Oxford University Press)

B7. Beyond the Sound of Suffering: Maltese Wind Bands, Funeral Marches, and Meanings

Mr Simon Farrugia

School of Performing Arts

Wind bands in Malta play an important role in Maltese life and culture. Indeed, local wind bands participate in a variety of events which can be attended throughout the year, featuring two main yearly dedications. These are: the wind bands' participation in village saint feasts, playing mostly festive marches, and; the annual village Good Friday processional pageants, during which they play funeral marches. It is worth noting that funeral marches can be heard in diverse settings, such as during funeral corteges, in parish workshops, on the local radio and as background music at Holy Week displays.

The funeral march repertoire in Malta has not yet received the scholarly attention it deserves, so the purpose of this research project seeks to fill this gap. This repertoire reveals considerably as much about the music itself as about the people who compose, transmit, and consume it. Thus, drawing upon established methodologies and theories in ethnomusicology, this study analyses the music itself as well as related aesthetic precepts in relation to its social and cultural significance, and how all this assists in the shaping of associative meanings that range from those which may be considered 'personal' to others which are more 'communal' or 'public'.

The proposed poster will include important snapshots from my research project as explained above, with special attention given to the background, research question, methodology and expected outcomes. Each of these components will be illustrated with relevant images, bullet-point statements, and connecting lines that help viewers understand the connections among the different parts of the project.

B8. A White-Light-Emitting Reconfigurable Pyrazoline-Naphthalimide Logic Gate with Magnesium, Sodium and Proton Inputs

Prof. David C. Magri

Department of Chemistry, Faculty of Science

White-light-emitting (WLE) materials are attracting considerable attention due to their commercial and societal applications in video displays and lighting devices. They are characterised by a fluorescent emission profile from 400 nm to 700 nm. While most WLE systems rely on several coloured components to collectively produce white light, a current research agenda is the development of single WLE chemical entities. However, designing WLE (CIE 0.33, 0.33) molecules is a molecular engineering challenge due to constraints imposed by Kasha's rule. Nonetheless, a number of organic molecules displaying white light have been successfully demonstrated. In contrast, examples of molecular logic gates that emit white light are extremely rare. In this presentation we report a WLE wavelength-reconfigurable and functionally integrated dual-emissive logic gate responsive to metal ion and acid inputs. The logic gate discriminates Na+ and Mg2+ on excitation with 365 nm light by emission of orange and white light, respectively.

B9. Fluorescent Cinchona Alkaloid-Based Copolymers with Intrinsic Logic Behavior

Ms Nicola' Agius

Department of Chemistry, Faculty of Science

Fluorescent natural products have attracted attention from various fields owing to their remarkable physicochemical and structural properties. The Cinchona tree bark alkaloids; quinidine, quinine, cinchonine and cinchonidine are examples of such compounds. Quinine is an ingredient of tonic water, a treatment for malaria, and a fluorescence quantum yield standard. The diastereomer quinidine is used as an antiarrhythmic agent for the treatment of heart conditions. Remarkably, Nature has engineered these molecules with a modular chemical design consisting of a "receptor1-fluorophore-spacer-receptor2-linker" format. In this study, these four alkaloids were polymerised with acrylamide by a one-step free radical polymerisation process and the photophysical properties studied in water. The polymeric sensors function as H+, Cl- -driven INHIBIT logic gates. Bright blue fluorescence is observed in instances where there is high H+ and low Cl- concentrations. Further testing with Br- and I- lead to the conclusion that the logic gates behaved similarly to Cl- with a disabling function thus introducing the OR function. Natural products have therefore been developed into intelligent logic-based materials for chemical sensing.

B10. Advancing Molecular Modelling of Covalent Organic Frameworks

Ms Grace Anne Muscat

Metamaterials Unit, Faculty of Science

Authors: Muscat G. A., Cardona M. A., Farrugia P. S., Grima, J.N., Gatt R.

Covalent Organic Frameworks (COFs) are a class of engineered, porous molecular crystals, constructed from organic building blocks, linked together via strong covalent bond. These frameworks are characterised by an extensive surface area, adjustable pore dimensions, low density, and customisable structures, rendering them versatile for a myriad of applications. To date, a plethora of both two- and three- dimensional (2D and 3D) COFs have been successfully synthesised. Examples include 2D COFs like COF-1, resembling stacked sheets akin to graphite, and 3D COFs such as COF-320, featuring an intricately interwoven diamond-like structure. Mechanical studies of COFs have predominantly focused on 2D systems, where remarkably high negative Poisson's ratio, reaching −1.5, were reported. On the other hand, investigations on the mechanical properties of 3D COFs are limited. A negative Poisson's ratio (auxetic behaviour) implies that a material expands in the transverse direction when stretched. This property leads to enhanced material features, making these materials suitable for various applications ranging from protective gear to medical devices. This study aims to explore the mechanical characteristics of various 3D COFs through molecular modelling techniques. A cohort of 3D COFs were identified and studied through forcefield- based studies. The results obtained show that a number of 3D COFs have the potential to exhibit auxetic behaviour, thereby laying the groundwork for the design and development of another class of inherently auxetic materials at the molecular level.

B11. Towards the unification of multicomponent reactions under green conditions and their products' advanced characterisation

Mr Roderick Abdilla

Department of Chemistry, Faculty of Science

The multicomponent reaction (MCR) approach is a convenient way to be able to synthesise complex small molecules via multiple bond-forming reactions in the same reaction pot from more than two reactants. Each kind of MCR is able to furnish a set of products with the same backbone, hence limiting the potential to synthesise larger molecules that can have broader biological/pharmaceutical activity. In light of this, by making the right choice of reactants, union of MCRs is possible to generate complex highly functionalised end products. During our studies, the latter was achieved via two methods: 1) the insertion of specific MCR products into other MCRs or 2) by using multifunctional (orthogonal) reactants that could react in a multicomponent fashion at different ends of the molecule. These unprecedented MCR unions were performed under mild and environmentally benign conditions by making use of green solvents and heterogeneous catalysts.

Ultimately, the novel products were characterised by infra-red spectroscopy (IR), mass spectrometry (MS) and both single and two-dimensional nuclear magnetic resonance (NMR) experiments that could prove beyond reasonable doubt the final product structure.

B12. Microalgae as Farm Support Technologies: Reviewing the Evidence and Testing with Farmers in Malta and Kenya

Dr Julian Mamo

Institute of Earth Systems

Our study examines microalgae-based agricultural support technologies, notably their capacity to support crop production. This includes reviewing the literature and conducting farm trials with farmers.

Farm trials are being conducted in Malta and Kenya, and thus consider different farm types. Maltese partner farmers rely on commercial farm inputs yet face sustainability threats. Kenyan partner farmers have limited access to commercial inputs and often face food insecurity.

One way the study differs from others on this theme is by looking at the pertinence of these technologies to key farmer priorities, notably raising productivity, resisting biotic and abiotic stresses, enhancing quality and lowering costs. Another difference is exploring their potential to help farmers face looming threats from climate change and land degradation. A third is focusing on the most known, accessible species, which offer greater scope for wider near-term uptake.

One finding of the review was that microalgal inputs are largely neglected. Another was that they have five distinct efficacy pathways, offering multiple benefits to farmers. Some pathways might allow farmers to replace conventional inputs like fertilisers or fungicides, while others address problem objectives like resilience to abiotic stresses and enhanced crop quality. Microalgal inputs moreover seem effective on various farm types. The early farm trials seem to corroborate the multifaceted promise of these technologies.

Ongoing research activities include pursuing the farm trials and launching livestock activities. One future collaboration interest is broadening the farm trials. Another is exploring whether microalgae could be produced locally, thus facilitating farmer access and lowering costs.

B13. The Thermodynamics Measurements and Precision

Dr Emanuel Schwarzhans

Department of Physics, Faculty of Science

Our ability to perform measurements of quantum systems has played a pivotal role in shaping our understanding of the microscopic world. While it is impossible to observe quantum systems directly, quantum measurements provide us with a window through which we can observe the quantum realm indirectly.

Measurement outcomes are usually obtained via a measurement apparatus, i.e., a device which detects and amplifies properties of the quantum system that is measured. This amplified signal comes in from of an output current of the apparatus (e.g., an electric current). The precision of quantum measurements is fundamentally limited by quantum noise which, in term, gives rise to output current fluctuations. While there exist well understood quantum effects, such as entanglement and superposition, that allow for an increased measurement precision (e.g., used gravitational wave detection), the role of thermodynamic constraints on quantum measurements remains an open question. Non-equilibrium thermodynamics dictates properties of the output current fluctuations of detectors in the form of so-called thermodynamic uncertainty relations, bounding the precision of the measurement by the entropy production rate of the measurement device. It has recently been shown that these additional fluctuations can, as well, be suppressed by quantum effects within the apparatus. In the Horizon Europe Project "ASPECTS" we investigate the precise role that quantum effects play for increasing measurement precision with respect to thermodynamic constraints, with the ultimate goal of improving measurement precision at fixed thermodynamic cost.

B14. Mitigating Ruminant Methane Emissions

Mr Jamie Buttigieg

Faculty of Science

This study explores the complex interactions between feed additives and greenhouse gas emissions in small ruminants, with a particular emphasis on the generation of nitrate and methane. The goal of the study is to determine how different terrestrial plants that are locally to Malta can be used as feed additives and how they affect the process of enteric fermentation in small ruminants.

To assess the efficacy of the different additions, the study uses a comprehensive methodology that combines nutritional analysis, gas emission measures, and microbial community characterisation. The goal of the study is to determine how much methane emissions are reduced by adding these plants to ruminants' usual diet. The study also looks into the effect on nitrate production.

Using an in-vitro fermentation technique, the different additions are examined under controlled settings using an in-vitro fermentation approach, and each additive is characterised by quantitative measures of methane and nitrate producing potential. Results show that various additives have varied effects on the rumen's microbial community, essentially regulating the generation of nitrate and methane.

The study's conclusions are relevant to the agriculture industry as they provide useful information on how to lessen the environmental impact of ruminant farming.

B15. Regional Paleoclimate Modelling of the Circum-Sicilian Islands for Ecological Studies of Arthropods

Dr James Ciarlo'

Institute of Earth Systems

Arthropods (insects, spiders, centipedes, etc.) play a vital role in ecosystems, and hence are excellent indicators of ecosystem integrity. Anthropogenic processes (such as climate change and land-use change) are substantially contributing towards the loss of this ecosystem integrity. The multidisciplinary PALEOSIM project (PALEOclimate modelling of Small Islands in the Mediterranean and possible impacts on arthropod habitats) aims to shed light on the processes (natural and anthropogenic) that contributed to the ecological changes of small islands such as the Circum-Sicilian islands (Malta, Gozo, Lampedusa, Pantelleria, Lipari, etc.) in the central Mediterranean.

The project is currently focusing on the generation of new regional paleoclimate simulations of the Mediterranean at a very high spatial resolution of 3km. This is achieved with the state-of-the-art Regional Climate Model, RegCM5 driven by PMIP4 (Paleoclimate Model Intercomparison Project Phase 4) simulations of multiple scenarios. This poster showcases the preparation of these simulations together with their evaluation. The results of the simulations will be applied to the ecological impacts study of PALEOSIM to build a storyline of arthropod habitats throughout the past 21,000 years.

B16. Unified Theory: Topological Connected Sum of Networks, Reconstruction, Molecular Electronic Devices

Dr James L. Borg

Department of Mathematics, Faculty of Science

The connected sum Z of two networks or graphs H_1 and H_2, both on n vertices, is obtained by gluing them together along a common subgraph G of order $n - 1$. The two vertices of Z not in G are called terminal vertices. We consider the case when the original two graphs have the same μ–eigenspace of the 0–1 adjacency matrix. We show that the μ–eigenspace imposes structural constraints on Z depending on the type of the two vertices. Three possibilities can occur leading to the terminal vertices being μ–cv, μ–cfv$_{mid}$ or μ–cfv$_{upp}$ depending on the change -1, 0 or 1 in the multiplicity of μ when a terminal is removed to obtain *G*.

The graphs H_1 and H_2, may be different if the vertices z_1 and z_2 are μ–*cfv*. If on the other hand, z_1 and z_2 are μ–cv, then H_1 and H_2 are identical.

The Reconstruction Problem, still open in general seeks to determine a parent graph on *n* vertices from the *deck of n cards* showing the vertex– deleted subgraphs. We show that a well-chosen single card suffices. The parent can be reconstructed if the card is complemented with additional properties, namely, that μ is an eigenvalue of the parent but not of the daughter and a μ-eigenvector of the parent.

Surprisingly, the same theory fits to determine the electrical properties of carbon molecules, such as fullerenes. The carbon skeleton is a graph in which the vertices represent the carbon molecules and the edges show the bonds between pairs of atoms. The graph $Z + e$ is obtained from Z by adding the edge $\{z_1, z_2\}$. For $\mu = 0$, we investigate the electrical behaviour of a molecular electronic device with structure Z or Z+e, connected at the terminal vertices in a circuit across a small bias voltage. It transpires that the device will be a conductor or insulator depending on the type of the terminal vertices in the 0–eigenspace. We show that conduction or insulation distinguishes between Z and $Z + e$.

B17. 365+ Earthquakes in 1 Year: The Malta Seismic Activity of 2023

Dr Matthew Agius
Department of Geosciences, Faculty of Science

2023 is marked as a very seismically active year for the Maltese islands. The first few months of the year were characterised by the occurrence of hundreds of earthquakes, in some cases several happening on the same day. A few earthquakes had a magnitude of about 5 and were felt by many on the islands. Although historically, this was not the first time that Malta has experienced intense seismicity, this is the first time that such a highly active period has been recorded on a modern seismic network in Malta. The Seismic Monitoring and Research Group within the Department of Geosciences at the University of Malta operates 8 broadband seismic stations across Malta, including Comino and Gozo. The real-time monitoring systems were put to the test with the automatic processing of the hundreds of earthquakes followed by manual verification by the SMRG team. The results yield new and important information on an active fault system to the south of the Maltese islands. Thousands of people visited the group's website for the latest information (**seismic.research.um.edu.mt**), and thousands more (~280K) visited the social media pages in one instance. Furthermore, the SMRG systems located many more earthquakes from around the world, particularly those from around the Mediterranean such as the Turkey, Syria and Morocco major earthquakes and aftershocks. We present the Malta Seismic Network, its operations, the preliminary seismicity map for 2023 highlighting the local seismic regions, and statistics about local earthquakes.

B18. Calixarene tubes with potential auxetic properties

Dr Maria Cardona
Metamaterials Unit, Faculty of Science

The development of intrinsically auxetic synthetic material has been a longstanding goal of the auxetics community. It attempts to introduce chemical tuneability and widen the spectrum of applications for such materials. To date, only one liquid crystalline elastomer has been synthesised and shown to exhibit a negative Poisson's ratio. A number of other molecular structures have been predicted to exhibit auxetic behaviour, including a polymeric network built from calix[4] arenes which mimics an "egg-rack" structure. This structure was, however, deemed too difficult to synthesise. In this study, a different related design was explored. This design uses calix[4]tubes which in turn consist of two calix[4]arenes connected through the lower rim. The upper rims of the calix[4]arenes were connected through rigid linkers kept apart using supramolecular interactions. The overall chemical structure forms a 3D molecular network. The auxetic potential of this system was confirmed using force-field based simulations and a synthetic strategy was devised for the synthesis of this molecular material. This presentation discusses the design rationale of the chosen polymer and presents the progress made in the synthetic route towards the designed polymer, thereby moving closer in the quest for synthetic molecular auxetics.

C1. Biological and Prosthetic Outcomes of Conventional and Mini-Implants immediately loaded with overdentures: Results of up to 8 year (medium term) cohort study

Dr David Paul Mifsud

Department of Oral Rehabilitation and Community Care, Faculty of Dental Surgery

Purpose: To report on an ongoing prospective study to evaluate the biological and prosthetic outcomes of patients treated with immediately loaded mandibular overdentures using two conventional or two mini-implants up to 8 years.

Materials and Methods: Two groups of edentulous patients with functional complete dentures had their lower complete prostheses converted into an overdenture using either two conventional (4.0mm) or mini-implants (<3.0mm) using unsplinted attachments (Locators) and followed up. Implant survival, peri-implant bone loss, prosthetic maintenance and complications were assessed. Results: A total of 50 patients were originally enrolled. 6 patients died and did not reach the 8 year follow up. 32 patients attended the recall appointments (18 in the conventional diameter group and 14 in the mini-implant group). 12 patients could not attend follow up due to mobility issues but were followed up with an online interview. The mean observation period was 55 months for the conventional diameter group and 56 months for the mini-implant group. Peri-implant bone loss, implant loss, prosthetic maintenance and complications over the observed time period will be reported.

Conclusion: The bone loss observed in the first year of treatment was still higher in the mini-implant group but stabilised over time. The prosthetic maintenance and complications were similar among the two groups. This study suggests that both treatment concepts result in a predictable medium-term rehabilitation if monitored regularly.

C2. The Prevalence of Dental Caries in School Children in Malta – findings from the National Oral Health Survey

Dr Gabriella Gatt

Department of Child Dental Health and Orthodontics, Faculty of Dental Surgery

Background: Early Childhood Caries (ECC) is the most common preventable disease of childhood while, untreated decay in permanent teeth is the most prevalent disease worldwide. Dental diseases impact quality of life and tend to affect more disadvantaged populations. The National Oral Health Child Survey study presents the epidemiological findings on dental caries in school children in Malta.

Methods: Sample: A multi-stage cluster sampling technique was used to design this cross-sectional study, including representations of gender, locality of residence and school type across five ages.

Ethical Considerations: The research protocol abided by requirements stated in the World Medical Association Declaration of Helsinki – Ethical Principles for Medical Research Involving Human Subjects, WMA General Assembly, 2008. Ethical approval was obtained from UREC (UREC MD 31/2013).

Methodology: Training in The International Caries Detection and Assessment System (ICDAS) was carried out individually via the eLearning programme portal provided by the ICDAS Foundation. Calibration sessions and inter- and intra-rater reliability analysis using the Kappa statistic were performed.

Clinical examinations held on school premises during school hours used a portable dental unit (Jiangsu Dynamic DU892, Zhengzhou Smile Dental Equipment Co., Ltd. Henan, China) and a standardised source of light (Daray Lighting Ltd., Leighton Buzzard, Luton, UK). Participants were charted for dental caries, erosive tooth wear, dental fluorosis, plaque, calculus, dental traumatic injuries and soft tissue lesions. Each child needing treatment was given a referral note.

A parent-administered questionnaire in both English and Maltese enquired about sociodemographic factors, parental perceptions of oral health, oral health habits, dietary habits and general health factors.

Data Analysis: The primary outcome was the prevalence of dental caries in children. Independent variables were analysed as categorical variables. Descriptive statistics, tests for normality of data, frequencies and cross-tabulations were performed. Non-parametric tests were applied for independent variables. Statistical significance for all tests was set at $p<0.05$.

Results: A total of 2109 children were screened. Prevalence of caries increased with age in both the primary dentition: age three (N = 255) 38%, age five (N = 335) 80%, age eight (N = 350) 71%, and in the permanent dentition: age twelve (N = 640) 69% and age fifteen (N = 529) 80%, and exhibited inequality in its distribution. Gozo exhibited significantly higher rates of reversible caries in the primary dentition (MW UTEST 0.044). The school attended was associated with caries experience in pre-adolescent and adolescent groups (KW Test 0.001). A preponderance of children exhibited poor hygiene practices- poor toothbrushing and flossing frequencies, presence of plaque, presence of untreated trauma, consumption of alcohol (age 12 and older) and cariogenic food sources that increased with age (KW Test 0.014). Maternal level of education, Parental Job (Unemployed > Gainfully employed), oral hygiene practices, dietary choices and self-reported pain/poor oral health were significant indicators for caries.

Conclusions: A high prevalence of dental caries in school-aged children was observed. Behavioural choices and socio-economic factors were indicators of dental caries in children. Malta urgently requires a preventive programme to provide a targeted and enduring oral health programme with the aim of mitigating the findings of this study,

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C3. Undergraduate dental student preferences for learning: a three-year prospective cohort study

Prof. Nikolai Attard

Department of Oral Rehabilitation and Community Care, Faculty of Dental Surgery

Background: This student-centred prospective cohort study evaluated the impact of multimodal teaching methods on student performance in the theoretical domain of dental studies.

Methods: Dental students answered anonymous questionnaires indicating their preferences and opinions three times over three consecutive academic years. Data collected included gender, course, year of study and most frequent and preferred learning modality. Scale responses were tested with the Mann-Whitney U test against gender, program and year of study. Grades obtained from structured examinations held in the third academic year were analysed using the Wilcoxon Signed Rank Test according to the teaching method employed. The level of statistical significance was set at $p < 0.05$.

Results: The response rate was high (> 80%) throughout the study. Acceptance of online modalities increased over time (Kruskal-Wallis test, $p = < 0.001$) and 75% of students requested that online teaching modalities be maintained. Significant differences in gender, course of study, year of study and discipline taught were observed (Mann-Whitney test, $p < 0.05$). Females differed from males by favouring online modalities and face-to-face lectures, respectively, and clinical year students opted to retain pre-recorded online lectures. Recorded lectures resulted better for teaching core knowledge (Wilcoxon Signed Rank Test, $p = 0.034$), while face-to-face lectures were better for teaching applied knowledge (Wilcoxon Signed Rank Test, $p = 0.043$). Student responses to open-ended questions identified the need for a blended approach with in-person lecturing as an opportunity to socialise and avoid mental health issues. Although preferences varied, students showed a willingness to influence their learning and changes in curriculum, a predilection for self-directed learning and the need for freedom in engaging with resources and content.

Conclusions: In the context of this study, online teaching modalities resulted in comparable examination performance and improved student satisfaction. This highlights the need for a blended approach to teaching.

C4. Attitudes and Perceptions of Health Professionals on Oral Health and Oral Health-related Quality of Life in a Long Term Care Facility for Older Adults

Ms Carmen Caruana

Department of Oral Rehabilitation and Community Care, Faculty of Dental Surgery

This research seeks to assess the perspectives on regular oral hygiene practices and how they influence the quality of life related to oral health among individuals working at St. Vincent de Paul, a long-term care facility for elderly residents.

Methodology: A cross-sectional examination was conducted through scientifically validated questionnaires distributed to various staff categories, including administrators, medical professionals, nursing staff, allied health professionals, and caregivers. The sample consisted of 213 staff members, representing 50% of the population.

Results: Demographic analysis revealed trends associated with age, gender, professional level, and ward distribution. Furthermore, distinct and significant patterns were observed among professional groups, highlighting differences in oral hygiene habits and dental care preferences. One notable scientific significant finding emerged from the comparison of health professionals' viewpoints regarding the condition of their teeth. A lower proportion of males, 35.9%, rated their oral health as average to poor compared to 19.3% of females ($p=0.009$). Additionally, bleeding from the gums was notably more prevalent among males (32.3%) compared to females (17.5%) ($p=0.043$). Despite variations, oral health-related quality of life, as measured by OHIP-14 scores, did not significantly differ across demographic and professional categories.

Conclusion: Findings underscore the importance of tailored interventions considering demographic and professional distinctions to address disparities in oral care practices. This study contributes to the understanding of factors influencing oral health behaviours among healthcare professionals within a long-term care facility and underscores the importance of targeted interventions to promote improved oral hygiene habits in order to prevent gingival and periodontal disease. Recognizing factors such as age, gender, and habits can serve as catalysts for motivational purposes aimed at fostering behavioural changes. These skills can subsequently be applied to assist older adults living in long-term care facilities with their daily oral care routines.

C5. Comparing the Diagnostic Performance of a Fluorescence-based Caries Detection tool of an Intra-oral Scanner to the Gold-standard Visual and Radiographic Examination

Dr Anne-Marie Agius

Department of Oral Rehabilitation and Community Care, Faculty of Dental Surgery

Many technologies are being developed to aid in caries detection, however, the gold-standards (visual for smooth surfaces and radiographs for proximal surfaces) to-date remain the same. The in vivo diagnostic performance of an intraoral scanner with an in-built caries detection device based on light fluorescence (IOSFT) was investigated. Seventy-eight participants over four years of age were recruited for a visual examination (based on ICDAS scores), bitewing radiographs and an intraoral scan. 4283 permanent premolar and molar surfaces and 970 primary molar surfaces were studied. The data was tabulated, and tests were run to compare and correlate the different variables and investigate the accuracy of the device. Results indicate that the IOSFT is promising at detecting initial caries and can potentially also be a good predictor for high-risk areas in the mouth. The correlations as well as the diagnostic performance of the IOSFT compared to the gold-standard clinical caries detection methods was significantly better for all primary surfaces, especially so for occlusal surfaces and irreversible lesions. IOSFT performance for secondary caries detection was unfavourable. Scanning time and number of images decreased significantly with operator training time but both the time taken and the number of images were significantly higher for the maxilla (compared to the mandible) and for older participants. Participant acceptance when scanning for caries detection was very high and considered the procedure to be comfortable in most areas in the mouth.

C6. Functional and bioactive packaging solutions to improve the quality of traditional Maltese cheeselets

Dr Foteini Pavli

Department of Food Sciences and Nutrition, Faculty of Health Sciences

FunPack is a project aiming to improve the quality of Maltese cheeselets while also suggesting an alternative to traditional ways of packaging of such products. The use of biopolymers as packaging materials confers certain benefits for the food industry mainly due to their ease of use, their environmental-friendly status, the ability to incorporate antimicrobial compounds to enhance safety or flavour compounds to enhance palatability, while quite recently the inclusion of probiotics into these materials is being proposed. Food products that contain probiotic bacteria are considered as functional and can potentially have certain health benefits to the consumers.

Maltese cheeselets are strongly linked to the Maltese tradition and culture. Such cheeselets are mainly found in plastic containers immersed in brine or individually packed. This project exploits the possibility of developing new coating materials as a form of packaging which contains selected bioactive and natural antimicrobial compounds, while their effect on the safety and quality characteristics of the cheeselets is being assessed. Similarly, the application of probiotic bacteria in the coatings is examined, potentially having a bioprotective effect on the cheeselets, thus spearheading the development of a functional food.

This novel project, besides exploring a new approach for Maltese cheeselet preservation, also proposes a more sustainable way of packaging, which can possibly contribute to the reduction of food waste and elimination of plastic in food packaging material.

The project has received funding by the FUSION Research Excellence Programme 2023.

C7. Assessing consumption of fermented foods in Malta: a tailored approach for local dietary habits

Dr Mario Caruana Grech Perry | *Co-researchers:* **Dr Petra Jones**, **Dr Foteini Pavli**

Department of Food Sciences and Nutrition, Faculty of Health Sciences

Fermented foods undergo lactofermentation, a transformative process where natural bacteria metabolise the sugars and starches in the food to produce lactic acid. This biochemical reaction not only extends the shelf life of the food but also amplifies its nutritional profile, infuses it with health-promoting probiotics, and infuses it with distinctive, complex flavours and textures that are characteristic of fermented delicacies. The initiative, "Development and Validation of the First European Fermented Food Frequency Questionnaire (FFFQ)," headed by a working group which forms part of the COST Action CA20128 PIMENTO, aims to construct and rigorously validate a FFFQ tailored to explore and assess fermented food intake across Europe. The project's broad reach, spanning 32 countries across the continent, including Malta, ensures a comprehensive and inclusive reflection of European fermented food consumption practices. Members of our department has supported this project by designing a questionnaire that captures local fermented food consumption pattern of 12 selected food items. The instrument's successful validation and reliability testing mark a pivotal achievement in the areas of food science and nutrition, broadening our comprehension of fermented food intake in Malta and laying a robust groundwork for future nutritional research and policy development aimed at promoting healthier eating habits locally and facilitating comparisons across Europe. This collective effort is instrumental in achieving the desired representativeness, thereby securing the FFFQ's reliability and applicability within the European dietary context.

C8. Comparison of Microbial Strain Variability Resistance under Pulsed Electric Fields (PEF) and Thermal Treatments: Microbial Targets for Food Safety Assurance

Mr Fotios Lytras

Department of Food Sciences and Nutrition, Faculty of Health Sciences

Pulsed Electric Fields (PEF), is an emerging alternative to thermal process technologies for food preservation, which stands out for its minimal impact on nutritional and sensory characteristics. In this study, we investigated the impact of PEF treatments with an electric field strength of 20 kV/cm and varying total specific energies (88, 136, and 184 kJ/kg) and of classical thermal treatment (62.8°C, 30 min) on microbial inactivation across 20 strains of two model pathogenic microorganisms: Escherichia coli and Listeria monocytogenes.

The findings revealed diverse strain-specific responses among the microorganisms relative to the total specific energy used. Escherichia coli strains exhibited notable Log10 inactivation disparities under 88 and 136 kJ/kg treatments, in contrast with L. monocytogenes strains that displayed significant differences solely under the 184 kJ/kg treatment. Particularly, L. monocytogenes L6 strain emerged as the most robust-PEF resistant, demonstrating under the highest PEF treatment. This result was in accordance with the microbial resistance under thermal treatment (62.8°C, 30min).

Identifying such resilient strains holds crucial implications for establishing tailored PEF treatment parameters or combinations with other hurdles for ensuring food safety. This study underscores the variability among species and strains, which was related to the specific PEF and thermal treatment conditions. These insights emphasise the nuanced nature of microbial resistance, highlighting the need for technology-specific assessments to gauge resistance levels in microorganisms pivotal for public health. Understanding these dynamics is crucial for designing precise and effective PEF treatments, ensuring optimal microbial inactivation, and enhancing food safety standards.

C9. Signals for Quality Assurance in Medicinal Products Regulatory Sciences

Ms Valentina Sammut

Faculty of Medicine and Surgery

Background: In the domain of medicinal product regulation, signals serve as critical elements to support the availability of safe, good quality, and effective pharmaceuticals. The study utilises signals as informative indicators within quality assurance, particularly in the assessment of complex determinants such as competence and compliance. These signals serve as an approach to enhance quality assurance in medicinal regulatory systems.

Objectives:

1. Identify signals and relatable attributes originating from sources within the pharmaceutical regulatory environment
2. Develop an innovative framework for quality assurance of signals
3. Evaluate the role of educational tools in the evolvement of awareness of signals quality assurance in the pharmaceutical regulatory sphere

Methodology:

1. Retrospective analysis of internal audit reports, quality improvement forms, and deviations
2. Retrospective analysis of signals in functional regulatory processes through a focus group
3. Development and validation of a training program

Results: Several opportunities for signal detection within the system, including analysing audit reports, quality improvement and deviation forms. These channels provide insights into potential trends, enhancing the regulatory quality assurance framework. Identified training requirements for signal categorisation underscore the importance of structured modules covering data interpretation, critical thinking, and domain expertise development.

Conclusion: This research reflects on the interplay between data, communication, and governance to enhance the comprehension of how organisations perceive, decipher, and respond to signals in the pharmaceutical regulatory sciences sphere. In undertaking this endeavour, the enhancement of regulatory agility and adaptability, enables entities to adeptly navigate emerging risks and capitalise on opportunities within the regulatory landscape.

C10. Identifying The Impact of the Use of Infographics in Educating Patients on Biosimilars

Ms Francesca Borg

Faculty of Medicine and Surgery

Background: The lower costs of biosimilars, compared to originator biologics, position these biopharmaceuticals as a prime opportunity for more cost-effective healthcare systems.

Purpose: The objectives were to develop a questionnaire and educational infographics to assess how the use of informational material affects patients' perception on biosimilar use.

Method: A questionnaire and informational material in the form of infographics were developed in Maltese and English and validated. One infographic explained what generics are. The other two infographics provided an overview on biologics and biosimilars and criteria to be satisfied for biosimilars to be placed onto the market. The research was conducted in ten community pharmacies around Malta selected by convenience sampling. All patients were provided with the questionnaire and subjected to an educational pharmacist intervention, using infographics.

Results: Sixty-five patients participated in the study. Nineteen patients were apprehensive of the fact they were given a biosimilar rather than the originator biologic pre-pharmacist intervention. Post-pharmacist intervention, only six patients remained apprehensive. Fifty-eight patients either strongly agreed or agreed that there is not enough education on biosimilars. Fifty-four patients found the infographic information detailing biologics, biosimilars, and regulatory criteria to be novel. When evaluated on their comprehension of the infographics, 56 patients answered all questions correctly. Forty-four patients agreed that a pharmacist intervention prior to initiating a biosimilar would have benefitted them.

Discussion: The use of infographics proved beneficial in increasing confidence of patients in biosimilars. The development of validated and easily understood teaching material played an important role in closing knowledge gaps and improving acceptance of biosimilars.

C11. Pharmacist Prescribing in Community Pharmacy Practice

Ms Abigail Buttigieg

Faculty of Medicine and Surgery

Pharmacist prescribing is being implemented around the globe as a means to increase patient access to healthcare services and to optimise use of medicine. The aim is to investigate the concerns and advantages of pharmacist prescribing by analysing community-based interventions and identifying scenarios in which pharmacist prescribing should occur. Patients were recruited in a community setting and divided into two groups based on the presenting complaint. Group A were given a pharmacist recommended medication. Group B were referred to a GP and his intervention was compared to medication given if the pharmacist could have prescribing rights. All patients were followed up after a week where the therapeutic outcome was determined. The study included one hundred patients (49F; 51M), aged 25–34 years. 56 patients (Group A) accepted a pharmacist recommendation and 44 patients (Group B) were referred. Forty-six patients from Group A reported symptomatic relief. From the 10 patients without symptomatic relief, 7 requested a doctor's appointment while 3 opted not to follow-up. Twenty-seven patients from Group B reported symptomatic relief. From the 17 patients with unresolved presenting symptoms, 12 patients opted for a specialist consultation, 3 were admitted to the hospital and 2 opted not to follow-up. In 29 of the 44 Group B patients, the pharmacist's theoretical prescription matched the GP's. The 15 cases,

where prescribing differences between GP and pharmacist have occurred, consisted of 10 cases where minor ailments were treated inappropriately with a broad-spectrum antibiotic, 2 cases of contraindications and 3 cases unjustified glucocorticoid prescriptions.

C12. Quality Evaluation of Clinical Pharmacy Services in an Intensive Care Unit

Ms Ruth Agius
Faculty of Medicine and Surgery

Pharmacists' participation in Intensive Care Units (ICUs) has been shown to improve patient outcomes and it is important to ensure that the service provided is of quality and effective to actually achieve this. This study aims to develop and implement a quality system for pharmaceutical service provision within ICU and to evaluate the activities of clinical pharmacists in intensive care by assessing surrogate clinical outcomes. Phase 1 of the study comprised the development of a policy to provide a structured framework and standardise the provision of clinical pharmacy services in ICU. During Phase 2, a data collection tool was developed to capture drug-related problems (DRPs) and pharmaceutical interventions (PIs) suggested by pharmacists in ICU. PIs recommended by clinical pharmacists over 3 months were recorded, and evaluated by an expert panel to assess the probability of a potential adverse drug event (ADE) occurring in the absence of the PI. The developed policy includes responsibilities and comprises 7 main practices of the ICU pharmacy team. Over 3 months, the ICU pharmacist-patient profiles of 164 patients were considered, where 484 DRPs were identified and a PI was suggested for each DRP. Clinical pharmacists optimised fluid management for 17 patients and managed therapeutic drug monitoring for 35 patients. Of the 113 PIs assessed by the expert panel, 31 were of medium and 63 were of low probability in preventing a potential ADE. This study aids to standardise the participation of clinical pharmacists in ICU and shows the benefits of clinical pharmacists in supporting to optimise patients' surrogate clinical outcomes in ICU.

C13. Enhancing Medication Error Reporting

Ms Julia Micallef | *Co-researchers:* **Ms Marise Gauci**, **Prof. Lilian M. Azzopardi**
Faculty of Medicine and Surgery

Background: Medication errors are a cause for concern. Reporting of errors may reduce medication error occurrence.

Purpose: The study aims to increase medication error reporting (MER) in a local rehabilitation setting by identifying and addressing barriers for report submission.

Method: A validated questionnaire was distributed to doctors, pharmacists and nurses at Karin Grech Rehabilitation Hospital (KGRH) to gauge awareness of the MER system. Data analysis guided the development of improvement strategies. Presentation sessions on MER were organised, QR code flyers to access MER forms were distributed, and a feedback report for staff was created and validated. Post-implementation, MER trends from June-September 2023 and October 2023-January 2024 were compared.

Results: 88% of health care professionals (HCPs) (N=86) were aware of the current MER system in place at KGRH, but 55% never reported a medication error. Most HCPs (87%) regarded the MER form to be accessible, but 35% encountered barriers to report errors. Over 58% of the study population did not know how to access the electronic MER form. Periodic feedback

for submitted reports was considered helpful by 84% of HCPs, although 52% were not aware of the 4-monthly feedback provided. Following implementation of new strategies, a twofold increase in the number of reports submitted was noted, from an average of 13 to 27 per month. The new format was implemented for provision of feedback to KGRH staff.

Discussion: Increasing awareness on MER and improving systems enhances a safety culture, improves patient safety, and contributes towards continuous quality improvement.

C14. Blood Pressure Monitoring in Community Pharmacy

Ms Michaela Vella

Faculty of Medicine and Surgery

Home blood pressure monitoring (HBPM) and ambulatory blood pressure monitoring (ABPM) compliment patient monitoring, assess white-coat hypertension and diagnose masked hypertension.

The objectives were to: 1) Appraise HBPM and ABPM devices, 2) Propose pharmacist interventions supporting patient empowerment of BP self-monitoring, 3) Assess the feasibility of introducing ABPM in community pharmacies.

In phase 1, HBPM and ABPM devices available on the market were appraised. In phase 2, a data collection sheet to assess practice of BP patient self-monitoring and an action plan to facilitate patient empowerment were developed. The data collection sheet and action plan were implemented by means of an interview to 120 participants on antihypertensive therapy recruited from 4 community pharmacies. In phase 3, 10 patients satisfying the inclusion criteria were recruited from phase 2 for 24-hour ABPM monitoring, and feasibility was evaluated.

For phase 1, 25 HBPM devices and 3 ABPM devices available locally were analysed for technical specifications. For phase 2, adoption of HBPM was reported by 66 participants (55%). Pharmacist intervention to empower patients for HBPM included information on benefits and devices available (n=54), adequate frequency of HBPM (n=21). For phase 3, the application of ABPM was accepted by patients (n=8), achieved the 24-hour monitoring (n=9), led to a report which was used by the pharmacist to provide patient recommendations, where 4 patients required physician referral.

The pharmacist-led ABPM service adopted in this study was feasible and contributed to identify patients requiring further assessment. The action plan developed addresses strategies applicable to patients defaulting HBPM.

C15. Piloting Extended Community Pharmacy Services

Ms Valerie Ariane Rivera

Faculty of Medicine and Surgery

Background: A previous study[1] proposed a framework for implementation of standardised clinical community pharmacy services locally.

Purpose: To test the feasibility of implementing extended community pharmacy services.

Method: Observation was conducted in a community pharmacy to identify extended services to be piloted and infrastructure present. The 17 proposed standard operating procedures (SOPs), categorised into medicine use review, patient review, and advice/treatment services, were appraised. Eleven services were selected, corresponding SOPs updated reflecting patient impact and practicality, a new SOP (urinalysis) was compiled, and a pharmacist checklist for each service developed. SOPs and checklists were validated by 4 community pharmacists and 3 general practitioners. Feasibility testing was conducted (300 hours) with a target of 10 participants for each service.

Results: Infrastructure present comprised a private consultation area, one pharmacy support staff, medical devices/consumables, and documentation forms. Eighty-eight participants were recruited; number of participants (n) and time (mean M, range R, in minutes) for services piloted were: Medicine use review (n=10, M=14, R=10–24), patient review services (n=22, M=21, R=14–28), including blood pressure measurement, weight management, or urinalysis, and advice/treatment services (n=56, M=17, R=11–26), including eye, ear, skin conditions, sore throat, urinary tract infections, smoking cessation, routine immunisation, or international travel health. Pharmacist interventions were non-pharmacological advice (n=88), referral to general practitioner (n=43), and/or pharmacotherapy recommendations (n=42). The majority of participants (n=87) were satisfied with pharmacist interventions.

Discussion: Availability of the necessary infrastructure and utilisation of practical SOPs and checklists support feasibility and successful implementation of extended community pharmacy services within a collaborative care context.

[1] Cancellu, O. (2022). Clinical Pharmacy Services in Primary Care [dissertation]. Msida (Malta): Department of Pharmacy, University of Malta.

C16. Proposing an Educational Framework for the Specialisation as a Responsible Person in Pharmaceutical Processes

Ms Bettina von Brockdorff

Faculty of Medicine and Surgery

The Responsible Person (RP) educational requirements in pharmaceutical wholesale distribution are not extensively defined via formal educational competency frameworks. This research aimed to identify current RP educational and workforce requirements, establish and evaluate relevant knowledge, skills and competencies, and develop a validated competency educational framework for attainment to the RP position. Content analysis was used to identify currently defined RP educational and workforce requirements internationally. Two Delphi rounds with an expert panel were conducted to develop a validated tool to identify Competencies Relevant for the RP role (COMP-RP Tool). Interviews with stakeholders were conducted to identify current educational needs. Subsequently, the RP Competency Framework (RP-CF) based on the validated COMP-RP tool incorporating a competency matrix was proposed and validated by stakeholders, presenting competency clusters and learning outcomes providing a potentially implementable deliverable. From 22 countries, 17 required the RP to be a pharmacist while five countries required other educational background and 16 countries did not specify the number of years of experience required. In the COMP-RP Tool, 58 criteria from the originally proposed 63 criteria of knowledge, skills and competencies were categorised into six competency domains. The generic and specific skills identified by the six stakeholders were grouped by themes. The final RP-CF consisted of six competency clusters describing validated skills, knowledge with generic and specific competencies presented as learning outcomes. The framework includes a validated competency matrix which summarises the six clusters into three identified competency bubbles. The RP-CF may be adapted and implemented in curricula internationally.

C17. Pharmacist contribution in transitioning of care of paediatric diabetic patients

Mr Jonathan Vella

Faculty of Medicine and Surgery

The process of transitioning from a paediatric clinic to an adult clinic is an inevitable process for paediatric patients suffering from type 1 Diabetes Mellitus (T1DM). The aims were to i) identify challenges and concerns of patients and their carers during the transition of care ii) explore expectations of patients and their carers with respect to the role of the pharmacist during the transition.

Three questionnaires were developed and validated. The 'Patient self-assessment Questionnaire' addressed teenage patients in order to assess the self-management abilities and knowledge of their diabetes whilst highlighting predictors leading to uncontrolled DM. The 'Parent's Concern Questionnaire' explored the concerns of the patient's carers regarding the transition phase. The 'Role of the Pharmacist Questionnaire' focused on the perception of patients, carers and healthcare professionals with respect to the expectations on the pharmacist's role.

A total of 41 patients answered the patient questionnaire and 22 parents answered the parents questionnaire. The main concern experienced by patients and parents during transition was reported to be that of having to change physician (22 patients and 15 parents). With respect to the pharmacist contribution, out of a total of 35 respondents, 19 agreed that the pharmacist should be involved during the transition process. Understanding the challenges and concerns of the patients and their carers during the transition phase supports optimisation of the transition plan. Identifying patient and healthcare team needs that can be addressed by pharmacists ensures that pharmacist interventions are evolved to meet service needs.

C18. Exploring participants' and providers' views of a nurse-led smoking cessation intervention for individuals with diabetes

Mr Joseph Grech

Faculty of Health Sciences

Introduction: Tobacco smoking poses added risks for those living with diabetes, who often struggle to adopt cessation interventions, resulting in low success rates. To address this, a tailored intervention was developed and pilot-tested before a feasibility trial. This study aimed to gather perspectives from participants and nurse educators, the providers, to enhance the intervention further.

Methods: Using maximal variation sampling, semi-structured interviews were conducted with 15 out of 34 individuals with type 1 or type 2 diabetes who participated in the study intervention between November 2022 and July 2023. Participants were recruited from diabetic clinics within the two main acute public hospitals in Malta. The intervention included three to four 30-minute behavioural support sessions and a six-week Nicotine Replacement Therapy (NRT) provision. All three diabetes nurse educators who delivered the intervention were interviewed. The interview transcriptions were analysed using applied thematic analysis.

Results: The participants reported finding the intervention helpful and supportive, while the nurses viewed it as part of diabetes education. Most participants (n=10) and the nurses found the provided NRT helpful for reducing/quitting smoking. The nurses acknowledged a lack of experience/confidence in delivering the intervention but found the provided guide helpful. Despite limited availability, the nurses suggested extending support for continuing smokers, by adding an extra session, totalling four instead of three.

Conclusion: The participants were satisfied with the intervention provided, perceiving it as useful. Based on the feedback received, the intervention was revised to include an additional follow-up session for continuing smokers, totalling four sessions.

C19. Analysis of the Metabolic Status of a subset of the Maltese Population over 8 Years: A Longitudinal Cohort

Ms Elizabeth Grech

Faculty of Medicine and Surgery

Metabolic disease is a well-established issue in the Maltese Islands. Prevalence rates of metabolic diseases have also increased over the years. 'SAHHTEK – The University of Malta Health and Wellbeing study' was the last representative national cross-sectional study conducted between 2014 and 2016. This study explored type 2 diabetes mellitus and impaired fasting blood glucose as well as their co-determinants at a population level. Establishing potential population-specific risk factors for these metabolic diseases requires a longitudinal cohort study in order to determine the possible causal relationships between different risk factors and lifestyle choices across time.

This nested cohort study will follow a sub-population of the SAHHTEK study. A randomised selection of participants stratified by gender, district and age group will be invited to take part. Participants will answer a validated questionnaire, blood samples for complete blood count, renal profile, HbA1c, fasting blood glucose, liver function test and lipids will be collected, and a physical examination (height, weight, blood pressure and waist circumference) will be performed. Data collected throughout the study will be inputted into an online platform then statistically analysed.

We expect additional cases of undiagnosed metabolic diseases relative to the SAHHTEK study due to a potential decrease in preventive care and changes in population behavioural factors during the COVID-19 pandemic. This research will provide a useful source of data for local policy makers in terms of post-pandemic recovery plans and may serve as a local template for other cohort studies to be carried out in the future.

C20. The CRISO project-case report 2

Mr Justin Lee Mifsud

Department of Nursing, Faculty of Health Sciences

The CRISO project aims to develop a preventive program targeting a potential risk group, facilitating opportunistic screening, improving professional contact, and encouraging risk assessment and support for first-degree relatives. We present three Maltese siblings with a premature ASCVD family history attending CRISO. The eldest, aged 43, showed no lifestyle improvements after 12 months. The middle sibling, aged 41, demonstrated increased physical activity and improved Mediterranean diet scores. The youngest, aged 32, ceased smoking but showed fluctuating lifestyle changes. Both brothers retained hyperlipidemia by program's end, but maintained blood pressure and heart rate within normal ranges. The eldest had elevated anthropometric measures, while the younger had favorable BMI and waist circumference attributed to his lifestyle. The sister had a lower risk profile due to her younger age. Despite being asymptomatic, both brothers were offered CT coronary calcium scoring. The middle sibling's scan revealed severe coronary calcification, emphasizing the program's significance. Prompt intervention with statin therapy aims to mitigate the risk of myocardial infarction and death. Monitoring and support will continue for risk modification, including persuading the eldest sibling to undergo assessment. This case underscores the CRISO project's role in identifying high-risk individuals and implementing timely interventions to prevent cardiovascular events.

C21. The TERESA Patient Assessment Tool – a Model for Predicting Rehabilitation Potential in Older Adults in Malta

Ms Francesca Muscat

Faculty of Health Sciences

Malta's ageing population is on the increase, presenting a growing challenge to the nation's healthcare system. With the ongoing reduction in the duration of acute care in hospitals, there is an increasing demand for effective rehabilitation services for older adults. The ageing demographic transition has led to a rise in the number of older adults living with frailty, reduced mobility, heightened disability, and often accompanying cognitive and psychosocial issues. As a result, the need for a standardised approach to assess patients for admission to Malta's sole rehabilitation hospital has become increasingly urgent.

In Malta, the number of beds available in the rehabilitation hospital has remained almost static over time, and this has intensified the need to establish an equitable and transparent process for evaluating the eligibility of older adults for admission. Addressing this issue is not only crucial for immediate patient care but also for informing policymakers and healthcare planners as they anticipate the evolving needs of an ageing population. This research carried out a comprehensive analysis of existing evidence-based practices and the local assessment process. The primary objective was to identify potential areas for improvement, with a focus on promoting fairness, transparency, and efficiency in inpatient

geriatric rehabilitation admissions. Subsequent to this assessment, rigorous research and evaluation were conducted to propose a new method that could potentially alleviate the current system's shortcoming to improve healthcare outcomes for older adults. TERESA Patient Assessment tool was designed for this research, aimed to serve as a resource to guide clinicians' assessments and informing their decision-making process regarding the rehabilitation potential of older adults.

C22. Nurse-initiated response to clinical deterioration in acute ward settings: a scoping review

Ms Alexis Borg Sapiano

Faculty of Health Sciences

Background: Understanding nurses' responses to clinical deterioration and their autonomous interventions is limited despite their important role in detecting changes in patients' conditions.
Objective: To investigate the initial response by nurses in managing acutely ill deteriorating patients until the attending doctor arrives.

Design: The Joanna Briggs Institute (JBI) guidelines and the PRISMA extension for scoping reviews were used for evidence synthesis and reporting.

Data sources: The electronic search of Cochrane Library, PubMed, Scopus, Cumulative Index to Nursing and Allied Health Literature (CINAHL), MEDLINE, and Google Scholar from September 2019 to December 2023. Keywords included nurs*, deterioration, and "acute care." These terms were combined using "AND" and "OR" in Boolean search operations.

Review methods: Extracted data included study aims, sample, setting, design, and key findings. Thematic analysis was performed.

Results: 32 articles met the inclusion criteria (17 qualitative, 6 quantitative, 1 mixed method, 2 literature reviews, 2 integrative reviews, 1 scoping review, and 2 systematic reviews). Four main themes emerged: Gathering information to guide response, Taking the lead, Care escalation practices, and Influencing factors.

Conclusion: The frontline role of nurses in initiating interventions during clinical deterioration is often overlooked. Nurses rely on early warning scores, yet lack detailed intervention instructions, leading to care variability. Despite this, nurses take proactive actions within their scope of practice while awaiting medical review. Involving nursing professionals in care escalation pathways ensures accurate representation of their roles and autonomy within their scope of practice, while training in critical care skills is essential for an effective hospital-wide response.

C23. The ECHOES project – A platform for sharing expertise in health

Dr Jose Guilherme Couto

Department of Radiography, Faculty of Health Sciences

The distribution of healthcare expertise is uneven across Europe, resulting in unequal accessibility to educational opportunities for graduates, and this may influence the quality of patient care delivered by these graduates. The lack of expertise is particularly accentuated in smaller and low-income countries, exacerbating healthcare education and practice disparities.

Addressing this issue, the ECHOES Project emerges as a pioneering initiative with the fundamental goal of creating a digital platform to facilitate the exchange of healthcare expertise among universities throughout Europe (and eventually worldwide). This platform allows healthcare professionals and educators to register their specific areas of expertise, enabling universities to connect easily with these experts for collaborative educational and research activities.

The project's implementation follows a structured approach. It commences with extensive research on expertise gaps across Europe to inform the development of the ECHOES platform. Subsequent phases involve creating the platform and an extensive dissemination campaign targeting healthcare experts and universities across Europe.

The project outcomes encompass heightened collaboration and knowledge sharing among universities, broadening graduates' access to advanced expertise across the continent. This, in turn, enhances the capabilities of healthcare professionals and fosters a culture of continuous upskilling, which is essential for positive disruptions within the field. The project, funded by an ERASMUS+ grant [2023–1-MT01-KA220-HED-000156744], engages five full and 12 associate partners in this transformative endeavour.

C24. Genomics of Idiopathic Hypogonadotropic Hypogonadism: An Evaluation of Fertility and Hormone Profiles in Gonadotropin-Releasing Hormone Receptor Heterozygotes

Mr Clayton John Axiak

Faculty of Health Sciences

We initiated this project with the aim to use genomics to delineate the genetic epidemiology of Idiopathic Hypogonadotropic Hypogonadism (IHH) in the Maltese population. IHH is characterised by deficient gonadal function resulting in the delay or absence of puberty and fertility. Utilizing high-throughput sequencing data from individuals with IHH, we found several pathogenic variants, two of which are novel. Within this cohort, we consistently encountered GNRHR p.Q106R in a heterozygous state. GNRHR is an autosomal recessive gene that encodes the gonadotropin-releasing hormone receptor (GnRHr). This variant is known to cause partial loss of function. From a follow-up study on 493 DNA samples from a Maltese neonatal cohort we found that this variant is at least 10 times higher in the Maltese compared to other populations worldwide. These are notably high frequencies suggesting a founder variant.

We measured hormone levels for gonadotropins, sex steroid hormones, adrenal, and pituitary hormones and evaluated questionnaire data for demographic, puberty and fertility characteristics in 1000 adults from the Maltese Acute Myocardial Infarction collection. We found no statistically significant differences in hormone levels or fertility characteristics between heterozygote and wild type individuals, except for lower TSH levels in older heterozygous men. These findings suggest that the GNRHR p.Q106R variant does not affect fertility or hormone levels in heterozygosity, challenging the pathogenic

characterisation of this variant in existing literature. GNRHR p.Q106R heterozygotes exhibiting IHH characteristics must have oligogenic interactions that drive pathogenicity or an environment factor such as diet or body mass is at play. Our research contributes to the understanding the impact of genetic variants impact on population-specific allele frequencies and their potential clinical implications, emphasizing the importance of genetic screening especially in population subsets with fertility issues.

C25. A validated, vendor-independent, free, and fully-automated tool for measuring patient outline and flagging truncated slices for the purpose of estimating radiation dose in adult abdomino-pelvic CT

Mr Eric Pace

Medical Physics Unit, Faculty of Health Sciences

Background: Accurate estimation of patient radiation dose in CT requires contouring the patient boundary from axial images. These must be free of foreign objects, such as the CT couch-top. Additionally, the patient must fully fit in the scanned Field of View, i.e. without truncation. As each study has hundreds of images, manual contouring is not feasible. This work sought to automate the contouring process, flag truncated images and calculate the radiation dose to the patient.

Method: The developed tool used a deterministic image processing pipeline for contouring and truncation flagging. Validated performed by four medical physicist using a 5-point Likert scale on 700 individual images sampled from 368 studies performed on fifteen different CT scanners from three different manufacturers.

Results: 98.5% of contoured images were given a score of 4 or 5 (5 being perfect). Regarding truncation flagging, 98.9% of images were correctly classified. As the tool was developed to make use of all available CPU cores, the average speed for contouring and truncation flagging was 47.6 images per second on a six-core CPU.

Conclusion: Validation of a random sample of images from across CT models and manufacturers showed that the tool is highly accurate in both contouring and truncation flagging as well as being vendor-independent. The speed of processing means that the tool can be operated in real-time on large datasets. As the tool may be used locally within the hospital environment, there are no data protection issues. The work has been published in the European Journal of Medical Physics, Physica Medica and has already been cited.

C26. Ethical issues in Photovoice: A report

Ms Sarah Cilia Vincenti
Faculty of Health Sciences

Photovoice, a participatory action research method, is increasingly being acknowledged as an effective tool to empower marginalised communities. It does, however, raise considerable ethical issues since fieldwork involving photography is conducted by participants. The limited available literature on photovoice ethics was reviewed prior to planning a project with adult women with Attention Deficit Hyperactivity Disorder and submitting a protocol for ethical clearance.

This presentation discusses the ethical challenges identified in the planning stages of the project, such as the danger of reifying disempowerment, issues of identification, representation and ownership, avoiding excessive researcher control and lack of promised social change. An overview of some negotiations with the Research Ethics Committee is, additionally, provided. Moreover, the discussion lays out the strategies implemented to circumvent ethical difficulties in this ongoing project, both those borrowed from the literature and those conceived by the research team.

This presentation seeks to inspire potential photovoice researchers who may be discouraged by the ethical complexities interwoven in photovoice. Academics on Research Ethics Committee boards, who may not be familiar with the epistemological grounding of participatory action research, may, similarly, find the presentation insightful. Participatory action research and photovoice impel a paradigm shift in social science research. The politics of knowledge generation on campus may contrast diametrically with those of a community. Deliberations surrounding the tension between the need for methodological rigour and the duty to honour the wisdom of the community one sets out to empower should intrigue social science researchers and students.

C27. Development of a digital competency framework for the health workforce

Ms Bernice Azzopardi Meli
Faculty of Medicine and Surgery

Background: Digital health involves the integration of information and communications technology in healthcare (HC), which has the potential to reshape how healthcare is delivered. The purpose of digital health is enhance efficiency and improve health outcomes. Healthcare professionals need specific competences to successfully utilise new technologies.

Methods: This research aims to address the identified gaps in digital competency frameworks through a systematic approach. It involves evaluating existing competency frameworks and conducting in-depth interviews with individuals from different HC professions to identify core digital competences needed by the healthcare workforce. Additionally, the Delphi method will be employed to validate and create a best-practice competency framework for digital health.

Results: Preliminary findings underscore the importance of developing a robust framework that encompasses technical and enabling competences for practitioners at various levels of the HC infrastructure. Key domains identified include leadership, procedural, and enabling competences, essential for effective digital health transformation.

Discussion: The proposed framework will serve as a guide for enhancing digital competences among healthcare professionals, ensuring ethical and effective utilisation of digital health tools. The development of this framework has made it evident that in addition to training the health workforce in digital competence, we also need to understand the current healthcare system landscape.

Conclusion: This research endeavors to contribute to the ongoing digital transformation of healthcare by identifying and validating essential digital competencies. By incorporating key domains and addressing ethical implications, the resulting framework will facilitate the effective utilisation of digital health tools, ultimately improving healthcare provision and patient outcomes.

C28. The Magnitude of Threatened Miscarriage in Malta

Ms Lara Sammut

Department of Radiography, Faculty of Health Sciences

Vaginal bleeding (VB) prior to the 20th week of gestation, with fetal cardiac activity and a closed cervical os on clinical examination is known as threatened miscarriage (TM). VB associated with TM in the first trimester of pregnancy may lead to a miscarriage later in pregnancy in more than 50% of patients. Of those women who progress with the pregnancy, there is a known increased risk of both maternal and fetal complications along the pregnancy.

According to the Directorate for Health Information and Research, the governance and legal framework of the local National Obstetrics and Information System states that ever since the year 2000, when national obstetric statistical data started to be collected, only information regarding deliveries of 22-week gestations and over have been collected and processed. Since statistical information regarding first trimester pregnancies has never been documented and local research in the field is limited, it is difficult to perceive the degree of TM on a national level.

A quantitative retrospective cohort design was chosen to quantify the magnitude of TM in Malta and generate the required statistics. The presentation will focus on the results of this study, providing details related to pregnancy outcome, including miscarriage, normal pregnancy outcome and any diagnosed abnormalities throughout the pregnancy or at birth. The data collected sets the stage for a prospective study on the topic to determine the prognosis of women who register themselves at the Accident & Emergency Department of an acute, general hospital, with symptoms of TM.

D1. Investigating the Global Proteome Changes Arising in Colorectal Cancer upon Gaining 5-Fluorouracil resistance

Mr Isaac Micallef

Centre for Molecular Medicine and Biobanking

Development of effective colorectal cancer (CRC) related therapeutics remains challenging due to innate or acquired chemoresistance arising. Predicting treatment response in CRC has strongly relied on genomics, transcriptomics and epigenomics. Despite being of benefit, these omics approaches fail to provide any assessment at a protein level. This ongoing study aims to investigated changes arising at a proteome level following 5-Fluoruracil (5FU) resistance development in different CRC cell lines. Three CRC cell lines underwent dose-escalation 5FU exposure for 6 months. Utilising the CCK-8 assay, 5FU sensitive and resistant (5FUR) cells were compared to determine the IC50 fold increase in resistance. To understand the changes arising following 5FUR development, global proteomics was performed by a Label Free Quantitation (LFQ) mode using an Easy nanoLC-Orbitrap Fusion Tribrid system equipped with a Nikkyo-C18-nano Column. Data analysis was performed using Proteome Discoverer v2.4 and Perseus. 5FUR cells for all three cell lines were successfully established with each displaying a significant fold increase in resistance after 6 months treatment. Through mass spectrometry, data dependent acquisition (DDA) proteome analysis between 5FU sensitive and 5FUR cells revealed over 6000 proteins (FDR <1%) in each cell line comparison. Volcano plot analysis and cluster analysis revealed significantly dysregulated proteins in 5FUR cells when compared to the sensitive cells (>1.5-fold, p-value). Gene Ontology (GO) analysis of dysregulated proteins is ongoing to understand which pathways are enriched following 5FU chemoresistance. So far this study revealed several significantly altered proteins in 5FUR CRC cell lines. It is anticipated that this could provide initial discovery stages of 5FU resistance mechanisms from a proteome perspective, for predictive biomarker discovery. Moreover, due to the group's interest, changes arising at a methyl proteome level (protein methylation) is also being investigated in parallel.

D2. Characterisation of the Bioactivity of a Novel Bioactive agent for the treatment of Leukaemia

Mr Neil Cutajar

Centre for Molecular Medicine and Biobanking

This study investigates the differentiation-inducing effects of polyphenolic compounds from Maltese extra virgin olive oil (EVOO) on acute myeloid leukemia (AML) cell lines HL-60, NB4R2, and KG1A. Using liquid-liquid extraction and Prep-HPLC, compounds were isolated from crude EVOO. MTT and NBT assays evaluated cytotoxicity and differentiation activity, with morphological changes observed via Leishman staining. Flow cytometry detected alterations in cell surface markers and the cell cycle post-treatment. Notably, a component from the EVOO extract exhibited significant differentiation activity on the NB4R2 cell line. Secretome analysis assessed protein expression changes, shedding light on the compounds' mechanisms of action. These findings contribute to understanding the potential therapeutic applications of EVOO polyphenols in AML treatment.

D3. Investigation of the effect of pesticides commonly used and abused in Malta on the proteomic landscape of the colon lining and their role in the development and progression of colorectal cancer

Ms Kimberly Fenech

Centre for Molecular Medicine and Biobanking

Agriculture relies on high amounts of pesticides as an economic tool to increase crop production and maintain high quality products. In 2020, Malta recorded the highest average of pesticides sought by sample (474 pesticides) out of all EU member countries. Two of the most used and sometimes abused pesticides locally are chlorpyrifos and glyphosate. There are numerous health effects associated with pesticide exposure, one of which is cancer. Most studies investigating this link focus on agricultural workers or residents of agricultural areas. However, clear links between pesticides and the molecular biology of cancer initiation and progression are only highlighted in a limited number of studies. Additionally, research is lacking on the effects of pesticides when consumed through contaminated food or water which is the main route of administration in the public. Colorectal cancer (CRC) is the third most diagnosed cancer in Malta. More than half (55%) of CRC cases are attributed to modifiable risk factors related to the lifestyle and environment including the diet. Therefore, the research question of this study is, do pesticides chronically present in the body contribute to colon inflammation, metabolism changes and subsequent CRC initiation, progression and drug resistance? Our aim is to investigate the effects of chlorpyrifos and glyphosate on the biochemical and phenotypic characteristics in normal and CRC cell lines where our hypothesis is that these pesticides will promote an increase in the protein expression of enzymes involved in cell metabolic pathways, proteins involved in oncogenic signalling pathways, drug transporters and inflammatory markers.

D4. Supplementary Breast Cancer Screening in Women with Dense Breasts: Insights from European Radiographers and Radiologists

Ms Deborah Mizzi

Department of Radiography, Faculty of Health Sciences

Purpose: This study explored the understanding of challenges and requirements for implementing supplementary breast cancer screening for women with dense breasts among radiographers and radiologists in Europe.

Method: Fourteen semi-structured online interviews were conducted with European radiologists (n=5) and radiographers (n=9) specializing in breast cancer screening from eight different countries. The interview schedule comprised questions regarding professional background and demographics and 13 key questions divided into six subgroups, namely Supplementary Imaging; Training; Resources and Guidelines; Challenges; Implementing supplementary screening and the Women's Perspective of Supplementary Imaging. Data analysis followed the six phases of reflexive thematic analysis.

Results: Six significant themes emerged from the data analysis: Understanding and experiences of supplementary imaging for women with dense breasts; Challenges and requirements related to training among clinical radiographers and radiologists; Awareness among radiographers and radiologists of guidelines on imaging women with dense breasts; Challenges to implement supplementary screening; Predictors of Implementing Supplementary screening and Views of radiologists and radiographers on women's perception towards supplementary screening.

Conclusion: The interviews with radiographers and radiologists provided valuable insights into the challenges and potential strategies for implementing supplementary breast cancer screening, including patient and staff related

challenges. Implementing multifaceted solutions such as Artificial Intelligence integration can address these challenges and promote the successful implementation of supplementary screening. Further research and collaboration are needed to refine and implement these strategies effectively.

Limitations: The data collection period coincided with the reopening of screening units after COVID-19 closures. During this period, participants were exceptionally busy, which limited their availability to partake in the study.

D5. Beating Cancer! It takes more than myelosuppresive treatment to save patients with haematological malignancies

Ms Ruth Pace

Faculty of Health Sciences

The overall purpose of this study is to enhance the effectiveness of infection prevention and control practices among highly vulnerable patients with haematological malignancies receiving myelosuppressive treatment, ultimately saving lives.

A qualitative exploratory investigation of current nurse-led infection prevention patient education (IPPE) practices, and into patients' and main caregivers' behaviours will expose gaps in infection prevention and control measures. Information giving alone does not guarantee the desired behaviour adaptation crucial to protect vulnerable lives. Behaviour modification theories and models shed light on a thorough needs assessment process, with further consideration to supporting facilitating factors and reducing barriers towards more effective IPPE practices, supporting patients and caregivers modify behaviours to reduce risk of morbidity and mortality from preventable infections. Therefore, the research question is:

What are the needs of nurses, patients and their families/carers for more effective nurse-led infection prevention patient education among adult patients with haematological malignancies receiving myelosuppressive treatment?

The research protocol:

Phase 1: Generation of a hybrid model of behaviour modification for patients with haematological malignancies.

Phase 2: Data collection in 4 stages and from three sources; nurses, patients and their main caregiver. The analysis of each source will inform the development of the following method

Phase 3: Generation of an intervention to improve/facilitate nurse-led IPPE, based on the hybrid model (phase 1) and data analyzed (phase 2).

The expected outcome of this study is to generate an evidence-based intervention for effective IPPE addressing behaviour modification, reducing morbidity and mortality of patients with haematological malignancies on myelosuppressive treatment.

D6. Functional and Structural Characterisation of Two Novel PP2A Isoforms

Ms Abigail Anne Dalli

Faculty of Medicine and Surgery

A decrease in activity of protein phosphatase 2A (PP2A) has been observed in various forms of cancer. PP2A functions as a molecular switch in the regulation of various signal transduction pathways including the AKT pathway. Overactivation of the AKT pathway coupled with a decrease in PP2A activity are implicated in the molecular pathogenesis of various forms of cancer. Previous studies (Grech et al., 2015 to date) have identified two novel isoforms of the protein phosphatase 2A (PP2A) catalytic subunit in chronic myeloid leukaemia. These two isoforms result from the loss of exon 5 and exon 2, respectively. The objective of this proposed Ph.D. thesis is to assess the validity of these two novel PP2A isoforms as diagnostic and prognostic biomarkers of mainly breast cancer and other forms of cancer such as colorectal cancer. Currently, on the expression and purification of these isoforms and the wild-type protein is being optimised in vitro in Escherichia coli cells and using various chromatography methods. In various cancer cell lines, the wild-type and isoform levels are being detected and quantified using PCR and quantitative PCR (qPCR) methods. This work in progress includes assessing the biophysical properties of these proteins, by identifying partners of the isoforms that may divert the direction of downstream signals and by conducting functional cellular assays to determine whether these isoforms support tumourigenesis.

D7. Using Omics to Identify Bone Genes

Ms Marichela Schembri

Department of Applied Biomedical Science, Faculty of Health Sciences

Osteoporosis is a complex hereditary skeletal disease characterised by low bone mass andmicroarchitectural deterioration, leading to an increased fracture risk. To date, around 20% of the underlying genetic factors are known, emphasising the need for further research efforts in the field of osteoporosis. From the research and clinical perspective, advances in knowledge about the genetic basis of osteoporosis is beneficial since knowing the casual gene/s underlying the disease will allow healthcare professionals to identify osteoporosis prediction biomarkers and drug targets based on a person's genetic make-up. The GRIT (Genetics of osteoporosis In MalTa) project will be using innovative omics techniques with the aim of identifying potentially causal genes and gene variants contributing to low and high bone mass. Samples from the Malta Osteoporotic Fracture Study (MOFS) will be utilised in this project and the resulting genetic findings will be tested in the case-control collection of more than 1000 Maltese individuals to replicate the findings. This project has received financial support through the FUSION R&I Technology Development Programme LITE 2022 (R&I-2022–007L) awarded by the Malta Council for Science and Technology (MCST).

The wealth of data generated from the GRIT study will widen the knowledge on the genetics of bone pathophysiological mechanisms and pave the way for future follow-up studies, including translational models.

D8. Establishing a Patient Centred Medical Device Body

Mr Julian Fearne
Faculty of Medicine and Surgery

In the continuously changing environment of healthcare, medical devices play an important role in improving patient safety and quality of life. Recent advances in technology and regulatory systems have triggered a shift in medical device legislation. The Medical Device Regulation (MDR – (EU) 2017/745) and the In-Vitro Diagnostic Medical Device Regulation (IVDR – (EU) 2017/746) superseded the directives governing medical and in-vitro diagnostic devices, marking a change in the regulatory environment.

This research aims to contribute to this transitional time by developing a framework for a patient-centred medical device body. The overarching goal is to provide a comprehensive transition framework for medical device regulation, which will assist stakeholders in understanding and complying with new regulatory requirements. The methodology is divided into four phases.

The first phase focuses on developing a Medical Device Quality Management System and determining the basic regulatory criteria needed to enable a patient-centred approach. The second phase of the project focuses on the creation of a centralised Medical Device Incident Reporting System, which streamlines processes and procedures for incident reporting in the medical device domain. The third phase focuses on establishing a Digital Medical Device Management System (MDMS), designed to manage the manufacture, notification, distribution, vigilance, and surveillance of medical devices on the market. The MDMS is intended to improve transparency and accessibility by allowing stakeholders and the general public to validate devices, report undesirable events, and contribute to enhanced market access for all. The fourth phase is dedicated to finding gaps in essential medical device training and continuous professional development, ensuring that medical device operators are proficient to handle the evolving regulatory landscape.

D9. Clinical outcomes at long-term follow-up of COVID-19

Ms Rachel Anne Xuereb
Faculty of Medicine and Surgery

Background: The long COVID syndrome is defined as persistent physical, cognitive and/or psychological symptoms that continue for more than 12-weeks following the acute illness.

Purpose: To determine the incidence of physical and psychological symptomatology at long-term follow-up in subjects previously infected with COVID-19, as well as any derangement in blood investigations at follow-up.

Methods: 995 patients were randomly selected from all individuals who were diagnosed with COVID-19 infection following nasopharyngeal swabbing. They were interviewed so as to assess for persistence of symptoms and health-related quality of life using a post-COVID questionnaire and the Short Form Survey (SF-36) respectively. Blood investigations were also taken.

Results: The median (interquartile range, IQR) age was 49 (36–60) years and 43.3% were males. 5.9% had been hospitalised. Follow-up was for a median of 811 days (IQR: 789–855). Twenty-one percent of the participants claimed that they were feeling worse than they felt before COVID-19. The most common symptoms were abnormal taste of food (41.8%), anosmia (40.8%), fatigue (25.9%), headache (22.4%), shortness of breath (22.1%) and myalgia (21.8%). The SF-36 questionnaire revealed that hospitalised patients fared worse only with respect to physical functioning as compared to non-hospitalised patients

(p=0.003). Patients with persistent fatigue were found to have significantly elevated platelets and GGT, as well as lower albumin levels following multivariate adjustment. Likewise, subjects with persistent shortness of breath had significantly higher AST levels and lower albumin levels on multivariate analysis, indicating ongoing inflammation and liver injury. With regards biochemical investigation in hospitalised compared to non-hospitalised patients at long-term follow-up, the former were found to have significantly higher troponin levels as well as lower eGFR, following adjustment for possible confounders.

Conclusions: A significant proportion of post-COVID patients were symptomatic at a median follow-up of 881 days. In addition, symptomatic subjects exhibited deranged biochemical markers in keeping with ongoing inflammation and liver injury. On assessing hospitalised patients, higher troponin levels were noted at long-term follow-up, suggesting underlying myocardial injury. Further studies are needed to assess whether such injury will result in impaired ventricular function at longer follow-up.

D10. In-vitro coagulation effects of branded vs. generic/biosimilar anticoagulant drugs

Dr Nicoletta Riva

Department of Pathology, Faculty of Medicine and Surgery

The patents of several anticoagulant drugs have expired over the past few years, thus several unbranded drugs with more affordable prices were recently marketed. The available unbranded anticoagulant drugs include several generic versions (i.e., copies of chemical branded drugs with the same active ingredient) of the direct oral anticoagulants, and several biosimilar versions (i.e., highly similar versions of biologic drugs) of the low molecular weight heparins.

We are currently performing several research projects with the aims: i) to compare the in vitro coagulation effects of branded vs. generic/biosimilar anticoagulant drugs; and ii) to better characterise the effects of these anticoagulant drugs on a panel of coagulation assays.

We evaluated the direct oral anticoagulant rivaroxaban, in its branded version (Xarelto®) and two locally available generics (Rivarolto® and Rivaroxaban Sandoz®). A wide range of concentrations was achieved by in vitro spiking of normal pool plasma with the three rivaroxabans. The results obtained on the coagulation assays by the three rivaroxabans at similar concentrations were comparable, showing that the branded and generic rivaroxabans exert an identical in vitro anticoagulant effect.

We are currently evaluating another direct oral anticoagulant (the generic apixaban) and a low molecular weight heparin (the biosimilar enoxaparin). Future research should also assess the in vitro dissolution of generic drugs, by creating models similar to the gastrointestinal tract.

D11. Investigating the Potential of Novel Treatment Combinations to Promote Chronic Wound Healing

Mr Lian Bonnici

Department of Anatomy, Faculty of Medicine and Surgery

Chronic wounds are characterised by reduced proliferation and migration of keratinocytes and fibroblasts which lead to incomplete wound closure. This study aims to develop and investigate the effect of combinatorial treatments consisting of epigenetic modifiers A (DNA demethylating agent), B (histone deacetylase inhibitor) and an insect-derived natural product X on the proliferation and migration of human dermal fibroblasts (HDFs) and keratinocytes (HaCaT).

All experiments were carried out on HDFs and HaCaT cells. The treatment regimen consisted of a 48-hr treatment with the combination of A and B followed by a 72-hr treatment with X. This was investigated on the proliferation of the two cell types by an MTT cell viability assay and cell cycle analysis. Wound healing assays were done to investigate the effect of the treatment on migration and a cytotoxicity assay on healthy white blood cells was also performed.

The treatment promoted the proliferation of HaCaT cells. However, it did not show a significant difference in the proliferation of HDFs. Cell cycle analysis showed an increase in the %G2M phase for HaCaT cells whereas no significant change was detected for HDFs. The treatment promoted the migration of both HaCaT and HDFs. The treatment also showed minimal cytotoxicity on healthy monocytes and lymphocytes. To conclude, the treatment demonstrated the potential of promoting wound healing. In the near future, qPCR, RNA sequencing and ELISA will be performed to elucidate the mechanism of action.

D12. Adult acute psychiatric admissions following Emergency Department (ED) attendance for recreational drug use in Malta (MDH & GGH), 2016–2022. What were the presenting psychiatric features associated with a psychiatric admission?

Dr Jeffrey Bonnici

Faculty of Medicine and Surgery

Background: We explored psychiatric features associated with acute psychiatric admissions after adult (>16 years) Emergency Department (ED) attendances for recreational drug use in Malta's two public general acute hospitals, Mater Dei Hospital (MDH) and Gozo General Hospital (GGH).

Methods: This is a retrospective study of all adult recreational drug use attendances to the two EDs in Malta between the 1st January 2016 and the 31st December 2022. The most reported psychiatric features and the use of sedation were further analysed to determine if any of these were more likely to result in a psychiatric admission in this cohort of patients. Recreational drugs will be deemed to have been involved if the patient self-reported their use, or if these were later found in drug toxicology tests, one not excluding the other. Intoxications associated with self-harm, drug withdrawal, trauma and lone alcohol ingestions were excluded. Data was collected using Excel® and then analysed using SPSS®-software. The Mann-Whitney U test, and the Pearson's chi-square or Fisher's exact test were used for statistical analysis. A p-value <0.05 was considered statistically significant.

Results: Out of the 4123 adult patients that attended the EDs of MDH and GGH during the 7-year period following recreational drug intoxication, 765 (18.5%) were transferred directly to a psychiatric facility (Mount Carmel Hospital, Short-stay ward), following the ED assessment. Drug-related psychosis (15.1%), agitation/aggression (32.3%), anxiety (26.4%) and hallucinations (7.2%) were the most common psychiatric features, whilst sedation was used in 14.2% of these patients. Of these, only drug-

related psychosis was found to be associated with a psychiatric admission in this cohort of recreational drug users attending the ED (p= 0.011).

Conclusion: The presence of anxiety, agitation/aggression, psychosis, and hallucinations in individuals presenting to the ED with recreational drug intoxication underscores the diverse and potentially severe mental health effects of these intoxications. This study highlights the importance of prompt and comprehensive medical evaluation and intervention for patients with recreational drug-related issues, particularly when symptoms escalate to drug-related psychosis, which often necessitates psychiatric admission for specialised care and management.

D13. Risk assessment on Local Antidote Availability: Are we prepared?

Ms Paula Gambin

Faculty of Medicine and Surgery

Background information: Globally, antidote preparedness has been identified as a major challenge. This study recognised a gap in literature on the local situation of emergency preparedness with regards to antidotes and deficiencies in local antidote availability. Identification of risks is crucial for the development of risk management strategies.

Purpose: To perform a risk assessment of antidote availability and accessibility in Malta.

Method: Data was collected after ethics approval, on antidote availability and accessibility through: (i) vertical audits of eight antidotes at the central procurement unit and two acute general hospitals, (ii) onsite-observations and (iii) meetings with experts in the field. Thematic analysis of data collected was performed for risk identification. A focus group was established for the validation of identified risks. Validated risks were inputted into a qualitative risk matrix developed for each antidote.

Results: Thirteen risk themes were identified, and all were validated by a nine-membered expert focus group. The top three risk themes were: (1) Problematic sourcing of antidotes, (2) Inadequate antidote stocking and, (3) Lack of national strategic plan.

Conclusion: Findings indicate need for healthcare system optimisation in national emergency preparedness. Prioritised risk themes have been utilised in the development of guidelines and recommendations on the optimisation of emergency preparedness based on risk management principles. This study recommends the establishment of cooperation agreements at a local, European and global levels with the objective of facilitating the availability, accessibility and usability of antidotes in a timely and organised manner.

D14. Best Practice Implementation Strategy For The Use Of Oxytocin During Labour

Ms Rebecca Marie Falzon

Faculty of Medicine and Surgery

The unstandardised use of Oxytocin (OT) gives rise to different concentrations, doses, rates and duration of infusion adhered to globally. This project aimed to develop a Best Practice Implementation Strategy for OT use during labour. Current practice was evaluated by compiling data from 30 parturients during 2022, excluding elective caesarean sections and weaknesses in the local system identified by applying the PCMCH' Safe Administration of Oxytocin Implementation Toolkit'[1]. A Best Practice Strategy was developed and validated by an expert panel. OT was used in 17 cases, 10 of which were inductions. The average Apgar Score at 5 or 10 minutes was 9 and no NPICU admissions were recorded. From the 7 cases where the frequency of contractions was more than 4 in 10 minutes OT was used in 6 cases. Two out of four cases where variable decelerations with concerning factors were noted, OT had been used. The Strategy developed focused on optimising practice through the development of checklists to support documentation, reducing risk of errors. The checklists were discussed with an expert panel for practicality and applicability. Sessions were carried out with midwives working at Labour Ward to disseminate the strategy and sensitise the safe use of OT and the implementation of the developed checklists, which are feasible and practical to use and contribute to documentation practices ensuring standardisation of use and improving patient safety.

[1] Provincial Council for Maternal Health and Child Health. Safe Administration of Oxytocin. Implementation Toolkit. Ontario:2022.

D15. Genetic Characterisation of a proband/kindred with Congenital Heart Disease

Ms Giulia Aquilina

Department of Pathology, Faculty of Medicine and Surgery

Congenital Heart Disease is a rare disease affecting around 1% of the population. Within the past few decades, a minority of patients diagnosed with this disorder were known to survive until adulthood, hence the research in this field is ever growing. The dissertation titled "Genetic Characterisation of Selected Probands/Kindreds with Congenital Heart Disease" presents a comprehensive study aimed at elucidating the genetic underpinnings of congenital heart disease (CHD). The research encompasses two primary aims: Primarily it aims at the establishment of correlations between genotype and phenotype in probands/kindreds affected by CHD, and secondly aiming at the exploration of the genetic burden of variants associated with CHD within the Maltese population.

To achieve these goals, a trio-whole exome sequencing approach is employed, enabling the simultaneous examination of the proband with their parents. Hence allowing the identification of any de novo and inherited genetic variations. In silico protein modelling of found variants allowed a comprehensive overview towards the effect of said variants, whilst annotation and frequency analysis allowed the derivation of population specific burden of CHD. These methodologies ensure a comprehensive assessment of genetic factors contributing to the development of CHD, facilitating a deeper understanding of the underlying mechanisms and potential therapeutic targets.

The findings of this dissertation hold significant implications for clinical practice, genetic counselling, and public health interventions in Malta. The identification of genetic variants in correlation to CHD, especially with regard to de novo or inherited variations, gives in depth insight into the pathophysiology of this disease. Through these, this study contributes

to the development of personalised medicine, early detection, and prevention strategies for individuals and families affected by CHD. Moreover, it provides a foundation for future research in the field of cardiovascular genetics and paves the way for advancements in precision medicine tailored to the Maltese population.

D16. Blending Traditional and Virtual Approaches: A Guideline for Podiatric Care within Primary Care Settings

Ms Lisa Ann Stojmanovski Mercieca

Faculty of Health Sciences

Introduction: Notable increase in telemedicine during the COVID-19 pandemic was striking, yet its integration into podiatry lacked an empirical foundation. Therefore, guidelines grounded in robust research to navigate this evolving landscape and seamlessly merge with conventional practices are needed.

Methods: A podiatric telemedicine guideline explicitly tailored for primary care settings was collaboratively developed through a modified Delphi method spanning three iterative rounds. Service users, podiatrists, and policymakers were engaged in focus group discussions, followed by an extensive questionnaire in the subsequent round comprising a diverse array of statements filtered from these discussions. In the third round, statements underwent final consensus. Only statements with 80% agreement or higher were deemed suitable for integration into the guideline.

Results: Stakeholders emphasised the importance of articulating clear expectations and elucidating this innovative approach's manifold benefits and nuanced limitations, especially in serving low-risk patients within primary care settings. Furthermore, integrating traditional and virtual podiatric practices holds promise for enhancing podiatry services, facilitating better continuity of care, and offering a means of triaging to facilitate more timely interventions.

Discussion: This guideline forms part of a broader study and a pilot study is in the pipeline to empirically evaluate the feasibility and efficacy of implementing this guideline in a primary care setting. Collectively embracing evidence-based practices can drive the domain of podiatric care to unparalleled levels of excellence, seamlessly integrating virtual and traditional practices. Hence, foot and ankle healthcare providers are encouraged to adopt this guideline, and consider the option of providing blended podiatric care.

D17. The Art of Living with a Chronic Illness in Adolescence: Facilitating Perceptions and adaptation through Art Therapeutic Interventions

Ms Stephanie Savona Ventura

Department of Psychology, Faculty for Social Wellbeing

Background: Medical art therapy has been indicated as an effective tool to allow the expression of emotions when addressing issues related to chronic illness in adolescence, specifically in T1DM.

Aim: This study aimed to explore the lived experiences of adolescents diagnosed with T1DM by using art representation to facilitate expression.

Methodology: 17 adolescents were asked to create an artistic representation of their personal experience of being diagnosed with T1DM. The artwork was explored through a semi- structured interview. Participants were recruited through the attending consultant at Mater Dei Hospital.

Results: Analysis of results retrieved 5 prominent themes which describe the psychological processes of being diagnosed with T1DM in adolescence. The themes include: The Emotional Roller- Coaster of T1DM [shame, loneliness, sadness, anxiety, and love: n = 17]; Living with T1DM [practical aspects of diabetes management: n = 4]; The Adaptation Process [acceptance and adjustment: n = 5]; The Importance of Social Support [family, healthcarers and peers: n = 3]; and Growth and Resilience [n = 3].

Conclusion: Using art as a therapeutic tool to encourage reflection and expression of emotions was an effective technique in the research process. By using art, the researcher was able to consolidate the adolescent's narratives and help them reflect safely about their own understanding of their condition and the emotions they feel, acknowledging their resilience and supportive factors, and finally accept the growth they have experienced along the way.

D18. (Un)Equal Financial Decision-Making Realities among Heterosexual Married Couples in Malta

Ms Nadia Abdilla

Faculty for Social Wellbeing

This research is about exploring what goes on behind closed doors when it comes to young heterosexual married couples' financial decision-making. It addresses an area that has been largely overlooked, if not entirely unexplored, within the local context of Malta. This research adopts a critical feminist epistemological approach and seeks to understand the (un)equal realities and negotiation practices that take place when dual career, married, heterosexual couples discuss their finances. It has at its core the exploration of marital power dynamics and the extent of women's financial control and independence in such relationships. The adoption of such a feminist, reflective approach allows for the possibility of deconstructing the complex relationship between marital financial inequalities and how the same inequalities relate to the social re-construction of roles that both men and women recreate in marriage during their financial negotiation practices. To attain a comprehensive understanding of this subject matter, a multi-layered approach is taken into consideration. It further explores the interplay between the personal, contextual, and legislative/structural factors and how ideologies influence the couple's negotiation practices when it comes to household financial decisions. To do so, a qualitative method has been adopted with data being collected via semi-structured interviews with couples. Interviews are conducted both jointly as a couple and separately. Furthermore, interviews with legal experts and local

financial service providers are intended to provide a broader viewpoint on how structural factors influence and shape the individual's meaning-making process vis-à-vis money in marriage.

D19. Business Entropy – the inevitable shift to chaos

Mr Andrea Delicata | *Co-researchers:* **Inġ. Joseph A. Bartolo**; **Prof. Russell Smith**
Centre for Entrepreneurship and Business Incubation

Entropy may be considered as the degree of disorder, randomness or uncertainty within a system. And it is a universal truth that entropy increases over time leading to disorder within any system. The Entropy Framework of the New Standard Model (Smith and Wragg, 2021) provides an opportunity to assess drivers towards disorder. It comprises 25 Factors that are grouped into three 'Enneads' of nine Factors together with a 'wild card' Factor (for example, COVID-19). The three Enneads are grouped as follows:

- Entropy PESTLE Ennead. The six external factors that can influence the behaviour of customers and competitors over time, being: Political, Economic, Social, Technological and Environmental.
- Entropy CUSTOMER Ennead. The six factors that impact upon Customers, the Market and Demand being: Notice, Like, Want, Need, Acquire and Replace (the Purchase Pathway).
- Entropy COMPETITOR Ennead. The sis activities needed to generate demand from the market in response to competitor actions, being: React, Adapt, Innovate, Implement, Improve and Increase.

The Entropy Framework provides an integrated framework (including Timing, Customers and Competitors) for the assessment and potential management of the shift to disorder over time. This is likely to become a useful management tool for both business founders and mentors (allowing for a more thorough assessment compared to the common SWOT Analysis (Strengths, Weaknesses, Opportunities, and Threats) and is the most recent focus of research from CEBI.

D20. First, do no harm (primum non nocere)

Prof. Russell Smith | *Co-researcher:* **Inġ. Joseph A. Bartolo**
Centre for Entrepreneurship and Business Incubation

Incubator facilities, for new enterprises, can be traced back at least 75 years to Bell Laboratories in the USA. Much later, in 1943, 'building 20' at Massachusetts Institute of Technology, went on to gather almost legendary status because of new technologies that were developed there. In the last 50 years, incubators and accelerators have become quite common in many countries. All such facilities offer shared space at low cost for new businesses. Some, but not all, offer forms of mentoring for new business owners. Almost all operate with external mentors drawn from professional advisers, such as lawyers and accountants, together with established business people and, sometimes, business angel private investors. These are usually all volunteers.

Experts who volunteer their time to support new, often young, enterprise founders can only be applauded. However, in the absence of formalised business mentoring it is to be expected that such volunteer mentors give guidance from a particular perspective. And that means that assessment and advice can be contradictory for different volunteer mentors. In the worst case, should the volunteer mentor give advice outside of their knowhow (the combination of expertise and experience) then

there is the possibility of causing real problems. Volunteer mentors would do well to remember the Hippocratic oath, familiar to physicians, that states, "First do no harm" (Primum non nocere).

This presentation summarises the methodology adopted at our own TAKEOFF incubator to help overcome this challenge.

D21. A Qualitative Analysis for Understanding the Decision-Making process by nurses in Triage

Mr Stephen Agius

Department of Marketing, Faculty of Economics, Management and Accountancy

Introduction: The emergency department (ED) is essential for providing urgent medical care, with triage being a pivotal process for efficient patient flow and quality care. Triage nurses make complex decisions amidst uncertainty. Effective triage decision-making is crucial for prioritising patient care and interventions, often occurring rapidly and autonomously within time constraints. Nurses rely on intuition, clinical experience, and cognitive factors for informed judgments.
Clinical decision-making in triage involves inherent uncertainty due to incomplete knowledge and unpredictable outcomes, which can lead to errors and poor patient outcomes. Errors in the ED, including diagnostic errors, stem from cognitive biases, communication breakdowns, procedural deviations, fatigue, and stress. Proactive strategies and technology, such as computerised clinical decision support systems (CDSS), play vital roles in error prevention and enhancing decision-making efficiency.

This paper explores the decision-making process of triage nurses within the ED, analysing factors influencing decision-making, cognitive processes, and challenges faced. Using Cognitive Task Analysis (CTA), this study aims to shed light on triage decision-making factors and provide a foundation for designing effective CDSS for triage.

Method: CTA was used to capture the cognitive processes of 16 triage nurses through interviews and 4 hours of observational data. Thematic analysis using NVivo 14® software identified 17 code labels, organising themes and sub-themes based on research questions. Results highlighted the dynamic nature of triage operations, the importance of communication, adherence to protocols, and challenges such as time constraints and resource allocation.

Results: The study revealed the multifaceted skills required for triage nurses, including clinical expertise, communication, critical thinking, and rapid decision-making. Challenges included time constraints, incomplete information, communication barriers, and deviations from protocols. Verification of triage decisions and seeking advice were vital for accurate patient prioritisation.

Discussion: A Cognitive Demand Table was developed to highlight the complex mental processes in triage, addressing challenges and proposing strategies. Design ideas for a CDSS included automated priority suggestion systems, predictive analytics for peak hours, real-time patient flow dashboards, and AI for pattern recognition.

Conclusion: The study's findings have implications for emergency healthcare, suggesting improvements in decision-making, reduction of errors, better resource utilisation, and enhanced patient safety. Understanding triage decision-making can guide policy and management decisions, optimising operational efficiency and patient outcomes. The study lays the groundwork for future research in emergency medicine, particularly in designing intelligent CDSS for triage.

D22. Societal Expectations and Economic Valuation of Eco-centric Management for Sustainable Fisheries and Healthy Marine Ecosystems

Mr Gilmour Camilleri

Department of Economics, Faculty of Economics, Management and Accountancy

Socio-economic preferences have received insufficient consideration in regulation and in the management of European fisheries. This project aims to address the knowledge gap by undertaking a series of representative surveys with embedded experiments (n>1500) in the United Kingdom, Bulgaria and Malta, home to individuals with access to the Atlantic Ocean, the Black Sea and the Mediterranean Sea. The surveys seek to gain an understanding of the perceptions, preferences, and expectations of the public for current and ecosystem-based fisheries management (EBFM) in Europe and specifically to model the determinants of fish consumption, the willingness to pay for labelled fish, the willingness to support fisheries regulation and the impact of marine ecosystems on citizen wellbeing more broadly. While the results highlight the heterogeneity in different contexts and by different socio-economic groups, they do indicate strong support for fisheries regulation, a positive willingness-to-pay for fish carrying attributes linked to ecosystems based fisheries management, a propensity to cooperate with voluntary organisations through financial donation, and a willingness to report illegal or dangerous activities on the coast. The European Commission's Horizon 2020 Research and Innovation programme (Grant agreement No. 101000302) funded this research.

D23. Sense-making processes of psychological contract breaches of multiple players over time: The case of an organisation experiencing a major internal change

Mr Reuben Navarro

Faculty of Economics, Management and Accountancy

The contemporary landscape of employment relations is undergoing profound transformations in response to the changing world of work. Globalisation, technological advancements, and shifting societal expectations have collectively contributed to a dynamic paradigm shift. Traditional employment structures are giving way to more flexible arrangements, such as remote work and gig economy participation and therefore challenging established norms. This evolution has significant implications for both employers and employees. The rise of automation and artificial intelligence further adds complexity, altering the skill sets required for the workforce. As the nature of work undergoes rapid change, scholars and practitioners alike are compelled to explore and understand the multifaceted dimensions of contemporary employment relations. The research aims to provide insights into the intersection of these trends with the nuanced dynamics of psychological contract breaches during organisational change.

Building on psychological contract research over the last 35 years, this project investigates PC development within a major organisational change. Unlike previous studies, this research project examines the unfolding process of the PC over a period of 6 months and also takes into consideration perspectives from both employees and employers. The employees chosen for this study are classified as knowledge workers. These professionals are characterised by their expertise, skills, and ability to contribute intellectual value to the tasks at hand. Utilizing an experiential sampling longitudinal design based on diary studies with repeated measures, the research employs a sequential approach to comprehensively capture the complex interplay between employer and employee sense-making in the process of psychological contract over an extensive period of time in such context. Additionally, qualitative reporting will also elucidate underlying trends observed in the data.

D24. New Left Economics

Prof. Philip von Brockdorff

Department of Economics, Faculty of Economics, Management and Accountancy

Exploring how the economy can develop and grow by upholding the social contract and giving social partners like trade unions the space and a key role in this new economy, A New Left Economics reviews the dominant neo-classical economic paradigm and provide insights into a new economic model by critically assessing the new left economics.

Through revisiting Keynes and the relevance of Keynesian economic thinking today, the underlying argument in the book is for going beyond GDP to a more social model based on welfare, reclaiming the word 'welfare' from neoclassical economics in the process. Incentivising the social economy enterprise model is also key to this new paradigm shift – the focus is never on curbing economic activity, but rather on making it work for more people to generate greater welfare. These could include social economy enterprises and employee- owned models, right through to certain circular economy models that promote social wellbeing.

This is an accessible and intriguing text focusing on new left economics, revisiting and modernising Keynesian economic thinking to frame a basis for an economy with a strong social focus.

D25. Chefs Working in the Maltese Catering Environment, Adopting an intersectional ethnographic approach

Ms Carmenrita Bugeja

Institute for Tourism, Travel and Culture

This research aims to understand the everyday and every night experiences of chefs working in the catering environment. It will look into the systemic and structural inequalities which chefs can face on an individual, situational and organisational basis and how these impinge on their wellbeing on both a personal and professional basis. It will explore the coping mechanisms they resort to in order to counteract the source of stress and the changes they would like to see on an organisational, institutional and legal basis to improve their quality of life. The research will focus on how private life issues impinge on work and hence wellbeing. The study adopts an intersectional perspective, while taking into consideration organisational culture. The primary objective of this study is to find out what are the factors which contribute both negatively and positively to working as a chef. The findings will then be used to help establish guidelines for good practice in the local culinary sector. The main aim of this research is to use ethnography to find out the microaggressions workers face, and the effect this can have on an employee's wellbeing. Note will also be taken of indirect discrimination which can occur when a so-called neutral policy or measure can have a differential impact on individuals who are positioned differently on the basis of their sex, interacting with their age, nationality, different abilities, race and sexual orientation.

E1. Expert Readers' Perceptions of Coherence using Topical Structure Analysis in Novice Written Texts

Ms Larissa Jonk

Centre for English Language Proficiency

Coherence can be captured by the application of topical structure analysis (TSA) of wiritten texts. With its roots in the Prague School of Linguisitics 'theme and rheme', Lautamatti's (1987) TSA framework became the structure by which texts written by novice writers were analysed. The presentation reports on a study which traces and analyses both how expert readers map coherence in the given texts by applying the TSA approach but also outlines some of the key findings that emerged from the close analysis of the texts.

The participants of the study are expert readers who are also language teachers and experienced assessors of academic writing. Text selection was determined on the basis of representation of the various proficiency levels produced by second-year novice writers. Many of the studies carried out using TSA look at topical progression trends in high quality writing and its effectiveness as a revision tool in teaching writing. Qualitative studies in TSA are rare research. Establishing the role of the reader in the writer-reader relationship has long been established as integral in the creation of coherence of a written text.

This study seeks to explore and describe individual expert readers' perceptions of topical progression in novice texts. A second level of embeded analysis consists of interviews with the readers using think-aloud protocols seeking to explore their reasoning when conducting TSA. The results will describe topical progression patterns in the cohort of novice texts used for this study and will shed light on the topical progression connections expert readers make in their search for coherence when reading these texts.

E2. A case study in relation to the concept of the placing of self

Rev. Dr Charló Camilleri | *Co-researcher:* **Mr James Formosa**

Department of Moral Theology, Faculty of Theology

The research constitutes an ongoing project initiated by the two researchers for the International qualitative Bioethics Conference 2024. The Metamorphosis of the body: Bioethics and Neuroscience organised by the Moral Department at the Faculty of Theology. The qualitative study presented in this conference opened up the researchers for further exploration. The project aims to explore how self-placement is affected by Carmelite meditation, which is a contemplative activity with Christian roots that seeks to improve one's relationship with God by self-awareness through introspection and "mental prayer." Data from questionnaires distributed to regular practitioners and collected for the study attempts to find out how the participants' sense of self-placement is impacted by the practice of Carmelite meditation. The various facets of self-placement that arise as a result of practice, such as self-transcendence, self-acceptance, and self-awareness, will be identified by the study using theme analysis. The study's research findings will add to the corpus of knowledge already available about meditation practices and neuroscience, providing insights into the potential benefits of Carmelite meditation for personal growth and general wellbeing. Taking into consideration that this study is focused on the practice of a meditative path, it aims at observing the search for a deeper connection with a reality perceived to be much greater than the perceiver, and hence involving a sense of meaning, and the placing of self.

E3. The Acquisition of the Verbal-Bracket-Structure by Maltese Learners of German as a Foreign Language at Secondary level (Der Erwerb der Verbklammerstruktur bei maltesischen Lernenden von DaF im Sekundarschulbereich)

Dr Denise Camenzuli

Department of German, Faculty of Arts

This study focused on the acquisition of the bracket construction, a structural feature particular to the German language, in which the verb is split into two parts, with one part appearing at the normal verb position in the second place and the other part at the end of the sentence. This also happens in main clauses containing modal verbs and analytic forms of verbs such as in the present perfect tense among others. This phenomenon has been dubbed by many as a stumbling block in the learning process and is highlighted when teaching the language. Language acquisition studies in the German as a Second Language field had established a certain acquisition sequence, according to which this "distant-positioning" takes place at level three, however in these studies no distinction is made between the various kinds of structures, which require distant-positioning. The aim of this longitudinal study was to investigate whether there is any difference in the acquisition of three particular structures namely those involving separable verbs, the modal verbs and verbs in the perfect-tense. Additionally it sought to find out which structure poses the Maltese learners of German less difficulties to acquire. The results have shown, that not all the three structures are mastered at the same level, with the perfect tense construction posing the least difficulties and the one involving separable verbs the most. In the case of separable verbs, the findings indicate that their acquisition is lexically driven, a fact which should not be ignored when delivering the topic.

E4. Latin On Screen – Gimmick or Gift? Film as a teaching tool for Latin

Ms Maria Giuliana Fenech

Faculty of Arts

Classical reception scholarship has long investigated the influence the classical world has exerted on cinema and television. Additionally new methodologies for teaching the Latin language are regularly being explored and utilised. This research lies at an intersection between two fields: classical reception and education.

The presentation will analyse the results of a survey conducted among educators about their perception of Latin used on screen. The survey findings reveal that while educators are aware of the prevalence of Latin in popular media, and recognise its function as a tool to promote language studies, its potential as a pedagogical tool is underexploited.

The analysis of results will be followed by an examination of the appropriateness of film in supporting the linguistic and cultural aims of Latin teaching in relation to certain pedagogical trends, namely the grammar-translation method and the Induction/Immersion method. Finally, practical approaches for making optimal use of film by striking a balance between its linguistic advantages and its cultural possibilities will be suggested.

E5. Women and Islands: the shift from dystopia to utopia in Stephanie Rothman's Terminal Island

Ms Irene Chiappisi
Faculty of Arts

Examining the small island as a privileged set for the emergence of gender conflicts (which is the crux of my doctoral research), several audiovisual texts can be taken into account, as they present societies marked by significant power dynamics. Among the latter, Terminal Island, a 1973 film co-scripted and directed by Stephanie Rothman, definitely stands out. Being an exploitation film, Terminal Island was originally marketed as a product featuring mostly sex and violence. Nevertheless, the director deployed the film medium to convey her own feminist statement. Terminal Island highlights the ambivalence of the island (benevolent and hostile, earthly paradise and prison) as well as the dystopian repercussions intrinsic to the idea of utopia itself. In fact, the offshore island portrayed by Rothman's film is a penal settlement where, further to the abolition of death penalty, the State of California sends murderers serving a life sentence; in such a forced residence, women are doubly enslaved, as labourers but also sexually. The ending, however, revolves around the end of this captivity and the start of a new, deliberately utopian, society, thus offering a self-reflexive perspective on the stereotypical features of exploitation cinema and the possibility of bending them towards a feminist view.

E6. The Philosophy and Theology Lecture Notes of Magister Baltassar Azzopardo

Rev. Dr Charló Camilleri | *Co-researcher:* **Dr Charles Farrugia**
Department of Moral Theology, Faculty of Theology

The research project evolves around 18th century manuscripts of Magister Baltassar Azzopardo (d.1773), a Maltese Carmelite who held the chair of philosophy and theology in Perugia, Pavia and Palermo. He was also co-visitor of Bishop Labini to the Church in Malta as well as examiner for local clergy. The manuscripts, believed to be long lost from the Fondo Magistri of the Archivum Conventus Carmelitarum Notabilis (ACCN), have been discovered by chance at the Notarial Archives in 2014. Researchers – from the Faculty of Theology and Faculty of Media and Knowledge Sciences – were able to conduct research and inspect the manuscripts after the completion of cleaning and restoration through collaboration with the National Archives Malta. The collection contains mainly scholastic philosophy and theology notes. A preliminary report has been drawn on the contents of the manuscripts. An academic publication on the findings will be published in due course as further research work on the contents of the collection is still ongoing on two aspects:

1. Archival Research to establish the provenance, the issue of displaced archival documentation and their conservation. On this level researches have also to propose archival decisions to be taken, mainly on the issue of whether the manuscripts should be returned to their archive of origin at the ACCN where similar collections of other Magistri are preserved. Paleographical analysis is also necessary to compare with lose folios in ACCN, who's authorship has yet to be established. Possible connections with other archival depositories in Perugia, Pavia and Palermo have to be tapped by the researchers.
2. Content Research to decipher the Philosophical and theological content of the manuscripts establishing the school of thought Magister Azzopardo followed in his Scholastic system. Usually Carmelite Magistri followed John Baconthorpe's system along the Thomistic one. Also the manuscripts throw light on the 18th century project of establishing an international collegium at the Mdina Priory for friars to practice Arabic while pursuing their studies, to be sent as missionaries in North Africa.

The research project is interdisciplinary in its method and approach throwing light on ecclesiastical academic formation, archival studies as well as potentially filling gaps in local ecclesiastical history.

E7. Ink and Memory: The Mario Azzopardi Archival Project

Dr Glen Attard

Department of Moral Theology, Faculty of Theology

The archival project dedicated to the late Maltese poet Mario Azzopardi (1944–2022) aims to organise and preserve his literary legacy for posterity. Born on September 11, 1944, Azzopardi's prolific contributions to Maltese literature spanned decades, earning him recognition as a significant figure in the country's cultural landscape. With his passing on March 11, 2022, the urgency to safeguard his works and personal artifacts became paramount.

This archival endeavor encompasses a comprehensive cataloging process, beginning with the collection, sorting, and digitisation of manuscripts, drafts, published works, correspondence, photographs, and ephemera associated with Azzopardi's life and career. Each item is documented, annotated, and categorised according to thematic, chronological, and contextual criteria.

Furthermore, the project entails collaboration with literary scholars, historians, archivists, and cultural institutions to ensure the accuracy, completeness, and accessibility of the archive. Through partnerships with libraries, universities, and digital repositories, efforts are made to disseminate Azzopardi's oeuvre to a global audience, fostering appreciation for Maltese literature and culture on an international scale.

Ultimately, this archival initiative serves as a tribute to Mario Azzopardi's enduring influence and artistic legacy, preserving his words, ideas, and contributions for future generations of scholars, enthusiasts, and cultural heritage advocates to explore, interpret, and celebrate. By safeguarding his archival material, the project honours Azzopardi's profound impact on Maltese literature while reaffirming the importance of preserving cultural heritage in a rapidly evolving world.

E8. Fertility in Intersex: "A Self-Guided Tour Through Mayhem"

Ms Claudia Bartolo Tabone

Faculty of Theology

Despite the rapid advancement in medicine and reproductive science, medical professionals still struggle to understand the complexity of fertility in intersex people. Infertility is often likened to a minefield, but when this is caused by one of over forty innate variations of sex development, the situation becomes altogether more challenging. Not only are intersex variations considered rare, but traditionally, intersex people were assumed to be infertile from birth. This caused research in this area to be stalled, and very often, gonadectomies would be carried out to remove what were assumed to be non-functional organs. In view of this, innovations in reproductive medicine, such as the preservation of prepubertal gonadal tissue, in-vitro gamete maturation, and uterine transplants, are being reviewed to determine how these could assist intersex people. The ethical and legal issues pertaining to the use of such techniques are being researched and reviewed. However, no study on intersex issues can be complete without including the lived experience of intersex individuals. So far, four intersex women have consented to sit for a short interview during which they were asked to share their personal fertility journey. Themes such as inadequate conversations about intersex and fertility, feelings of shame, guilt, and grief, negative self-image, insecurity, and helplessness were found to be common to all four. Counselling or psychological care to support them in their struggle to form a family was never offered. This presentation will tentatively highlight the dire need for research and improvement in the fertility care of intersex people.

E9. A Prospect of High-rise Housing and Their Socio-spatial Impacts: The Case of Malta and Kuwait

Ms Raweyah Alsedairawi

Faculty for the Built Environment

This research delves into the complex interplay between contemporary societies, spatial dynamics, and current housing demands by exploring high-rise residential buildings in Malta and Kuwait. By navigating the multifaceted spheres of the concept of "house is home" within these contexts. Despite criticisms, high-rise living has garnered attention, prompting an exploration into its suitability as a sustainable solution for housing demands. This study focuses on two case studies – Malta and Kuwait – chosen for their comparable affordability index, rapid urbanisation, and population growth. The comparative analysis examines the unique challenges and opportunities associated with high-rise housing in both countries, addressing gaps in existing literature regarding socio-spatial implications. Through an empirical approach including post-occupancy evaluations and interviews, the research aims to uncover the socio-cultural individual preferences for successful high-rise housing designs. Furthermore, it investigates regulatory frameworks, planning policies, and market forces influencing the construction and management of high-rise buildings, while exploring the social implications such as community cohesion and provision of amenities. This study contributes to a broader understanding of the sustainable and inclusive development of vertical communities, offering valuable insights for policymakers, urban planners, architects, and developers involved in high-rise residential projects. By addressing the disconnect between current housing practices and their social and economic values, it seeks to propose innovative design guidelines and schemes to enhance social responsibility and well-being in high-rise living environments. The research adopts a structured methodology encompassing literature review, empirical research, thematic analysis, and discussion, aiming to shed light on the socio-spatial dynamics of high-rise housing in Malta and Kuwait. Ultimately, it seeks to bridge research gaps and offer practical solutions to meet the evolving housing demands while fostering sustainable development and societal well-being in densely populated urban areas.

E10. Visual Analysis of Discolouration in 18th Century Documents – first results

Ms Chanelle Mifsud Briffa
Faculty for the Built Environment

This research investigates unidentified discolouration patterns on 18th century paper documents within Malta's Notarial Archives Maritime Collection. Manifesting in shades of yellow, brown, and black, these discolourations vary in size and exhibit clear edges, creating a harsh contrast with the paper. Adopting a multi-analytical methodology, the study combines visual assessments with non-invasive chemical analysis to explore the discolouration's properties and possible impact on the documents. The presentation highlights the initial findings from visual analysis, which includes codicological assessments and employs tools such as the Munsell Colour System, colourimetry, optical microscopy, UV and IR imaging, and spectrophotometry for a comprehensive classification of discolouration.

Following codicological analysis of the collection, it was determined that categorising discolouration into three primary colours (black, brown, yellow) and intensities (light, medium, dark), using the Munsell Soil Classification System, optical microscopy and spectrophotometry establishes a structured framework for in-depth analysis. This structured categorisation is crucial for subsequent steps, including chemical analysis, facilitating a methodical examination and comparison. Investigations using UV photography also reveal discolouration invisible to the naked eye, marking the boundaries of these patterns essential for selecting precise areas for chemical testing.

The significance of this study stems from its methodical approach to discolouration categorisation, paving the way for focused chemical analysis and enriching our understanding of the characteristics of these discolourations. This methodology, enhanced by IR and UV photography, is foundational in uncovering the chemical nature of these discolourations and whether they affect these historical documents.

E11. Bridging Gaps in Local Education: Insights from the Early Childhood and Primary Education

Dr Josephine Milton | *Co-researcher:* **Dr Rosienne Camilleri**; **Dr Charmaine Bonello**; **Dr Josephine Deguara**; **Dr Tania Muscat**
Department of Early Childhood and Primary Education, Faculty of Education

Since its establishment in 2020, the Early Childhood and Primary Education (ECPE) Research Group, currently composed of five academic lecturers within the Department of Early Childhood and Primary Education, has been at the forefront of addressing crucial gaps in local educational research. The group initiated its collaborative research journey with the COVID-19 and Education in Malta (Cov-EM) study, which explored the profound impact of the pandemic on various stakeholders in education. Amongst its publications were five comprehensive reports that unveiled how teaching and learning, learning spaces, and overall wellbeing for different educational stakeholders were affected by the constantly shifting societal and educational scenarios. Multiple research papers emerged from the Cov-EM study, each tackling a distinct aspect, such as the influence of COVID-19 on Initial Teacher Education (ITE), uncovering educational inequalities through parents' perspectives, and analysing the impact of the pandemic on children's learning. In a continuation of their commitment to addressing critical educational issues, the ECPE Research Group has more recently embarked on a new venture focused on linguistic diversity in the local educational landscape. A central aim is to shed light on the unique challenges arising from evolving bilingual, multilingual and/or plurilingual contexts in early childhood and primary Maltese

schools. Supported by the UM Excellence Research Fund Award, this study places particular emphasis on teacher education and classroom pedagogy. At the UM Research Expo, the ECPE Research Group will thus showcase its ongoing efforts to bridge gaps, unravel insights, and contribute to the advancement of early childhood and primary education in Malta.

E12. Investing in high quality professional learning for STEM teachers: An innovative approach

Dr Josette Farrugia

Department of Mathematics and Science Education, Faculty of Education

The International Centre for STEM Education (ICSE) Academy, a collaboration of 13 higher education institutions, 13 policy-making organisations and 65 schools in 13 European countries, supports the EU's endeavours to minimise students' low-performance and lack of engagement in STEM subjects (science, maths, technology, engineering). To address students' low-performance, ICSE Academy initiated the proSTEM project (2022–2025) to invest in a high-quality STEM teacher workforce through ongoing innovation based on existing best practices teacher education and transnational exchange strategies. The approach undertaken by ICSE Academy draws on mobility and collaboration to support pre- and in-service STEM teachers across Europe. Additionally, all activities link STEM to European priorities such as sustainability, climate change, green skills, digital skills, gender-sensitive STEM, and diversity in STEM classrooms.

In this poster presentation, we highlight the key features of our collaboration which include:

1. A high-capacity partnership across all countries;
2. Peer-learning through job-shadowing opportunities for teacher educators;
3. A distinct needs-feasibility-alignment process involving a bottom-up approach involving teachers' and students' needs combined with top-down requirements from policy makers;
4. An unprecedented professional learning concept with innovative professional learning formats for pre- and in-service STEM teachers;
5. An online interdisciplinary European workshop series (for STEM teachers across Europe); and
6. Two collaborative European summer schools.

This project involves ongoing research carried out with pre- and in-service teachers and teacher educators about their experiences and knowledge gained. We will also delve into the work carried out by ICSE Academy and how, through a systemic approach, this collaborative work will inform national and European policy based on a profound policy needs analysis.

E13. Class without walls

Prof. Adrian-Mario Gellel

Department of Early Childhood and Primary Education, Faculty of Education

The project, which was conducted in collaboration with the Assessment for Learning Unit, the National Literacy Agency, the Directorate for Digital and Technical skills and four State schools, aimed at enhancing child holistic development by increasing children's cultural capital and funds of knowledge, while exploring the possibility of developing a new pedagogical approach.
It adopted a socio-cultural stance that focuses on a situated and distributed learning approach.
69 children between the ages of 6–8 participated in two Class without Walls project, at Ħaġar Qim (14 children) and Fort St Angelo (55 children). The two projects unfolded over a number of weeks allowing children to engage with the place, identify the learning opportunities, develop inquiry and critical thinking skills, as well as making meaning. Both projects culminated with a week-long activity in the historical sites.

The project investigated:

1. the pedagogical benefits of using a symbol literacy approach in a historical site over a five-day period;
2. how participatory methods enhance children's learning, and cultural capital;
3. the way a symbol literacy approach, that makes us of cultural sites, may enhance children's reasoning skills.

The two Class without Walls activities indicate that a site-based symbol literacy approach provides the space for diverse able children to gradually build their understanding, observation, and critical skills. The two activities were successful in targeting all areas of the curriculum, with teachers reporting that they covered more learning outcomes at the historical sites than they would normally cover in class over the same period of time.

E14. The CLeStuM Teacher Professional Development Programme: Past, Present and Future

Dr Michael Buhagiar

Department of Mathematics and Science Education, Faculty of Education

Collaborative Lesson Study Malta (CLeStuM – **clestum.eu**) was set up in 2017 as a teacher professional development programme within the Faculty of Education, University of Malta (UM). CLeStuM aims: (i) to support schools to learn about and implement lesson study (LS); and (ii) to promote, conduct and disseminate research about LS. CLeStuM is led by Dr James Calleja in collaboration with Dr Michael Buhagiar and Dr Michelle Attard Tonna, all from the Faculty of Education. So far, CLeStuM work has included:

- supporting lesson studies in local primary, secondary and post-secondary schools;
- conducting and presenting LS research in local and international fora;
- publishing LS research in local and international peer-reviewed journals and books;
- organising LS activities for local and foreign participants;
- participating in international EU-funded LS projects;
- designing and teaching LS courses for ITE students, in-service teachers and prospective school leaders; and
- supervising student research at master's and doctoral levels.

By now, CLeStuM has gained a very good international reputation, which is evident by requests from international colleagues to visit UM to learn about LS and invitations for international collaborations. Despite these successes, the long-term sustainability of the CLeStuM programme and its activities remains a matter of concern.

The poster will: (i) provide basic information about LS and highlight the programme's aims; (i) list the programme's past and present activities; and (iii) suggest a path to enhance the programme's sustainability. Moreover, the poster will include a QR code that provides access to additional pertinent information.

E15. Developing a Comprehensive Conceptual Framework for Integrating Augmented Reality into Engineering Education

Mr Christian Camilleri

Faculty of Education

Augmented reality is considered an emerging technology which amalgamates real content, recorded through IP cameras with virtual computer-generated content. Several studies have explored the trends, advantages, opportunities, challenges, and overall impact of this technology on education. However, most of the previous studies overlook a crucial understanding i.e. the success of an AR-based intervention does not solely depend on the technical attributes of the technology. It also hinges on the pedagogical strategies employed during implementation, along with the consideration of learners' emotional and cognitive processes. This work portrays the development of a learner-centred framework tailored for higher education engineering students. Based on the Design Science Research (DSR), the initial phase in this framework focuses on (1) identifying the pedagogical requirements. The scope of this phase is to carefully consider and ensure that the requirements upon which AR-based learning scenarios will be developed are well aligned with the needs and characteristics of the identified learners' cohort, thus, enhancing the overall effectiveness of the educational experience. This phase will serve as the foundation for the (2) subsequent development of AR-learning-based scenarios, and (3) the evaluation of the impact of AR-based learning scenarios on learners' emotions, achievements, and engagement. Implementing this framework aims to result in AR experiences that are naturally captivating and emotionally satisfying for engineering learners.

E16. Citizens' participation in informal science activities in Malta

Ms Danielle Martine Farrugia

Faculty of Education

Science has a complex history in the Maltese Islands, sketched by who defines it to how it is conducted to who engages with it. Citizens' science capital is a theoretical lens that explores uneven patterns in science participation (Archer et al., 2015). It influences their perceived self-efficacy and how they engage with science and scientific research if and when they do. This presentation will focus on one of the factors affecting Maltese citizens' science capital: whether they attend science activities, which institutions they visit, and their relationship with institutions that conduct Public Engagement with Science (PES).

While the conceptual approach to theorising science capital was designed as a survey tool for use with school students, this analysis will extend the concept to citizens' participation in science activities in Malta in 2019/2020. A questionnaire was distributed to Maltese citizens to determine their engagement with science and science activities.

Some of the results from the questionnaire will be presented in this presentation. The highest percentage of the respondents attending science activities were from the 18–24 age group (65.2%). The 55–64 age group had the lowest percentage (29.4%), followed by the 65+ group (32.7%). Results also show that 36.6% of the respondents have never visited Esplora, the Interactive Science Centre, and a further 7.7% are unaware of it.

Current approaches in PES are sporadic and fragmented. Activities can be more inclusive if institutions conducting PES include citizens in the design of the activities. A national PES strategy might act towards a better-coordinated approach among stakeholders conducting PES.

Parallel Sessions 2

Presentations – Academics/Researchers

Expo Stream ES 1.1 – ES 1.8

CHAIR: **Prof. Rebecca Dalli Gonzi** | VENUE: **Sacra Infermeria Hall**

Outliers – A Particular Skorba Phase Pottery Fabric

Dr Inġ. John Charles Betts
Department of Classics and Archaeology, Faculty of Arts

The analysis of Għar Dalam and Skorba phase (6000–4800 BCE) pottery in the MaltaPot Project (**um.edu.mt/projects/maltapot**) identified just two Skorba phase sherds with a calcium carbonate temper of particular appearance. They were found in David Trump's excavation of Skorba (1961 – 1963), and had been selected for analysis as being representative of Red Skorba ware. The round temper particles were identified as ooids by petrography, and stood out in contrast to the angular shapes used in other sherds. The ongoing project aims to determine whether the use of this particular material was limited to occasional instances, or whether a trend can be identified. The initial analysis started with a review of published fabrics; low power microscopy of an additional thin section prehistoric pottery sherd set; and low power microscopy of sherds which made up the initial complete sample set of the MaltaPot project. The cultural provenance of any materials identified as having a similar temper material will be documented to try to identify any pattern of use. Geological samples will be collected from potential sources of ooids, in Malta. Any positive identification of ooids in samples would lead to comparison of the geological samples and the pottery, which could reveal the potential provenance of these particular materials. The main research work of the project will start in September 2024.

Mapping Maltese Families Through Genealogy: Works in Progress

Dr Charles Farrugia
Department of Library Information and Archive Sciences, Faculty of Media and Knowledge Sciences

The size of the Maltese archipelago makes it possible to carry our genealogical research and build family trees that span back to more than five centuries. Yet such a process was till now restricted to very few Family Research private service providers. The fact that the Public Registry in Malta started documenting Civil Registration in 1863 makes the process complex. For the pre-1863 period the fragmented network of parish archives has to be consulted. This is time consuming and complex. Over the years a number of genealogists invested money and energy in building a unique typology of finding aid – the Guliana. The presentation explains the progress registered so far by public archives acquiring such sources and make them available to the reading public. Furthermore, the presentation will explain the challenges, the upcoming collaboration with international organisations on the structuring of data and its exploitation, and the need of collaboration between archivists, IT and AI specialists and the growing community of family research patrons. This collaboration has a potential to develop extensive data platforms that will be beneficial not only for the building of family trees of a local interest, but also provide opportunities for filling the gaps in data on international platforms.

Investigation of Environmental Conditions at the Mnajdra Megalithic Temple Using Computational Fluid Dynamics Modelling and Artificial Intelligence and Machine Learning

Mr Mantas Valantinavicius

Department of Conservation and Built Heritage, Faculty for the Built Environment

This research aims to investigate and characterise the micro-scale environmental physical processes promoting the degradation of the Globigerina Limestone in the pilot study of Mnajdra Temples, which is on the UNESCO World Heritage List. Degradation processes in stone are highly dependent on environmental factors including wind conditions, temperature and humidity fluctuations, wind-driven rain, solar radiation and salt crystallisation cycles. Malta's megalithic temples have been exposed to harsh environmental conditions for thousands of years and efforts to actively reduce the degradation rates of such stones have included the erection of shelters above three of the megalithic temples (including Mnajdra), where environmental conditions and degradation phenomena are being studied. Characterising the environment is crucial to be able to understand the mechanisms leading to limestone degradation and therefore to provide a scientific basis for decision-making in protecting this heritage. Previous efforts have been focused on understanding the direct and indirect causes of deterioration, and more recently focused on investigating the wind flow conditions at the Mnajdra temples. These investigations have been both experimentally and numerically investigated using Computational Fluid Dynamics (CFD). The first stage is to investigate, analyse and validate different flow conditions, in and around Mnajdra temples. This is being done by CFD in more than 64 different scenarios, where different wind directions and velocities are used. These data sets then will be used as part of larger and wider environmental monitoring and observation data to construct ML models. Such models can serve to provide a direct mapping between meteorological conditions and the conditions close to the surface of the stone being studied. Therewith, these models can provide long-term simulations of degradation scenarios under different conditions, including the effects of climate change. Both classical machine learning models and more modern deep learning models will be investigated.

Preserving Our Past, Sustaining Our Future: Harnessing Earth Observation for Heritage Building Conservation

Prof. JoAnn Cassar

Department of Conservation and Built Heritage, Faculty for the Built Environment

The Mediterranean region's traditional flat roofs are renowned for their adaptation to local climates, employing region-specific materials and techniques. This study, funded by the Malta Council for Science and Technology (MCST) through the Space Research Fund 2019, investigates the cooling effects of traditional roofs on Malta, aiming to promote their maintenance and wider adoption.

Understanding the energy efficiency of historical buildings, especially traditional roofs, offers passive solutions amidst challenges like composition comprehension and limited study on their seasonal thermal properties. This research pioneers a methodology using high-resolution multispectral satellite data, detailed drone imagery, and on-site monitoring to evaluate traditional roofs' thermal performance.

The study revealed several key findings: traditional roofs can be distinguished from other types based on their unique interaction with electromagnetic radiation; they exhibit significant temperature variations compared to other roof types,

offering superior insulation; and specific wavelengths, such as the blue band, can effectively identify these roofs in satellite imagery. This research significantly enhances our understanding of the energy dynamics of traditional roofs in Mediterranean climates, facilitating energy audits, intervention planning, and preservation efforts for historically significant buildings.

The study underscores the significance of preserving architectural heritage amid climate change, advocating for sustainable retrofits to traditional buildings. Beyond functional enhancements, these retrofits align with contemporary sustainability concerns, ensuring their viability for future generations.

Overall, this research contributes to a deeper understanding of traditional roof behaviour in Mediterranean climates, facilitating informed decision-making for energy efficiency, preservation, and sustainability initiatives.

Endangered Cultural Heritage in Conflict Zones: A Case Study of the Current Russia–Ukraine War

Dr Marc Kosciejew

Department of Library Information and Archive Sciences, Faculty of Media and Knowledge Sciences

Cultural heritage in Ukraine is presently endangered. As Russia's war against the country continues, Ukrainian cultural heritage has been damaged, destroyed, and remains at risk. Interventions into the war initiated by the international cultural heritage community commenced with the issuance of formal public statements regarding the war and its implications. This presentation provides an overview of the war's impacts on Ukrainian cultural heritage and unpacks the international cultural heritage community's early communications regarding the war. Ultimately, a joint contemporary and historical snapshot situating the international cultural heritage community within the war's early stages is established.

No country for (Fictional) Terrors? The Unrecognised Gothic in Italian Literature

Dr Fabrizio Foni

Faculty of Arts, Institute of Anglo-Italian Studies

When it comes to the nature or the very existence of Gothic and fantastic elements in Italian literature, most critics and academics seem to be in a rather fossilised state of denial. In general, scholars have clung to the idea that, differently from other cultures (especially the North European ones), the true spirit of Italianness has given expression to fantasy by channeling its fanciest imaginations predominantly through clear-eyed irony and self-conscious intellectualism, thus banishing not only the narrative devices of suspense and terror, but also the reader's identification with the characters and, more broadly, a genuinely emotional approach to fictional texts. In actual fact, however, several Italian authors who openly rejected northern mists, ghosts, and witches went on to utilise such tropes and atmospheres in their own works to generate pathos and foreboding. Moreover, an unprejudiced scrutiny of the book trade in Italy can prove that, towards the end of the nineteenth century (with the first signs becoming noticeable already in the 1860s), many publishers in Italy thrived on popular magazines and book series, destined for the broadest audience possible, which offered short stories, novellas, and novels imbued with eerie, weird, and uncanny topics, in the style of the so-called penny dreadfuls, dime novels, and pulp magazines. A thorough examination can also demonstrate that, despite being mostly lowbrow, this neglected production shared a common backdrop (folklore, mesmerism, spiritualism, theosophy, psychical research) with contemporary literary masterpieces and, in some cases, even exerted a strong influence on their authors' imagination.

Identity in Western Libya

Mr Ranier Fsadni
Department of Anthropological Sciences, Faculty of Arts

Modern Libya is a unique country because it is the only state deriving over 90 percent of its revenues from hydrocarbons that has also undergone a political revolution (arguably, twice). Its other striking features include a brutal colonial history, tribes and Islam. The country remains little understood with contesting interpretations and explanations offered by various distinguished scholars, while media reporting has often been of poor quality because of a simplistic understanding of Libyan identity. This presentation — focused on western Libya and one of that region's largest tribes — offers a framework for understanding events and the country's multifaceted identities, one based on appreciating that Libya has different kinds of tribes, whose own experience is mediated by demographic change and sociological generations. Tribal identity is not a fixed transhistorical identity; it is an independent variable that is also shaped by factors like army conscription, educational experience, economy, social memory and the national political cycle — with an impact not just on macro politics but also on the micro-sociology of social life (such as marriage dowries and joking patterns). These factors explain not only social and cultural diversity in Libya but also why scholarly explanations have sometimes diverged so strikingly.

Chinese Messaging to the Global Community

Dr Nicole Talmacs
Department of Media and Communications, Faculty of Media and Knowledge Sciences

China's entertainment and media industries were estimated in 2023 to be worth 222 billion euros. Their media and entertainment industries are, however, typically servicing a single market: Chinese audiences. Over the past two decades, China made clear efforts to export their entertainment and media products such as CGTN broadcasting, Chinese films, theatre and dance and digital innovations such as TikTok. Similarly, foreign efforts to access the lucrative Chinese market worth one fifth of the world's population have seen efforts for collaboration between Chinese and non-Chinese creative workers. This has not been without challenges though.

My research considers the challenges Chinese communications face in communicating who China is to the international community and entertaining and informing non-Chinese consumers. To date the findings suggest the challenges are: the social conditions that Chinese media and entertainment products reflect about China with Chinese audiences in mind, are often quite different to the rest of the world; a foreigners perception everything that stems from China is produced by, or on the behalf of, the Chinese State and thus "propaganda"; and growing geopolitical tensions result in the diplomatic sacrifice of cultural exchange as a first (and easier) symbolism of geopolitical dissatisfaction. However, understanding China, its society and culture expressed through its media and entertainment, is crucial to a world of greater understanding and international relations. The circulation of China's media and entertainment industries is one way in achieving this understanding. Importantly, China appears willing to share, but are we the international audience willing to listen?

Expo Stream ES 2.1 – ES 2.8

CHAIR: **Prof. Valerie Sollars** | VENUE: **Syndicate Room 8**

Fostering Creativity and Imagination in Primary School Students: A Proposed Framework

Dr Margaret Mangion

Edward de Bono Institute for Creative Thinking and Innovation

In today's world, characterised by unique and complex challenges, there is a pressing need for educational methods that go beyond conventional teaching and equip students with skills to effectively navigate the real world. Embracing a broad spectrum of creative and innovative approaches is essential in this quest. This conceptual paper, influenced by the Possible Action Model (P-ACT, Glaveanu, 2023), outlines a strategy to foster possibility thinking in students through the development of creativity, imagination, and a sense of wonder. The framework is designed to provide students with the skills to create and explore 'Possibility Spaces' (Glaveanu, 2023), enhancing their personal agency. These spaces can emerge spontaneously or be deliberately created, offering students varied opportunities to engage with potential scenarios and broaden their perspectives.

In the present social, economic, and educational climate, the value of cultivating students' critical and imaginative thinking skills is increasingly acknowledged. These abilities are vital for their successful integration into the real world. The proposed framework aims to establish a rich learning environment that promotes discovery, idea generation, and the exploration of multiple solutions, thereby addressing the demands of the 21st century, particularly in the era of the Anthropocene.

Narrative Enquiry of a Student's Lived Experience of the Transition from Bachelors to Masters Dissertation Writing

Dr Natalie Schembri

Institute of Linguistics and Language Technology

The "diverse cohort" (Coneyworth et al., 2020, p. 264) of graduates in Masters-level programmes has shown a steady increase globally over recent years. The transition to Masters level is, however, a far from trivial educational challenge, involving adjustments beyond the educational sphere that prove more demanding than earlier transitions, as students' progress into adulthood and their lives become more complex (Tobell et al., 2010). This study is a longitudinal narrative enquiry of the transition into Masters level dissertation writing, focusing on the lived experience of a student following a taught Masters in a European university through to completion. The data comprised interviews, journey plots and correspondence through email. Three main themes emerged: SUPERVISION; FEEDBACK and UNIVERSITY REGULATIONS. The study advocates greater awareness of the need for writing support at Masters level. The findings are in line with results from previous research indicating the importance of debunking the myth of "assumed competence" (Tobell & O'Donnell, 2013) at Masters level that is prevalent in the academy. It is hoped the findings from this study will result in heightening awareness for the need for more adequate provision of writing support in higher education academic institutions at both staff and policy level.

Seven Educators Implementing the Emergent Curriculum in a Maltese ECEC Context (0–7 Years)

Dr Charmaine Bonello | *Co-researcher:* **Prof. Carmen Dalli**; **Dr Anna Baldacchino**
Department of Early Childhood and Primary Education, Faculty of Education

This study describes how seven educators working in Maltese early years settings (0–7 years) experienced a policy transition from a prescriptive curriculum to a curriculum co-constructed and co-owned by the educator and the child. It describes instances of pedagogical change and charts the development of a new curriculum discourse. The use of discourse such as "emergent curriculum" (Stacey, 2018), the "Reggio Emilia approach" (Malaguzzi, 1996), and "the Project Approach" (Katz & Chard, 2000) are only a few examples of the international literature that supports child-centred early years education. Grounded in social constructivist theory, the theoretical framework employed in this study facilitated a collaborative approach to capturing the experiences and narratives of educators throughout the implementation of the curriculum change. This theoretical foundation underscored the importance of social interactions, collective meaning-making, and shared experiences in comprehending the nuanced shifts in pedagogical practices within the early years' educational context. In order to document and critically reflect on the educators' comprehension of the new curricular approach, how they applied it, and how they perceived its influence on children's learning, the researchers worked with educators to co-construct a methodological framework. The educators' reflective accounts and the transcripts of the subsequent focus groups and individual interviews served as the basis for the qualitative narrative investigation. We discuss initial themes identified in our thematic analysis of the textual data, such as how adopting the emergent curriculum approach by educators altered their perspectives on learning and led to both tangible successes and challenges in relation to pedagogical practice and learning for children under the age of seven.

The Essay Today

Prof. Mario Aquilina
Department of English, Faculty of Arts

This presentation will discuss the project, Essays Beyond Borders (EBB), which is funded by the Erasmus Plus Programme for Higher Education. The EBB objectives are to promote essayistic writing as a tool for civic engagement and active citizenship; to strengthen the participants' critical and creative thinking skills; to encourage participants to develop their voice through self-reflective writing based on individual experience; to provide participants with ways of thinking about and addressing the effects of climate change; and to conduct and disseminate research on the contemporary uses of the essay in democratic societies. The Lead of the project, Prof. Mario Aquilina from the Department of English in the Faculty of Arts, will explain the rationale behind the project, its aims and its expected results.

University Academic Lectureship Pathways: Privilege or Pain?

Dr Maria Cutajar

Department of Arts, Open Communities, and Adult Education, Faculty of Education

This presentation shares research results of an explorative study investigating the University of Malta (UM) university lectureship experience. These qualitative research findings based on thematic analysis of 10 verbatim transcripts of interviews with UM academics. They describe the experience of being a university academic as an ever-changing journey of time passages in space and time. The journey is characterised by the strong theme of teaching along with the two other primary themes labelled identity and un/belonging. Identity feeds on teaching and un/belonging but not only. Profession/Practice and Research/Publication are two other themes that in this study emerge as feeding the primary themes. These research findings add to the literature that challenges privilege portrayals of being a university academic. They confirm the emphasis on teaching in this local context and piling administration work obligations. Distinctively, they expose an identity dimension additional to teacher and researcher attributions highlighted in mainstream literature. These findings suggest that UM academics need to be supported for keeping alive differentiated identity dimensions which are not in opposition to each other but still in competition for time. Although a lot has been done in recent years locally to support university lecturers, these findings suggest that more is needed. Additional suggestions are put forward to nurture productive and positive connections among UM university lecturers building an inclusive collegial academic staff community. The UM research expo can be considered as one such event. But more is needed to cater for the diversity that the UM university staff community encompasses.

A Field Experiment on Gamification of Physical Activity – Effects on Motivation and Behaviour Change

Dr Elaine Marie Grech

Department of Marketing, Faculty of Economics, Management and Accountancy

Gamification is finding growing application in the field of physical activity, promising engaging and motivating experiences that foster behavioural change. Yet, rigorous empirical work substantiating favourable claims is limited. Our study sought to find evidence for the effects resulting from gamification of physical activity on the users' motivation and behavioural change in terms of step counts. We employed a four-week randomised controlled field experiment to investigate how the choice of different gamification designs affects outcomes. Participants were provided with a wearable physical activity tracker and randomly assigned to either a: 1) competitive gamified group; 2) cooperative gamified group; 3) hybrid gamified group; or 4) control group. Data gathered includes a panel dataset of step counts and self-reported data on the users' intrinsic motivation and perceived usefulness. We found that at the end of the intervention, gamification made no difference to self-assessed intrinsic motivation or perceived usefulness compared to a non-gamified self-tracking experience. Yet, despite the lack of psychological effects, the use of gamification did result in stronger behavioural outcomes relative to the control group – in the form of increased step counts. Indeed, all groups treated with gamification recorded an increase in step counts during the intervention period. Furthermore, amongst the gamified treatments, it was the hybrid design that generated the largest difference in step counts (relative to the control group). The finding that gamification can stimulate a stronger behavioural outcome but does not evoke a stronger psychological outcome at the end of the intervention merits further investigation as to the mechanisms at play.

My Accent is Better than Yours

Prof. Holger Mitterer

Department of Cognitive Science, Faculty of Media and Knowledge Sciences

When learning a second language at a later age, adult learners often "fossilise" and do not get any better anymore. This is most obvious in terms of accent. Arnold Schwarzenegger, for instance, still speaks English with a recognizable Austrian accent, despite living in the US for decades. This raises the question why learners fail to progress once a certain level is reached. In this project, we investigated whether one contributing factor is that our own feedback is biased, that is, might we, maybe due to familiarity, perceive our own accent as closer to the target than it actually is? One methodological problem is that judging one's own accent is fraught with methodological issues that might lead to both overestimation (preservation of self-esteem) or underestimation (wanting to appear modest). To circumvent that, we first recorded female native speakers of German producing a series of sentences in English. Then we edited these voices so that they sound more male by lowering the pitch as well as reducing the so-called formant dispersion. The same female speakers were—four to six weeks later—asked to rate these apparently male voices with regard of the quality of second-language accent. In that rating task, they also heard their own, altered voice. Most speakers did indeed not realise that they were listening to their own voice. Under these circumstances, they did rate their own accent as better than that of comparable others, showing that external feedback might be necessary to improve "fossilised" second-language accents.

AI meets the Maltese Courts: Safe use of AI to imProve efficiency using the Small Claims Tribunal as a model (AMPS)

Dr Ivan Mifsud

Department of Public Law, Faculty of Laws

The legal domain represents a primary candidate for Web-based information distribution, exchange, and management, and is motivated by numerous e-government, e-justice, and e-democracy initiatives worldwide. In the local sphere, Government provides publicly available legal information (in Maltese) such as judgements together with keyword-based search facilities available through the Justice Services and more recently the eCourts portal.

Recent years have seen an increase in research and practice in the field of Artificial Intelligence (AI) and Law intended to address aspects such as automated legal reasoning and argumentation, semantic and cross-language legal information retrieval, document classification, legal drafting and legal knowledge discovery and extraction, as well as predicting the outcome of legal cases.

AMPS is a joint initiative between the Faculty of Laws (Department of Public Law), and the Faculty of Information and Communication Technology (Department of Artificial Intelligence). The scope behind this project is that of developing an ethical Judgement Decision Support System that leverages on AI to predict the outcome of Maltese court cases, specifically those within the Small Claims Tribunal (SCT).

A newly specialised legal corpus comprising all the final rulings from the SCT is being built with the support of a team of Legal Experts. Furthermore, AMPS is leveraging on advances made on building models that have been pre-trained on a multilingual and monolingual model for Maltese with a special focus on the issue of bias.

Expo Stream ES 3.1 – ES 3.7

CHAIR: **Prof. Inġ. Kenneth P. Camilleri** | VENUE: **David Bruce Hall**

Understanding the Effect of Grown-In Defects in Silicon on Solar Cell Efficiency

Dr Jinta Mathew
Institute for Sustainable Energy

Improving the efficiency of silicon-based solar cells is imperative to maximise the harnessed solar power. The current improvements in efficiency were attained by better manufacturing techniques and purer materials. There is however indirect evidence that the so-called agglomerated grown-in defects in silicon have a direct impact on cell efficiency and if this is the case, the efficiency could be improved by crystal engineering. This research focuses on understanding the defect generation and growth mechanisms in commercial silicon crystals and their impact on cell efficiency. Different silicon crystals were grown and silicon wafers from different parts of these crystals, having a range of oxygen, dopant concentrations, and growth profiles, were then investigated. These wafers were characterised using various tools and techniques such as Infrared Light Scattering Tomography (LST) to measure the defect density, and Fourier Transform Infrared (FTIR) spectroscopy to measure the oxygen concentration. Solar cells were then fabricated out of these wafers to measure the performance of the devices. An understanding of why and how such defects impact the yield of different silicon wafers will lead to a thorough understanding of the relationship between the defect types/size/densities and cell efficiency, and also shed light on the development of crystal recipes or after-crystal procedures to eliminate or minimise these effects on the solar cell performance. This project is funded by funded by the Energy and Water Agency under the National Strategy for Research and Innovation in Energy and Water (2021–2030), and is being carried out in collaboration with the Center for Solar Energy Research and Applications (ODTÜ -GÜNAM) and the industrial partner Kalyon PV.

Subjective Wellbeing in Malta – An Interactive Online Data Dashboard

Prof. Marie Briguglio
Department of Economics, Faculty of Economics, Management and Accountancy

Malta has undergone rapid development since gaining independence and now performs exceptionally well on traditional metrics of material wellbeing like Gross Domestic Product (GDP). It is more laggard on broader indicators of sustainable development or quality-of-life (for instance, work-life balance) but still positions well in world rankings. Yet neither the narrow view of material-wellbeing, nor the broader view offered by objective data dashboards, have, to date, been capable of offering a complete picture of wellbeing in Malta – in that they lack the dimension of subjective wellbeing. Surveys asking how people feel can offer a democratic and direct account of wellbeing – as judged by individuals themselves. Furthermore, generating sufficiently large representative data-sets on self-assessed wellbeing offers the potential to go beyond national averages to allow the examination of disaggregated data pertaining to diverse socio-economic groups. This presentation showcases the results of a collaboration of the Malta Foundation for the Wellbeing of Society, with the University of Malta, resulting in a dedicated on-line portal acting as a one-stop-shop of Wellbeing Indicators, Networking, Data, Exploratory studies and eXchange (INDEX). Within this, a dashboard of subjective wellbeing data in Malta visualises indicators on satisfaction (in different life domains) and affect (positive and negative emotions), collected by the National Statistics Office utilising the European Union's "Wellbeing Module" (SILC). Users may juxtapose wellbeing trends against a range of relevant variables on income and living conditions as well as drilling down by demographic characteristics in order to obtain insights on wellbeing in Malta.

Researching Hate Speech from a Discourse-Analytic Perspective

Prof. Stavros Assimakopoulos
Institute of Linguistics and Language Technology

While it is generally acknowledged that it is particularly difficult to provide a universally accepted definition of hate speech, it is also increasingly being recognised that the term has now transcended its original legal meaning and is currently used in common parlance to refer to a much wider array of discourses that do not necessarily fall under the legal requirement of incitement to discriminatory hatred. In view of this, and as a result of continuous data-driven research that has been undertaken in the area at the Institute of Linguistics and Language Technology, a distinction has been drawn between hard and soft hate speech, with the former encompassing those familiar speech acts that are legally regulated in several countries and the latter referring to discourses that may at first sight appear unproblematic under the relevant legal provisions, but can still be shown to disseminate disparaging attitudes in relation to minority groups. In this talk, after briefly presenting the relevant dichotomy, I will summarise some main findings in relation to the (often distinct) discursive strategies that are used for the communication of discriminatory hatred within user comments that are posted in local news portals. Then, I will present some directions for future research, which would benefit immensely from an interdisciplinary perspective.

Analysing Human Smuggling Through Social Media Content Analysis

Dr Aitana Radu
Department of Information Policy and Governance, Faculty of Media and Knowledge Sciences

Modern communication technologies – namely the internet, social media and mobile applications – have significantly impacted the way in which human smugglers operate.

In this context, our research has focused in developing a set of virtual indicators which can be employed by security practitioners and NGOs working in the field of border security and migration to detect and analyse instances of human smuggling.

Building on real-world threat indicators of human smuggling, the research team has designed and tested a set of virtual indicators, applicable for social media content, which are employed to map the threat as well as gather insights related to its magnitude and likelihood.

The core problems addressed in the research process have been:

a. Mapping the digital footprint of the threat;
b. The need for a multi-language lexicon enabling content identification using AI-systems. The developed lexicon included both visual and text concepts.
c. Developing a set of indicators for assessing the intelligence value of the content and online interaction of users. For this purpose, research employed concepts extracted from marketing in order to explore the correlation between the human smugglers 'branding' activities online and the magnitude and likelihood of their operations.

The overall result of the research, carried out as part of the EU-funded CRiTERIA project has been the development of a prototype OSINT system which supports risk analysis for border security purposes.

Everyday Extremism Ecological Scale

Prof. Gordon Sammut
Department of Cognitive Science, Faculty of Media and Knowledge Sciences

Everyday extremism describes extremist attitudes that occur frequently, and once manifested in our day-to-day life, become normalised and socially acceptable. Specifically, it describes those behaviours that are not considered to be too extreme, like acts of violence or armed revolution, yet neither too every day in such a way that they consistently perpetuate social norms. We developed a scale for measuring this construct by utilising Reddit and local news articles deriving from Greece, Kosovo, the United Kingdom, and Malta, as data sources for capturing specific attitudes, behaviours, and sentiments amongst the everyday citizens. After identifying actions concerned with activities aimed at bringing about certain change (e.g., social, political, economic, or environmental change), we carried out a thematic analysis resulting in a list of unique actions relating to everyday extremism. Following this, we asked experts to rank the actions from the most extreme to the most every day and conducted statistical tests that ultimately resulted in a scale of 12 actions spanning from those that advance one's own views to those that impede others' views. The development of this scale forms part of OppAttune, a Horizon-Europe funded project involving 17 partners across Europe, that aims to track, attune, and limit extreme narratives.

Creating an Innovative Green Business Model Canvas

Prof. Sandra M. Dingli
Edward de Bono Institute for Creative Thinking and Innovation

The aim of this presentation is to describe innovative green practices that have been tried and tested and to demonstrate how the empirical data that emerged from 60 interviews with entrepreneurs in seven European countries was used to elicit innovative sustainable practices.

InnoGreen is an Erasmus+ Cooperation partnership which is in the final stages of its two-year life cycle. An innovative green business model canvas to motivate entrepreneurs to adopt more sustainable practices has been created and the partners are in the process of developing an e-learning platform for adult educators to promote innovative green practices. Sixty interviews with entrepreneurs in each of the participating countries (Romania, Poland, Austria, Italy, Greece, Malta and Switzerland) were conducted and analysed to elicit innovative green practices that form part of the final GBIC [Green Business Innovation Canvas].

An extensive database that incorporates all the innovative features that are found in green businesses and that emerged from the interviews has been compiled, together with methods for their implementation in business activities. The result is the identification of explicit innovative features implemented by green businesses (summarised as 'triggers') and methods to support the implementation of those features. These features of innovative green practices are increasingly relevant and necessary to address the challenges which the world is facing today. The research conducted by the project partners is, moreover, in line with the European Commission's Green Deal which aims to make Europe the first climate neutral continent by 2050 – a mammoth task that certainly requires increased innovation.

Small Islands, Big Challenges: Coordinated Responses to Climate and Health Risks

Dr Luca Nguyen
Islands and Small States Institute

This research is part of the project "Beyond Pandemics: Improving Climate Resilience and Health Systems in Small Island States", that received the research excellence award by the University of Malta in 2022.

Small islands exhibit a high degree of vulnerability, given their dependence on economic activities located in coastal areas, and limited resource endowment, and are often disproportionately impacted by external shocks. Understanding the manner in which small islands can strengthen their resilience is increasingly important in the face of climate change and public health crises. However, there is still scarce evidence about the main factors conducive to building resilience in the context of small islands, and even more uncertainty in identifying features that can address both climate and public health risks. This gap underscores the need for coherent strategies that enhance crisis management in small island settings.

Utilising national household surveys in Mauritius and Malta, this research investigates the nexus between environmental challenges and health system efficacy in crisis response. The aim is to identify robust linkages that bolster resilience to external shocks, using health and climate crises as topics of study. Preliminary results using regression and factor analysis suggest a link between state/government and individual/community actions, showing that climate and health risks can be addressed more comprehensively and effectively if those actions are coordinated, especially if planned purposely in advance, and not only the result of ad-hoc or reactive measures. These findings intend to inform strategies to enhance resilience building in the context of small island states.

Expo Stream ES 4.1 – ES 4.8

CHAIR: **Dr Claudia Borg** | VENUE: **Vassalli Hall**

Pain Reduction through Enhanced Conditioning and Intelligent Simulation Environments (P.R.E.C.I.S.E)

Mr Liam Bugeja Douglas

Department of Artificial Intelligence, Faculty of Information and Communication Technology

Pain management is a daunting challenge in healthcare, affecting millions worldwide and significantly impacting the lives of patients and their families. Although existing pain management strategies offer relief, they often come with limitations, such as the risk of addiction, highlighting a clear need for an innovative, non-invasive, and effective solution. To address this, we propose a novel approach named PRECISE (Pain Reduction through Enhanced Conditioning and Intelligent Simulation Environments). PRECISE draws inspiration from the success of MORPHEUS, a cutting-edge pain distraction system with a remarkable 80% reduction in pain. However, a notable limitation of MORPHEUS is that the pain returns once its use is discontinued. PRECISE is designed to overcome this limitation by offering sustained pain relief even after the distraction therapy is ceased. Unlike MORPHEUS, which relies on Virtual Reality (VR) for pain distraction, PRECISE employs a more holistic approach. It melds AI-powered VR with Distraction Therapy, particularly emphasising Conditioning to improve pain management outcomes. Through affective computing, the AI-powered VR tailors the experience to the patient's emotional state, providing an engaging distraction from pain and enhancing the therapy's overall effectiveness. What differentiates PRECISE is its innovative conditioning methodology, which delivers both temporary distraction and long-term pain relief without any side effects. Our preliminary experiments, using only tactile stimuli, have already showcased a significant margin of improvement over MORPHEUS without the necessity of VR equipment. This success has resulted in a lasting reduction in pain. As we progress to the next phase of PRECISE, we plan to enrich our approach by introducing visual and auditory stimuli, creating a multi-modal conditioning environment. This strategy is centered around providing a temporary distraction while working towards long-term pain alleviation without reliance on medication, thereby eliminating any risk of side effects. PRECISE promises a comprehensive sensory experience that maximises patient engagement, empowering individuals to manage their pain more effectively.

Advancing CACTUS: A Gaze-Native Web Browser Project for Constraint-Free Multi-Modal Access to Communication Technology

Dr Chris Porter

Department of Computer Information Systems, Faculty of Information and Communication Technology

Web Content Accessibility Guidelines (WCAG) serve as the cornerstone of universal web design, emphasising perceptibility, operability, understanding, and robustness across diverse user agents and assistive technologies. Despite adherence to WCAG standards, individuals with severe motor impairments, relying on eye trackers (ETs), often encounter accessibility challenges due to designs lacking specific affordances for ET interaction.

This project, titled "Advancing CACTUS (Constraint-free multi-modal Access to Communication Technology for Users with Severe motor impairments)," introduces innovative interaction patterns within a purpose-built gaze-native web browser named CACTUS. The project aims to enhance accessibility for users with severe motor impairments by leveraging novel eye-tracking interaction patterns and integrating secondary input modalities.

The proposed patterns include a Quadtree-based Target Selection with Secondary Confirmation, aiming to enhance precision and efficiency in ET interaction, and a Hierarchical Re-rendering of Navigation Menus, which seeks to provide constraint-free multi-modal access in complex web environments.

This project's overarching aims include advancing the state of the art in accessible web design for individuals with severe motor impairments. By integrating novel eye-tracking patterns and secondary input modalities, the project contributes to the evolution of inclusive web design, ensuring a more accessible and user-friendly online environment for this specific user group.

Satellite4Health Project and Future Research Ideas

Prof. Lalit Garg

Department of Computer Information, Faculty of Information and Communication Technology

This talk will present the findings of the MCST-funded Satellite4Health project, which explores Satellite data analytics applications in forecasting health resource requirements and management. The weather, pollution, vegetation, and other geospatial features collected from satellites can be analysed to characterise their impact on public health and hospital resource requirements and availability. This knowledge can be used to develop better public health measures/policies and analyse their impact to ensure public health and improved healthcare outcomes. The discussion on future research ideas and avenues will follow the talk.

Laser Shock Peening: The Next Step in Enhancing the Surfaces of Automotive Gears

Mr Matthew Curmi

Department of Metallurgy and Materials Engineering, Faculty of Engineering

Laser Shock Peening: The Next Step in Enhancing the Surfaces of Automotive Gears

Shot peening a widely employed process in metallurgy, involves the rapid impact of micrometric spherical projectiles onto metal surfaces to induce cold working. While effective in enhancing surface hardness and fatigue performance, shot peening often compromises the surface roughness, leading to diminished wear resistance.

In response to this challenge, laser shock peening or LSP, emerges as a promising solution. LSP utilises short laser pulses lasting only a few nanoseconds to impart shock waves that propagate deep into the material, inducing beneficial compressive residual stresses. Particularly in industries such as aerospace and nuclear, where the demand for robust materials is paramount, LSP presents a compelling alternative.

However, despite its potential, LSP is yet to see a greater degree of accessibility and optimisation. An ongoing concern revolves around the application of laser pulses on intricate geometries, tight spaces or small parts, which inherently introduces angles of incidence and poses challenges. Addressing this issue is crucial for furthering the efficacy and applicability of LSP.

This research aims at investigating and mitigating such challenges, with a specific focus on optimising LSP for austempered ductile iron automotive gears. The final goal is to exploit the inherent toughness of ADI, while enhancing surface hardness and residual compressive stresses, keeping the surface roughness low and improving the bending fatigue properties of gear teeth.

Through systematic experimentation and analysis, this work aims to propel laser shock peening towards broader industrial adoption, offering enhanced surface engineering techniques for critical components in various sectors.

Detection of Resident Space Objects and Fast Radio Bursts with the Northern Cross

Prof. Alessio Magro

Institute of Space Sciences and Astronomy

The Real-Time Backend for the Medicina Northern Cross Telescope project, funded under the PNRR (National Recovery and Resilience Plan), focuses on upgrading the backend systems of the Medicina Northern Cross Telescope. Spearheaded by the Italian National Institute for Astrophysics (INAF), this initiative aims to enhance the detection and analysis capabilities of the telescope's Fast Radio Burst (FRB) detection system. The upgrade encompasses advancements in beamforming, correlation, calibration, dedispersion, and the FRB detection pipeline, which is led by member of ISSA and funded through the UoM Research Excellence grant. These enhancements seek to improve the sensitivity and efficiency of FRB detection, enabling deeper insights into their origins and characteristics, and expanding our knowledge of astrophysical phenomena.

Concurrently, the SMARTIES (Space Monitoring AI Radar Technique for Improved Echo Streaks) project, funded by the MCST Space Upstream Fund, endeavors to advance space debris monitoring by integrating Artificial Intelligence (AI) techniques with radar data analysis. Through the development of a realistic simulator and exploration of deep learning methods, SMARTIES aims to overcome challenges such as low signal-to-noise ratios, enhancing space situational awareness and contributing to improved safety protocols and space exploration strategies. Collaborative efforts with partners like the Politecnico di Milano further enrich the project's capabilities through expertise in developing parameterised space debris models.

Surface Engineering of Wire Arc Additively Manufactured Magnesium for Satellites

Prof. Inġ. Glenn Cassar

Department of Metallurgy and Materials Engineering, Faculty of Engineering

Magnesium (Mg) is increasingly finding applications as replacement material for aluminium (Al) based alloys within space hardware where the integration of magnesium is key to large weight reductions in payload. Unfortunately, both traditional machining and forming of Mg-based alloys is challenging and inflates costs of production, especially if complex space-relevant geometries are considered. This has sparked a growing interest to capitalise on additive manufacturing's unique design capabilities. The use of wire arc additive manufacturing (WAAM) is being investigated for magnesium-based components for satellite applications. WAAM offers the ability to produce net shape components with a high material efficiency without the need to handle large quantities of highly reactive magnesium powder or molten magnesium.

This research aims at studying Mg-WAAM in combination with surface engineering techniques. The use of surface engineering will be key towards optimising the as-built materials for the intended application including satellite electrical and antenna products. For instance, the use of physical vapour deposition and/or shot peening can allow for further improvement of the material's mechanical and electrical surface properties and manipulation of the resultant surface topography. Shot peening is particularly relevant to increase high cycle fatigue strength, resistance against stress cracking and vibration cracking, which is a key operational requirement of smaller satellites while physical vapour deposition is also particularly important to create highly conductive surfaces.

Characterisation and analytical work of optimised AM parts will include tensile-compressive and torsional studies particularly in comparison to industry-standard Al alloys.

Nuclear Fusion Vacuum Vessel Inner Shell Thermo-Mechanical Analysis

Prof. Inġ. Pierluigi Mollicone

Department of Mechanical Engineering, Faculty of Engineering

UM is part of the EUROfusion consortium, through the national MCST programme 'Research and Development towards a European Fusion Reactor' (ENDURE). The research group at the Department of Mechanical Engineering contributes in the field of stress analysis and structural integrity as part of DEMO, the DEMOnstration power plant, successor of ITER (an experimental power plant currently being constructed). DEMO is a technology-driven programme where the key criterion is the production of electricity, to lay the foundation for the environmentally sustainable power plants of the future.

The work presented here deals with a preliminary thermo-mechanical analysis of the inner shell of an experimental vacuum vessel that will form the basic structure for an experimental reactor, to be built as a technology demonstrator for the full-scale DEMO power plant. In the study, several load cases are considered, which represent normal operation and baking conditions. The loads considered are the neutron heat generated, coolant pressure and mechanical loads due to the Toroidal Field (TF) coil fast discharge. The neutron heat generation accounts for the non-uniform distribution resulting from the gaps between each blanket module. Results are computed by Finite Element Analysis (FEA) using advanced modelling techniques. Models are solved in the thermal and structural domains with a sequentially coupled approach. The work provides a preliminary assessment of the structural response of the vessel as a function of the main driving load parameters.

Micromanufacturing: Challenges and Opportunities

Dr Inġ. Pierre Vella

Department of Industrial and Manufacturing Engineering, Faculty of Engineering

The global market for miniaturised products has been increasing dramatically in recent years across a range of industry sectors such as biotechnology, energy, medical, and ultra-precision engineering. Due to technology advances, products around us are becoming smaller allowing for mobility, whilst tending to integrate more functionality and intelligence. The development of such multifunctional miniaturised products offers important advantages, in particular cost, size, material usage and power consumption reductions. This trend has precipitated in all stages of product design and development and has resulted in a need for components which require the use of a variety of materials and complex 3D microstructures with high aspect ratios. For example, complex internal geometries are particularly important for emerging applications such as high-performance microfluidics for medical analysis. At the same time, manufacturing such components poses a great challenge for conventional fabrication methods. As a result, there is a demand for advances in micro-manufacturing technologies and their integration into new manufacturing platforms in order to satisfactorily fabricate these miniaturised products. Within this context, the presentation will outline the current trends in the development of micro-manufacturing. It will also discuss the existing trends in research and development of micromanufacturing technologies and their applications, together with the challenges and opportunities they represent for the research community and industry when designing and implementing new manufacturing platforms for existing and emerging products. Furthermore, it will highlight the research which has been carried out within the Department of Industrial and Manufacturing Engineering (University of Malta) on specific micro-manufacturing technologies, such as micro-electro discharge machining, laser ablation, and micro-injection moulding.

Expo Stream ES 5.1 – ES 5.8

CHAIR: **Prof. Inġ. Maurice Apap** | VENUE: **Girolamo Cassar**

Advancing Marine Transportation Through Additive Manufacturing and Surface Engineering

Prof. Inġ. Ann Zammit

Department of Metallurgy and Materials Engineering, Faculty of Engineering

The SEAM project (Surface Engineering for Additive Manufactured parts used in marine transportation) conducted jointly by the University of Malta and Southeast University (China) addresses a critical need in the maritime industry. Marine transportation serves as the primary mode of international freight movement in both China and Malta, emphasizing the importance of robust and reliable components within this sector. Additive manufacturing presents an innovative solution for the rapid production of intricate parts; however, its application in marine environments necessitates addressing inherent limitations.

This project focuses on enhancing additive manufactured metallic parts for marine applications through the implementation of two surface treatments: shot peening and deposition of coatings via physical vapour deposition. By mitigating the challenges associated with additive manufacturing, such as material integrity, together with corrosion, fatigue and cavitation resistance, the aim is to ensure the suitability and durability of these components in maritime settings. Rigorous testing procedures, simulating the harsh conditions of the marine environment, have been conducted to validate the efficacy of the proposed surface treatments.

This collaborative effort signifies a significant step forward in advancing marine transportation technology, with the potential to revolutionise manufacturing practices and enhance the reliability of critical components in the maritime sector. Through the integration of advanced surface engineering techniques, the SEAM project contributes to the evolution of marine technology, offering a pathway towards safer, more efficient, and sustainable maritime operations.

Trajectory Generation for Emergency Landings of Commercial Aircraft

Dr Inġ. Brian Zammit

Department of Electronic Systems Engineering, Faculty of Engineering

Emergency landings of commercial aircraft due to Total Loss of Thrust (TLOT) are rare, primarily due to the reliability of modern jet engines. However, pilots must be equipped to respond effectively in such situations to ensure the safe landing of the aircraft and mitigate potential loss of life. Presently, no flight deck automation exists to facilitate the decision-making process in these crucial moments. The STELA project introduces innovative automation aimed at assisting the crew in navigating the aircraft safely to the ground during emergencies. This involves the identification and selection of suitable landing sites. A fuzzy logic framework has been developed to mimic the reasoning and decision-making process of airline pilots. This framework enables the system to assess the risk associated with various landing sites and prioritise them accordingly. Once a preferred landing site is chosen by the pilot, a path planning algorithm is employed to determine the appropriate descent path for the aircraft. Specifically, a path planning algorithm using Genetic Algorithms (GAs) is utilised. The algorithm identifies a feasible glide path, taking into account the aircraft's performance characteristics whilst ensuring that the aircraft reaches the landing site at the correct altitude, speed and heading. The presentation will discuss the development of these sub-systems and showcase results derived from simulated emergency scenarios. moreover, in line with the European Commission's Green Deal which aims to make Europe the first climate neutral continent by 2050 – a mammoth task that certainly requires increased innovation.

ASTRA – AI-Enabled Tactical FMP Hotspot Prediction and Resolution

Dr Leander Grech
Institute of Aerospace Technologies

The aviation industry faces persistent challenges due to congested airspace (aka hotspots), exacerbated by the limitations of current approaches in identifying and resolving these hotspots. While existing methods rely on flight plan data to manage hotspots pre-tactically, the variance between planned and actual trajectories often leads to unanticipated hotspots during operation. Air Traffic Controllers (ATCOs) are then forced to address these issues with minimal advance notice, resulting in delays and heightened workload. The EU-funded ASTRA project aims to harness the power of state-of-the-art Artificial Intelligence (AI) to improve upon hotspot prediction and resolution in the en-route phase of flight. Unlike conventional methods, ASTRA aims to predict hotspots up to one hour in advance, which will give ATCOs more time to devise proactive resolution strategies. The solution developed by ASTRA will also empower Flow Management Position (FMP) personnel to anticipate hotspots and propose efficient resolution tactics.

The extended hotspot prediction window will allow for the novel use of Reinforcement Learning (RL) techniques to assist ATCOs and FMP personnel with efficient hotspot resolution strategies. By integrating historical data and flight trajectory simulations, ASTRA will train RL agents to not only enhance airspace capacity but also to provide more fuel-efficient and environmentally sustainable flight trajectories. The implications of ASTRA extend beyond immediate congestion reduction. By providing FMPs and ATCOs with enhanced predictive capabilities and actionable insights, the project aims to streamline operations, reduce delays, and alleviate the burden on air traffic management personnel.

Innovative Strategies for Decarbonising Maritime Transportation: A Case Study of Alternative Fuel Integration in Shipboard Power Systems

Dr Younes Boujoudar
Department of Electrical Engineering, Faculty of Engineering

In recent years, there has been increasing concern about the decarbonisation of the shipping industry. Replacing fossil-fueled vessels with hybrid or all-electric alternatives can significantly reduce greenhouse gas (GHG) emissions and other pollutants. Additionally, there is a growing demand for improvements in onboard energy efficiency, leading to reduced fuel consumption. However, given the isolated nature of shipboard power systems, ensuring system resilience is crucial.

Challenges arise for system integrators when sizing batteries and alternative fuel systems in new builds due to the different dynamic behavior of the alternative sources and the limited upfront inputs about the expected vessel operational profile or power load variation. RIVIERA (Reducing Emissions with Innovative Marine Power and Propulsion Systems using Alternative Fuels) aims to address these challenges by developing methods and tools for the integration of alternative fuel systems on a vessel with a DC bus architecture.

Currently, the main components of the identified vessel have been modeled and simulated. A robust control system was also designed and implemented to ensure proper load power sharing among the generator and onboard Li-Ion battery storage system, as well as to regulate the vessel's DC bus voltage.

The next stage involves integrating hydrogen fuel-based generation to replace the onboard diesel generators. Power management strategies will then be adapted for the new power system dynamics to ensure they do not compromise the vessel's operational capabilities.

Human–Machine Interface R&I for Large Transport Aircraft at UM

Prof. Inġ. David Zammit Mangion
Institute of Aerospace Technologies

This presentation will start with an overview of over 15 years of the presenter's engagement in human-machine interface research and innovation for large transport aircraft, highlighting the evolving industrial state-of-the-art; the drivers that are behind the need for innovation and change; and the challenges associated with the associated disruptive technologies. The work carried out at UM in the field will be presented in a chronological order, and will address the evolution of technologies developed though the multiple, follow-on, externally funded projects involved, including ODICIS, TOUCH-FLIGHT, TOUCH-FLIGHT 2, SMARTAP and ARTIAP. The first development of a single, end-to-end, touch screen concept, which was displayed at the Paris Le Bourget and Farnborough airshows in the early 2010s and evolved into an industrial product will be briefly described as a baseline that led to the development of the TOUCH-FLIGHT platform, which was further developed to include voice communication to improve throughput efficiency and reliability. Key advantages and challenges in the technologies will be briefly described.

The address will then move on to the bolt-on innovations introduced to the TOUCH-FLIGHT platform. Initially, smart system interactions that took over the second pilot's role of command, check and challenge were introduced as a pathway towards the system being a technology enabler for reduced pilot workload and reduced crew operations. Now, the research is involving artificial intelligence to elevate the platform from a 'smart' to 'intelligent' system, which is beyond current state-of-the-art. The presentation will close with a brief address of the value and challenges of AI-in-the-loop inside the cockpit and argues for the approach, particularly in the light of contemporary failures.

Microelectromechanical System Gripper for Biomedical Applications

Inġ. Thomas Sciberras
Department of Mechanical Engineering, Faculty of Engineering

Microelectromechanical systems (MEMS) are devices constructed on the micron scale and have potential in a diverse array of functions. Their precision and scalability allow for such diversity and MEMS have therefore nested themselves well in numerous academic and industrial sectors. One such industry is the biomedical industry whereby MEMS devices are used as single cell manipulation and characterisation tools. Research has shown that MEMS devices have the capacity to be utilised as micro object characterization tools where one particular sub-category is the diagnosis of certain diseases which affect a cell's mechanical integrity. Through a collaboration between the Faculty of Engineering and the Faculty of ICT, this project set out to design and develop MEMS devices suitable for manipulation and mechanical characterisation of single biological cells, particularly human red blood cells suspended in aqueous media. Such applications impart strict thermal and structural specifications by which potential MEMS devices must abide to perform the exercise without damaging the biological cells being investigated. Several device configurations were designed and fabricated using a commercially available fabrication technology known as SOIMUMPs™. State-of-the-art finite element analysis techniques together with experimental testing have demonstrated that the devices are potential candidates for the intended function.

UM Research Innovations for Local and Global Plastic Manufacturing Industry

Prof. Arif Rochman

Department of Industrial and Manufacturing Engineering, Faculty of Engineering

In the contemporary landscape of industrial manufacturing, plastic injection molding serves as a fundamental pillar, both locally and on a global scale. Injection molding process is characterised by pressurizing molten plastic to fill mold cavities. One of the prevalent issues in injection molding process is the potential entrapment of air in mold cavities, leading to defects such as incomplete cavity filling, burn marks, and heightened residual stress in the injected products. To address such issues, the VacuUM (MCST TDP) project has successfully developed and tested an innovative active vacuum venting system to eliminate air traps in the mold. This patented VacuUM device is a plug and play system, requires no seals in the mold, and involves very minimal mold and machine modifications. Preliminary findings are quite encouraging since the application of VacuUM has demonstrated a substantial reduction in melt pressure within the mold, resulting in parts with diminished residual stresses and significant improvement in overall quality.

Furthermore, the CONFORM (TRAKE) project deals with the longest stage of injection molding cycle, namely the cooling stage. The cooling stage affects both the effectiveness and efficiency of the injection molding process. A more effective injection molding process produces plastic parts with a better quality, while a more efficient injection molding process results in a shorter cycle time. Considering the importance of the cooling stage in injection molding, CONFORM aims to develop a novel type of conformal cooling channels (CCCs), called "Freeform Conformal Cooling Channels" (FCCCs).

Using Nature's Resources to Make Composites More Sustainable

Dr Brian Ellul Grech

Department of Mechanical Engineering, Faculty of Engineering

Composites are nowadays extensively used in a number of applications due to their ability to be customised to meet the diverse requirements of modern technology. Synthetic fibre reinforcements are extensively utilised in composites. These fibres are not environmentally sustainable due to the toxic and non-biodegradable nature of the by-products produced during their manufacturing. Given the increased environmental impact awareness, research into natural fibre reinforcements experienced a considerable impetus during the past two decades.

Flax is widely recognised as a prominent natural fibre in composites, benefiting from a well-established industry. On the other hand, fibres derived from the agave sisalana plant and marketed for composite use is not commercially available. The agave sisalana plant is relatively more climate-resilient compared to flax and it grows in semi-aired regions. Processing sisal fibres present various drawbacks and judging from the experience gained, the main obstacle is fine fibre spinning. This stems out from the natural high stiffness of the fibres. Despite this challenge, the project managed to create plain woven mats using 100% sisal fibres. The sisal mats were impregnated with 29% biobased epoxy resin using vacuum assisted compression moulding which is the most popular method to create sisal-epoxy composites. The resulting coupons suffered from several voids on the outer surfaces. The fabrication process was changed to resin infusion and this resulted in a smaller void content The thickness for one layer of sisal mat impregnated with epoxy was approximately 3mm. Tensile test coupons with sisal and flax (separately) are being prepared which will help us to compare the final strength and the cost of sisal composites with flax, which is yet the most popular natural plant fibre composite.

Expo Stream ES 6.1 – ES 6.8

CHAIR: **Prof. Richard Muscat** | VENUE: **M.A. Grima Hall**

Impact of Methylation Enzymes in Colorectal Cancer

Prof. Byron Baron
Centre for Molecular Medicine and Biobanking

Protein methylation, mainly on lysine and arginine, is the smallest chemical change but can modulate protein properties such as structure, function and stability. Dysregulated methylation can initiate abnormal biochemistry, leading to disease. Methylating enzymes (methyltransferases) have been found to be dysregulated in various cancers including colorectal cancer (CRC). The Euchromatic histone-lysine N-methyltransferase 2 (EHMT2) is one of the most overexpressed methyltransferases in CRC as well as various other cancers. It catalyses the addition of methylation via the Su(var)3–9, Enhancer-of-zeste and Trithorax (SET) domain, composed of 130- to 140-amino acids, flanked by two cysteine-rich regions called the pre-SET and post-SET domains. These 3 essential domains only cover residues 972–1180 of the massive EHMT2 protein. The aim of this project was to isolate interactors of EHMT2 using only the three essential domains and then follow up which interactors were dysregulated in CRC. A clone covering the 3 SET domains was generated and used to create a bait fusion protein for the isolation of interactors from a protein library using a yeast-two hybrid system. Following the determination of the interaction strength of the isolated interactions using a CPRG assay, a number of successful strong interactors were sequenced. The differential expression of the isolated EHMT2 interactors is now being investigated in CRC spheroids, since 3D cell culture better mimics in-vivo protein expression patterns. The data generated will be a useful guide for future diagnostic and prognostic testing of different CRC sub-types, particularly prior to chemotherapy administration or to determine the metastatic potential of tumours.

A Novel Methodology to Produce Bioactive Peptides

Prof. Gary Hunter
Department of Physiology and Biochemistry, Faculty of Medicine and Surgery

We have explored a method employing fusion protein technology to produce peptides with naturally occurring amino acids. The production of proteins using fusion protein technology for purification is not a new concept, however, its application to much smaller peptides is rarely employed. Chemical synthesis is the most commonly used method and has an advantage that unnatural amino acids can be introduced within the sequence. Its drawback is usually a high cost for custom made peptides. While large proteins are often expressed in bacterial cells in culture, the subsequent purification steps are not suited to smaller proteins or peptides, which are lost amongst the cellular milieu. Adding a removable fusion tag to the peptide or protein can aid in the folding of large proteins and simplify the downstream purification after in vivo expression. We applied this technique to produce the human peptide hormone Thymosin-1-α and analogues of naturally occurring human peptides with anti-microbial activities. We present some unexpected problems and conclude that it is not only possible to make bioactive peptides by this method but also do so less expensively.

Decoding ALS in Malta: Flying Towards a Better Future

Prof. Ruben Cauchi

Department of Physiology and Biochemistry, Faculty of Medicine and Surgery

Amyotrophic lateral sclerosis (ALS) is a progressive neurodegenerative disease that attacks the nerves that control the body's muscles. The disease typically leads to complete paralysis of the body, robbing patients of their ability to walk, speak, eat and breathe. Genetic risk for ALS is highly elevated in genetic isolates, like the island population of Malta, providing a golden opportunity to investigate the genetics of this disease. In this oral presentation, Malta's unique ALS genetic architecture will be highlighted with this opening up the possibility of novel ALS gene discovery. Importantly, the talk will showcase ongoing work aimed at characterizing newly identified ALS genes in the fruit fly (Drosophila) model system. Through use of transcriptome profiling and high-resolution immunofluorescence imaging, we pin point pathways that are dysregulated as a result of gene loss, allowing us to arrive at mechanisms that can be targeted by precision medicine for the benefit of ALS patients in Malta and worldwide.

Phage Display Identifies Antibodies Targeting Tumour Associated Antigens

Ms Mariana Grima

Department of Applied Biomedical Science, Faculty of Health Sciences

The rising use of immunotherapy in lung cancer treatment is due to its potential for extended efficacy and reduced side effects when compared to chemotherapy. Antibody-based immunotherapy focuses on specific molecular targets or cells, improving treatment accuracy and minimising potential adverse effects.

One effective approach in antibody-based immunotherapy is to target immune checkpoints, which are molecular switches that cancer cells use to evade immune surveillance. Immune checkpoint inhibitors (ICIs) block these switches, allowing the immune system to recognise and attack cancer cells. A separate approach involves targeting tumour-associated antigens (TAAs) which are molecular markers found on cancer cells. Antibody mediated targeting of TAAs destroys cancer cells whilst protecting healthy tissue.

We employed phage display biopanning to identify novel antibodies for cancer immunotherapy by focusing on emerging immune checkpoints such as T cell Immunoglobulin and Mucin domain 3 (TIM-3) and TIM-4. This process involves anchoring the target protein onto a surface to discover phage-displayed antibodies that interact with these proteins. We confirm the specificity of the binding antibodies using ELISA and analyse their amino acid sequences through Sanger sequencing.

We uncovered unique amino acid sequences for antibodies targeting immune checkpoints TIM-3 and TIM-4. We have extended this platform to discover antibodies directed towards TAAs such as CarcinoEmbryonic Antigen-related Cell Adhesion Molecule 5 (CEACAM5), mucin-1, podoplanin, and mesothelin which are overexpressed in non-small cell lung cancer (NSCLC) and mesothelioma. Such studies demonstrate the potential of phage display technology in finding novel antibodies targeting new molecules for cancer immunotherapy.

New Cage-Based Imine and Ester Linked COFas a Smart Nanocarrier Drug Delivery System

Prof. Ulrich Baisch

Department of Chemistry, Faculty of Science

The incorporation of active pharmaceutical ingredients (APIs) as guests, and the conjugation of stimuli-responsive molecules onto the surface, to create smart COF drug carriers, is a novel application of COFs to the field of therapeutics, providing an alternative route to enhance the loading capacity of delivery systems, increase drug solubility and protection from degradation, and provide additional control on the release of the entrapped drug molecules. [1, 2]

Structure determination from laboratory PXRD data revealed the formation of a new cage-based COF. Modification of its unit cell parameters and atomic coordinates upon API loading and smart molecule conjugation, indicated the physical adsorption of the molecules into the pores and onto the surface of the framework, via strong intermolecular hydrogen bonds and π-π interactions.

The new cage-based imine and ester linked COF was synthesised using liquid-assisted grinding (LAG). Conjugation of a pH sensitive aldehyde, an electro sensitive dicarboxaldehyde, and a UV sensitive aniline, followed the post-synthetic loading of heterocycle into the cages and onto the surface of this new extended network, to form the smart nanocarrier drug delivery system.

Control on the release of the loaded API molecules was confirmed in vitro [3]. These complexes demonstrate the application of COFs as stimuli-responsive nanocarriers in drug delivery systems, going beyond the prevalent passive targeting nanocarrier applications.

Further investigation included the growth of sizeable single-crystals of the cage-based imine for single crystal analysis, as well as thermal analysis to further understand the thermodynamic versus kinetic paths in the synthesis of COFs.

The Mechanical Properties of Monosodium Urate

Dr Michelle Vella Wood

Department of Chemistry, Metamaterials Unit, Faculty of Science

Monosodium urate (MSU) is a salt that can form in the body in conditions of hyperuricemia. The tendency of MSU needle-shaped crystals to deposit in arthroscopic spaces such as foot and hand joints is well known due to the resulting painful inflammatory condition called gout.

However, there is limited research when it comes to the material properties of MSU. Understanding how these properties can differ if both sodium and urate ions arrange differently in the crystal structure, is an important basis for further research. Hence, in order to better understand the link between the mechanical properties of MSU and the arrangement of its components in the crystalline solid, simulations were carried out on the experimentally-determined structure and the elastic constants were calculated. The results show that, as expected, the structure is highly anisotropic, with markedly different Young's modulus values for each plane. Particularly of interest, a Poisson's ratio along the ZX plane of 0.044, i.e., close to zero is reported. The anisotropic mechanical behaviour associated with a near-zero Poisson's ratio has been linked with increased lateral expansion, giving favourable conditions for crystal deposition as well as enhanced nucleation sites along a plane. Thus, this result puts us closer to understanding the mechanisms that trigger gout flare ups. This

information also may aid the design of possible solutions focused on manipulating the mechanical properties of gout crystals, i.e., inhibition of growth or growth into a different, harmless, shape.

Elucidating the Cause of Long COVID Muscle Weakness Using the Fly Model System

Dr Paul Herrera

Department of Physiology and Biochemistry, Faculty of Medicine and Surgery

The virus responsible for COVID-19, SARS-CoV-2, brought life to a halt when it started spreading rapidly worldwide. The major target of this coronavirus is the respiratory system, and in the worst case it can lead to respiratory failure when it reaches the lungs. Although the pandemic is now largely over, the effects of SARS-CoV-2 are still being felt mainly due to the persistent and often debilitating symptoms experienced by long COVID-19 patients. In fact, nearly one third of individuals that recover from COVID-19 are plagued by symptoms that are often life-derailing including lingering fatigue, breathlessness, difficulty with concentrating ('brain fog') and muscle weakness. Despite long COVID increasingly becoming a significant global burden affecting everyday functioning, the cause of such neuromuscular manifestations remains elusive. Since ACE2 has been highly conserved throughout evolution, we were able to use the fruit fly (Drosophila) to investigate the probable cause of the COVID-19 neuromuscular complications. We took advantage of the ability of the flies to respond rapidly to stimulation and perform complex motoric behaviours. In the laboratory we knocked down the conserved gene in the fruit fly and made use of a Drosophila Activity Monitor (DAM) to assess the resilience of the flies to stress upon induction of neuromuscular fatigue driven by physical activity. We demonstrated that fatigued flies with reduced ACE2 protein levels had a diminished resilience upon exposure to thermal stress, hinting at a probable neuromuscular function for the ACE2 gene, and providing fresh insight on the lasting impact of COVID-19 infection.

Characterising and Correcting Artifacts and from Functional MRI Preprocessing, for the Analysis of Spaceflight Neuroimaging Data

Dr Claude J. Bajada

Department of Physiology and Biochemistry, Faculty of Medicine and Surgery

Spaceflight presents a unique set of conditions, notably microgravity and prolonged exposure to the space environment, which significantly impacts human physiology. Among these impacts, alterations to brain function are particularly compelling, warranting in-depth investigation due to their potential implications for astronaut health and mission success. Functional Magnetic Resonance Imaging (fMRI) emerges as a critical tool in this research, offering nuanced insights into the brain's adaptability under such unprecedented conditions. Through fMRI, scientists can explore the intricate changes in neural activity and brain structure that astronauts experience, shedding light on the resilience and vulnerability of the human brain in space.

The Operation TOM Project employs data-driven analytical techniques to evaluate the functional homogeneity within brain regions, using fMRI data collected from astronauts before and after their space missions. This approach is essential for understanding the nuanced effects of spaceflight on brain function. However, the project faces challenges due to artifacts introduced during the standard pre-processing of fMRI data, which can obscure the true changes in brain activity.

Our research team is engaged in a process of characterizing and correcting these artifacts, aiming to refine the accuracy of our analyses. This talk will provide an overview of our latest findings, delineating the specific challenges we face and the strategies we are implementing to overcome them. Furthermore, I will discuss our ongoing research directions and outline our future plans for the project.

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