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UM RESEARCH EXPO 2025



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editorial

UMRE25

The most exciting breakthroughs rarely happen in isolation. They happen in hallways, between meetings, and over coffee. They happen when a data analyst's strategy meets a historian's archival knowledge, or when an occupational therapist's clinical need finds an engineer's solution.

'Research is part of our DNA as a University. The solutions to today's complex challenges often lie at the intersection of disciplines, so it is important that we promote interdisciplinary work by having faculties and institutes collaborate on projects. The wheel is already turning, but now we need to see it spinning.'

– Prof. Alfred Vella
(Rector of the University of Malta)

In May 2025, the University of Malta held its third Research Expo (UMRE25) at the Valletta Campus to encourage the cross-fertilisation of ideas and multidisciplinary collaboration for stronger, more effective results. The main objective of the research expo is to disseminate and promote the impressive spectrum of research activities carried out by UM's community of resident academics, researchers, and doctoral candidates.

'Very often, we researchers become so deeply engrossed in our project work that our colleagues' equally exciting research initiatives are overlooked or not given enough attention. The research expo gives our community members the opportunity to showcase their work alongside peers from various disciplines.'

– Prof. Ing. Simon Fabri
(Pro-Rector for Research and Knowledge Transfer, and Chair of UMRE)

With over 200 presentations and 450 attendees at UMRE25, our researchers reaffirmed their commitment to developing knowledge that benefits our region, our country, and society at large. As we move through 2026, last May's collaborations have found their way into our labs and classrooms, promising a fruitful UMRE26.

Prof. Ing. Simon G. Fabri

Editor-in-Chief

✉ simon.fabri@um.edu.mt

Rebekah Zammit

Editor

✉ rebekah.zammit@um.edu.mt

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EDITORIAL

Prof. Ing. Simon G. Fabri EDITOR-IN-CHIEF
Rebekah Zammit EDITOR

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EVENT & PROGRAMME COORDINATION

Noeleen Mifsud

DESIGN

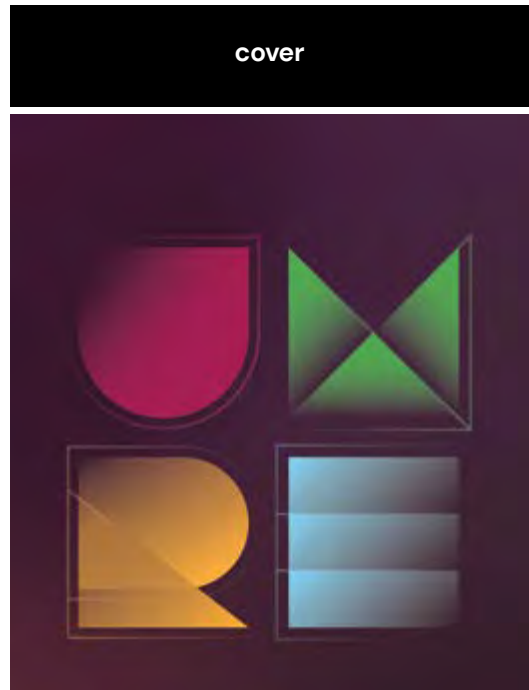
Gabriel Izzo DESIGNER
Gizelle DeGiorgio DESIGNER

PROOFREADING

Noah Galea
Andre Pawney

PRINTING

Gutenberg Press Ltd., Malta



CONTRIBUTORS

Prof. Charlie Abela
Dr Joan Abela
Prof. Mario Aquilina
Prof. Leonie Baldacchino
Prof. Stephanie Bezzina Wettinger
Dr James Calleja
Cynthia Caruana
Dr Jeremy Coleman
Charlene Ellul
Etienne Magri
Dr Roxanne Meilak Borg
Prof. Stefan Mol
Antonio Polidano Vella
Dr Aitana Radu
Dr Brendon Scicluna
Prof. Cristiana Sebu

WRITERS

Timothy Alden
Andrea Cuschieri
Sofia Dias
Courtney Ekezie
Jonathan Firkbank
Noah Galea
Christian Keszthelyi
David Mizzi
James Moffett
Elena Said

ISSN 2306-0735 | Copyright © University of Malta, 2026

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University of Malta, Msida, Malta
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THINK is a research magazine published by the Marketing, Communications & Alumni Office at the University of Malta.

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Mental Health in the Ivory Tower

Author:
David Mizzi

A Europe-wide study reveals concerning mental health trends among researchers, especially early-career academics.

What can institutions do to respond?

Prof. Stefan T. Mol, from the University of Amsterdam, presents research conducted by the ReMO Consortium at UMRE 2025 and gives us a glimpse of mental health in the Ivory Tower and how to address it.

One in two Ph.D. students experiences psychological distress, while one in three is at risk of a common psychiatric disorder, such as depression or anxiety (see Levecque et al., 2017). While academic institutions encourage the life of the mind, they are also mental minefields with levels of burnout comparable to 'high-risk' groups such as healthcare workers and teachers.

'We wanted to implement the largest ever benchmark on mental health in European academia,' says Prof. Stefan T. Mol (Assistant Professor in Organisational Behaviour and Research Methods at the Amsterdam Business School – University of Amsterdam, and Co-founder and Chair of the SciLink Foundation). Rather than focusing only on individual responses, the study analysed how mental health varies across institutions and countries in Europe. 'It is a multi-level study in which we aggregate the variance in mental health to the individual level, the institutional level, and even the country level,' says Mol. By averaging participants' responses within each institution and country, the team could examine broader patterns across Europe's academic institutions.

MENTAL HEALTH ACROSS ACADEMIA IN EUROPE

	First stage researcher (Ph.D. student or candidate)	Leading researcher (full professor,...)
Depression (DASS)	20.4%	5.8%
Anxiety (DASS)	19.1%	8.4%
Stress (DASS)	15.7%	6.7%
Burnout (DASS)	25.0%	11.5%
Poor Wellbeing (WHO)	55.0%	31.1%

'The findings suggest that mental health improves with age or career stage. Or stated more prudently, mental health issues appear to be more pervasive in more junior positions, where people oftentimes face precarity, such as not having a steady job,' says Mol. Over 20% of first-stage researchers (Ph.D. students or candidates) interviewed exhibited symptoms of depression, in contrast with the 5.8% of full professors.

When looking at predictors for depression, anxiety, stress, burnout, and poor wellbeing, the lack of a sense of community always appears as one of the top three correlates. Having an unpredictable working environment and being asked to perform extraneous tasks (such as administrative tasks that are outside one's workload) also regularly appear as the top predictors.

The aim of the study is not to compare the mental health of one individual to another, but rather to aggregate contextual factors to the institutional level. That is, in theory, people within the same context ought to experience the same sense of community. So if incumbents of one institution, on average, report a weaker sense of community and lower mental health, whereas those of another institution report a stronger sense of community and higher mental health, then this makes a stronger case that having a sense of community is a determining factor in mental health. These multi-level analyses are currently underway.

CORRELATIONAL, NOT NECESSARILY CAUSAL

It is imperative to point out that this is a relational, and not a causal study. 'To demonstrate causal effects, you'd need to leverage an experimental design instead of the one-shot cross-sectional survey that we carried out. Such a design would allow one to demonstrate




Prof. Stefan T. Mol

that changes in the sense of community in question are associated with changes in mental health. That requires further funding,' says Mol. 'One way of thinking about it is that this is step one. A sense of community, for example, is a strong suspect antecedent of mental health. To examine it further, we need more funding and research.'

While ambitious in scope, from a methodological perspective, it is hard to deduce the origins of mental health issues. For example, the data seems to suggest that people who are isolated exhibit greater symptoms of depression. However, it could also be the other way around, in that people who are depressed may tend to isolate themselves. 'When we run a survey, and participants say "I have a terrible boss and I have mental health struggles", we can't say one is causing the other. Maybe the relationship is the other way around. For example, one could say that people who

have bad mental health lose the support of their boss. However, it could also be another variable that is causing both. Similarly, people may differ in the degree to which they are inclined to agree with certain survey questions. Such a difference between people might provide an alternative explanation for the trends that we observe in the data,' says Mol.

However, Mol remains both positive and pragmatic, 'If this survey only got people talking, that's already a huge gain. The first and paramount thing is that people recognise the problem and break the stigma around mental health in academia.' Still, the challenges aren't going to be resolved overnight. He points out that one of the first steps should be to train supervisors. 'When you enter academia, you are tasked with doing research. You show your aptitude through research, then you are asked to teach, which you are not specially trained for. After that, you are promoted to a position of leadership. But a good researcher is not necessarily a good teacher, and a good teacher is not necessarily a good manager,' he says.

'The change required is systemic. It has to do with power differentials, and people operating in a system with simply insufficient resources to do good by everyone. Change needs to be implemented incrementally by breaking the silence and having discussions, so that it is on the agenda for policymakers,' explains Mol. 

This research was conducted as part of the Researcher Mental Health Observatory (ReMO) COST Action on Researcher Mental Health, CA19117, supported by COST (European Cooperation in Science and Technology).

Further Reading:

Guthrie, S., Lichten, C. A., van Belle, J., Ball, S., Knack, A., & Hofman, J. (2018). Understanding mental health in the research environment: A rapid evidence assessment. *RAND Health Quarterly*, 7(3), 2. <https://www.rand.org/pubs/periodicals/health-quarterly/issues/v7/n3/02.html>

Kismihók, G., McCashin, D., Mol, S. T., & Cahill, B. (2022). The well-being and mental health of doctoral candidates. *European Journal of Education*, 57(3), 410–423. <https://doi.org/10.1111/ejed.12519>

Levecque, K., Anseel, F., De Beuckelaer, A., Van der Heyden, J., & Gisle, L. (2017). Work organization and mental health problems in PhD students. *Research Policy*, 46(4), 868–879. <https://doi.org/10.1016/j.respol.2017.02.008>

Reimagining the University in a Post-AI World

Author:
Prof. Mario Aquilina

During the UMRE 2025, I moderated a discussion panel entitled 'Reimagining the University in the Age of AI: Challenges, Choices, and Change'. The invited panellists were Prof. Matthew Montebello and Prof. Vanessa Camilleri (Faculty of ICT), Prof. Leonard Busuttil (Faculty of Education), Prof. Mireille M. Sant (Faculty of Laws), and Prof. James Corby (Faculty of Arts).

The discussion, along with subsequent questions from the audience, broached the implications of developments in Generative Artificial Intelligence (Gen AI) for universities from diverse perspectives, including pedagogy, assessment, legislation, ethics, and research. In this article, I reflect on the panel through more or less provocative propositions that are not intended as conclusive claims but rather as an invitation to further discussion.

ATTITUDES TOWARDS GEN AI

Gen AI provokes both fear and fascination. As Corby suggested during the panel, Gen AI evokes

the feeling of *deinos*, or the sense of witnessing something at once 'terrifying and wonderful'. In universities, Gen AI has given rise to legitimate concerns about the erosion of certain cognitive skills and about its implications for specific disciplines, including but not limited to the humanities. At the same time, others see Gen AI as promising exponential growth in efficiency and exciting innovation.

As Sant explained in relation to the European Union Artificial Intelligence Act, and as Camilleri argued in relation to ethical considerations in AI research and implementation, the adoption of Gen AI must strike a balance between allowing for innovation and being wary of, as well as counteracting, the risks that it brings. One risk, I believe, is to focus exclusively on potential at the expense of human consequences. Far from being just a more sophisticated calculator – an analogy often used by those who see Gen AI as merely an advanced tool – Gen AI could potentially transform human history because it competes with, and sometimes surpasses, people in qualities that we used

to consider as exclusively human. AI should be approached with the seriousness demanded of an epochal turning point, rather than dismissed as merely another technological development. And if there is a place where such reflection can or should occur, it is within the university.

A MOMENT OF DECISION

Universities today find themselves in a moment of crisis, in the original Greek sense of *krisis* – a turning point, a moment of judgement and decision. Gen AI is simultaneously a cause (not the only one, of course) and a symptom of this crisis.

On the one hand, as Montebello, Busuttil, and Camilleri explained and illustrated through various practical examples, the availability of Gen AI for students and lecturers means that pedagogy and assessment cannot remain unaffected. We have to adjust and adapt, perhaps radically. On the other hand, as Corby suggested, Gen AI in universities can also be seen as an extension of the logic of neo-liberal rationalisation with its preference for efficiency, speed, and



Discussion panel on AI during UMRE 2025. From left to right: Prof. Mario Aquilna (Moderator), Prof. Matthew Montebello, Prof. Leonard Busuttil, Prof. Mireille M. Sant, Prof. Vanessa Camilleri, and Prof. James Corby
 Photo by Kristov Scicluna

quantifiable outcomes. Seen from this perspective, how we respond to AI is not just a pedagogical matter; it is also decisive for the future of the university and what it stands for.

This should not push us into anachronistic and naive luddism, pushing against the use and development of this new technology. In any case, banning AI from the lecture room is neither possible nor desirable. On the contrary, it is essential for university members to develop AI literacy, not only to use Gen AI if and when needed, but also to truly understand the implications of doing so, or of choosing not to.

TOWARDS A MORE HOLISTIC UNIVERSITY

If we were to think of the irruptive and disruptive potential of Gen AI for universities from a more positive perspective, we might reimagine the university less in terms of the transactions it facilitates and more in terms of the human experiences it provides. As several panellists argued in relation to assessment, one form of adaptation might be

to prioritise process over product in assessment and learning.

What if we used this transformative moment to rediscover or consolidate the values of presence, discussion, and the holistic growth of individuals? What if we moved away from the conception of the university as simply a space for knowledge and skill delivery in a provider-to-customer relation? This is not to say that the university should in any way abdicate from its educational mission (which, of course, includes the formation and dissemination of knowledge and the development of skills) or that it should set aside concerns about student employability. But, it is also possible, and arguably necessary, to think of tertiary education in more rounded ways. Doing so would be radical and courageous, and possibly also beneficial for the future of universities and the societies they serve.

THE WAY FORWARD

A final thought that arises from the panel and the animated discussion that followed is that, irrespective of where and how members of the university position themselves in

relation to AI, it is important for there to be sustained debate. In what is already a world irreversibly marked by AI, universities today do not have a choice about introducing or excluding Gen AI. There is no way back, but it would be a mistake to fail to understand just how epoch-shifting AI technology truly is.

The consolidation of interdisciplinary spaces for serious discussion about AI is thus of fundamental importance. These may include training workshops (some already underway), research initiatives across faculties, and genuinely consultative, university-wide discussions on policy. The University of Malta is well placed not only to provide such spaces for its members but also to become an important voice in local and international conversations through more sustained public interventions on AI by its members.

Perhaps the real challenge is not to limit ourselves to thinking of Gen AI as something to which the university must react but to make the university a place that can guide society on how to live with Gen AI. **T**

Education, Humanities, and Law



Early Music

REVIVALS

& the Origins of Musicology

Author: Elena Said



How did the study of music's past become a discipline in its own right?

Dr Jeremy Coleman investigates the 18th and 19th-century roots of musicology, when antiquarians, historians, and performers across Europe began treating old music as cultural heritage. His research reveals how early revivals, historical concerts, and scholarly traditions shaped not only what we hear today, but also how we perceive the history of Western music.



The modern discipline of musicology, and our very idea of 'music history', took shape between 1770 and the mid-19th century. This was a pivotal period when historians, antiquarians, and performers began to study and revive older music in new ways, laying the groundwork for how we understand and perform the past today. However, what if we looked not just at the history of music, but at the history of music history itself? What if we looked at how the story of Western music was constructed in the first place?

This is the main focus of Dr Jeremy Coleman's ongoing research. A musicologist and pianist, Coleman lectures in the Music Studies Department at UM's School of Performing Arts, where he also serves as Area Director for Research. His work centres on the historical study of music. This involves tracing manuscripts, printed sources, and forgotten repertoires to make them accessible and performable today. He is particularly interested in how the story of Western music has been shaped by the way it is taught as well as how textbooks and scholarly traditions construct a sequence, a narrative of progress, and a version of history that has come to define what we know as 'music history'.

Focusing on the origins of historical thinking about music, Coleman explores how early scholars and performers began to treat music as something to be researched, preserved, and reinterpreted. He examines how the revival of early music during this period was tied to broader cultural ideas about

history, identity, authenticity, and how performance itself became a form of historical understanding. At this time, and in this process, the act of playing old music was also an act of rediscovery.

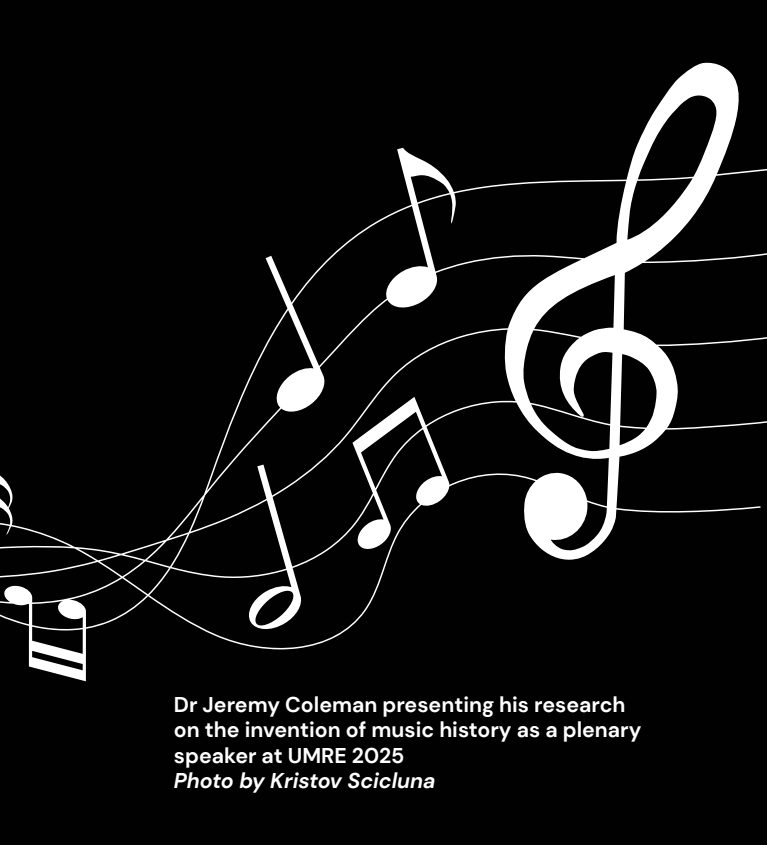
THE PAST AS A PATH FORWARD

In his ongoing work, Coleman traces how the modern idea of music history emerged from the practices of 18th-century antiquaries, early collectors and cataloguers. These people were unlike traditional historians in that they were less concerned with writing narratives than with preserving the physical traces of the past. Their influence shaped the musical culture of the late 18th century – a time marked by uncertainty as to where music was heading.

Amid Enlightenment ideals and political upheaval, patrons, aristocrats, and composers alike began looking to earlier works to legitimise power, glorify royal lineage, and find artistic direction. For composers, 'it was becoming increasingly meaningful to look to the past to find a way forward,' Coleman describes it.

This impulse gave rise to the notion of 'ancient' music, embodied in concert series such as London's Concerts of Ancient Music (1776 – mid-19th century), which celebrated George Frideric Handel and inspired similar initiatives across Europe.

Tracing this evolution into the 19th century, Coleman's research highlights figures such as François-Joseph Fétis in Paris and Brussels and Felix Mendelssohn



Dr Jeremy Coleman presenting his research on the invention of music history as a plenary speaker at UMRE 2025
Photo by Kristov Scicluna



in Berlin and Leipzig. Both pioneered 'historical concerts' that presented music chronologically, from Renaissance pieces to contemporary works. In this way, they transformed audiences' engagement with history from reading about it to hearing it.

'It had a lot to do with novelty. The old turned out to be new. There was a hunger for more musical variety as the repertoire had become too narrow in style and performance. There is this paradoxical idea of people looking to the past to find novelty – not out of nostalgia, but in search of innovation,' Coleman explains.

By comparing these movements across cultural contexts, the study shows how ideas and methods circulated between France, Germany, and beyond. The early music revival was hence not just a series of isolated efforts but a shared European phenomenon. The study also examines historical concert practices in relation to how history books were being written at the time, exploring how narrative itself functions as a kind of literary construction – not merely a collection of facts, but a creative and dynamic process.

Coleman further reflects on how ideas from this period continue to shape the way we think about music today. We still live with the concept of 'early music' – the idea of a musical heritage that fell out of the performance tradition and had to be revived. This revival involves a musicological process of looking back at sources to understand what composers originally intended, especially as musical notation and performance practices have changed over time.

What once referred to Medieval or Renaissance works has since expanded to include music from as late as the 19th century. This shows how flexible and enduring this category has become.

RETHINKING THE 'HISTORICAL CONCERT'

During his sabbatical in the second semester of 2024, following work which had begun intermittently since early 2023, Coleman conducted extensive archival research in Brussels and Vienna. This period proved especially productive, allowing him to collaborate with other musicologists and archivists who directed him towards previously overlooked sources.

In Vienna, his research focused on the Austrian National Library and the Gesellschaft der Musikfreunde archives. There, his primary interest lay in the figure of Raphael Georg Kiesewetter, a prominent Austrian scholar often regarded as a counterpart, or even a rival, to François-Joseph Fétis. Both men were early music antiquarians, deeply engaged in collecting and studying sources of early music. Both played pivotal roles in shaping the emerging discipline of music historiography. Kiesewetter is particularly significant for having written one of the first concise histories of Western music, originally published in German in 1834. Coleman also explores the contributions made by women, both to music historiography and to 'historical' performance practice during this time. For instance, the French writer, singer and composer Alexandrine- 

Sophie de Bawr published a single-volume history of music in 1823, expressly for a readership of women.

One of the more revealing findings to emerge from Coleman's research concerns the origins and usage of the term 'historical concerts'. In much of the scholarship written over the past fifty years, the phrase has been employed rather freely to describe 19th-century revivalist projects. Nonetheless, a closer examination complicates this assumption.

While Fétis appears to have used, and quite possibly coined the term, very few of his contemporaries adopted it. Mendelssohn used it occasionally, and it has sometimes been attributed to Kiesewetter, although, as far as current evidence suggests, Kiesewetter himself never employed it.

Some modern accounts even claim that 'historical concerts' took place as early as the mid-17th century. Such attributions reveal the extent to which the concept is, in fact, a 20th-century construction, retrospectively projected onto a variety of 19th-century revivalist endeavours.

At the time, the word *historical* carried broader connotations. It did not merely mean 'old', but also evoked a sense of story or narrative – a nuance that Fétis himself seemed to have embraced when using the term *historique*.

PERFORMANCE AUTHENTICITY AND IMAGINATION

One area still requiring further investigation is the case of instruments. More specifically, how these relate to early approaches to what would later be called 'historically informed performance'.

The modern notion of authenticity, which relates to performing works on period instruments and employing historically accurate techniques, is a 20th-century ideology. By contrast, in the early 19th century, figures such as Mendelssohn, who famously revived Bach's music, typically performed on contemporary instruments such as the modern piano.

'Fétis, on the other hand, claimed to perform on original instruments, although this is open to question,' declares Coleman. 'Moreover, Fétis frequently composed pieces for his "historical concerts" in the style of earlier composers, presenting them as the work of others. In this sense, there is an element of forgery at play – not


a pursuit of literal fidelity to the original, but rather the creation of an imaginative fantasy of the past.'

In parallel with this research, Coleman is also involved in a related but distinct initiative – an EU-funded networking project titled *EarlyMuse*, part of the COST Actions programme. This project examines the place of early music and musicology more broadly, within European cultural and heritage policy. It seeks to explore how music historiography can be promoted at a European level, how musicology can play a more visible role within cultural institutions, and lastly, to what extent musicologists have engaged with European funding frameworks.

Alongside his academic work, Coleman remains active as a pianist, collaborating in opera classes and preparing a series of upcoming recitals. These experiences continue to inform his scholarly perspective and may develop into future research projects, particularly concerning the relationship between performance practice and historical inquiry. **T**



Document reference, Library of the Royal Conservatory of Brussels, B-Bc, FA-IV-304: *La musique de XVIIe siècle, à l'église, au concert et au bal : concert historique : donné par M. Fétis : à la Salle du Grand Concert, le 3 Décembre 1836 : programme* (Brussels: Ode and Wodon, [1836]), title page.



Developing Students' Conceptual Understanding:

Teaching Mathematics Through Problem Solving

Author: Noah Galea



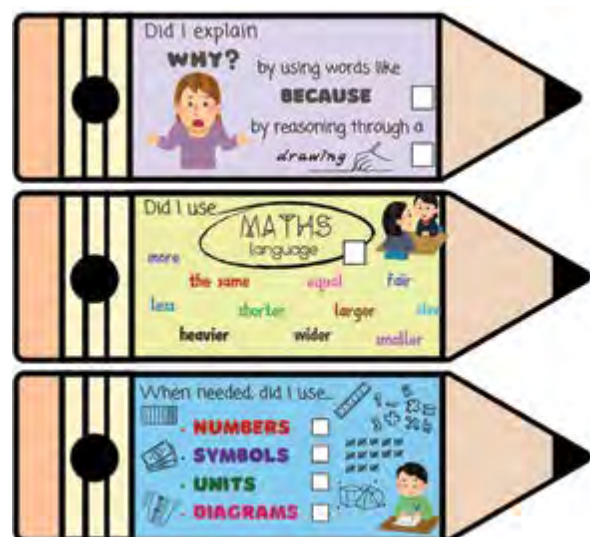
Running from September 2025 to February 2026 as a joint collaboration between the University of Malta and the Ministry for Education and Employment, **Dr James Calleja's INSOLVU Project** aims to revitalise how mathematics is taught across primary schools in Malta. Supported by UNESCO and funded by HUAWEI Technologies, INSOLVU has developed extensive resources to aid mathematics teachers in implementing a teaching approach that prioritises solving real-world problems over simply working on routine exam-type questions.

As an expert in school leadership, mathematics education and supporting teachers in their professional development, Dr James Calleja (Department of Leadership for Learning and Innovation) believes in revitalising the way mathematics is taught at all levels of Malta's education system. To do this, he calls for a thorough revamp of the teaching and learning process. The traditional way of teaching, which Calleja notes as 'transmission-based teaching', involves teachers simply communicating knowledge to their students. These students would then be required to reproduce what they've learnt in tests or exams. This approach highlights a key problem – students are prepared to pass a test, and not necessarily to apply what they've learnt to real-world situations. Moreover, this approach arguably does little to engage students and get them to think deeply about the content being taught. Instead, students often remain passive, perceived as a blank slate with little knowledge, while the teacher dominates classroom dynamics. Calleja has concerns about this approach: 'I think it is both unethical and disrespectful to treat students as though they know nothing. Like this, we are devaluing what prior knowledge they may have, and which could be useful when discussing how to solve a given scenario.'

INQUIRY AS AN EXPLORATORY PROCESS FOR LEARNING

What, then, is the solution? For INSOLVU, this would be ways of teaching that prioritise student engagement in thinking, discussion and collaborative inquiry in solving problems through an approach that 'considers the importance of teaching for life rather than teaching for the test,' as Calleja puts it. In teaching through problem-solving, students are presented with

challenging and non-routine problems, also related to real-life situations, for which the solution is not known in advance. Students are then invited to examine problems independently with teacher support, discuss with their peers, and explore strategies to arrive at potential solutions. Calleja states that this typically involves presenting students with a challenging scenario at the start of the lesson, associated with, but not limited to, the mathematics topic or topics being tackled. This opposes traditional teaching norms, which often engage students with routine closed-ended problems and gradually lead them to tackle more complex ones. When faced with a challenging problem right away, students are encouraged to connect the scenario to their own life experiences and mathematical knowledge, potentially identifying links that generate ideas leading to a solution. This emphasis on inquiry, which allows students to tap into prior knowledge, enhances their exploratory skills and learning. Students are therefore



The problem-solving 'justification fan'
Photo courtesy of Dr James Calleja



The problem-solving 'bookmark'
 Photo courtesy of Dr James Calleja



A post-lesson discussion at Pietà Primary School
 Photo courtesy of Dr James Calleja

the ones leading the discussion. The teacher, on the other hand, acts as an observer while simultaneously stimulating students' thinking through questions and reflective prompts, closely analysing their ideas to determine how best to orchestrate the end-of-lesson discussion and guide them toward possible solutions.

The benefits of this approach to teaching and learning are numerous. Not only does it ensure engagement from both students and the teacher through dialogic inquiry, but it can also provide opportunities for students to make mathematical connections across topics and engage in deeper learning, which research shows is more transferable. This is particularly valuable for mathematics teachers due to the vast syllabus they have

to cover in a short time span. Calleja, in fact, notes that this approach to teaching requires teachers to rethink curriculum design and implementation by providing students with problems that connect rather than isolate the mathematical content in the syllabus. As Calleja notes, 'This increased connectedness is likely to help students bridge the gaps presented within problems and enhance links to other knowledge they would have already gained from their own life experiences.'


Having spent over two decades teaching mathematics in secondary schools, Calleja understands the importance of being clear to teachers about what this approach of teaching through problem solving involves. Due to syllabus and time constraints, teachers may initially be hesitant to take this approach and would tend to lead students to the answer rather than allowing space and time for students to deconstruct mathematical problems. Indeed, Calleja believes that thinking, reflection, exploration, and communication should become an integral part of the students' learning process. By allowing students to explore and recognise the connectedness between the content being taught and the real-world relevance of mathematics, the lesson's focus shifts from finding the correct answer to considering a variety of perspectives to solve the problem presented. The effect of this approach is not only beneficial to students, but also to teachers. As Calleja notes, 'students' ideas help me to notice things which I may have never considered.'

COLLABORATION AT ALL LEVELS

In implementing teaching through problem solving, Calleja sought support. By recruiting primary mathematics support teachers and heads of the primary mathematics department, Calleja formed a team of specialist teachers who could learn about and support primary school teachers. Working alongside these specialists, he designed a lesson study-based programme through which specialist teachers could guide primary school teachers on best practices and ways to improve their lessons. The programme clarified what is meant by 'teaching through problem-solving'. The approach entails grounding abstract theory in real-life scenarios that are then tackled creatively and dynamically, not by isolating areas of mathematics but instead by connecting mathematical content – for example, fractions, graphs, algebra and more – in the pursuit of more robust solutions.

Calleja strongly believes in collaboration and in the process of lesson study as a means to develop teachers' knowledge about mathematical content and pedagogy. ➔

Lesson study – a professional development process involving teachers working together to solve an issue in teaching and learning by planning, teaching, observing, and reflecting on lesson outcomes – embraces teacher collaboration and external support. In the case of INSOLVU, the external support was provided by specialist teachers. Yet, as Calleja claims, in lesson study, 'we need to treat teachers as experts', and whereas the specialists may have more expertise about mathematics as a subject, primary school teachers have more knowledge about the school context, the students and the challenges that they face in learning the subject. Hence, teachers' contribution in lesson planning is then complemented by the observations carried out by other teachers and the specialist teachers. The aim of lesson observations is not to judge, but to learn together. This stance holds greater weight when taking into account the opportunity teachers were given to share their findings at a national conference, entitled 'INSOLVU Seminar: Teaching Mathematics through Problem-Solving', held on 26 February 2025 at the University of Malta's Valletta Campus. Although some were initially intimidated by the prospect, they ultimately felt empowered as they received positive feedback and visible approval from the audience. This goes to show the positive outcomes that may come from working together.

Calleja believes that this sense of collaboration will continue beyond INSOLVU – 'I hope for us as researchers to continue collaborating with teachers, as it aids all of us in our professional growth. Just as we encourage teamwork among students, we should apply teamwork in our professional lives as well.' In this regard, Calleja hopes to lead by example through the next stage of this project, INSOLVU+, where schools are working together to educate deputy heads of school about the lesson study process and to act as lesson study facilitators. In this way, teachers will be able to find support from the deputy heads of school in designing and delivering more engaging and effective lessons for students. 

INSOLVU, a project led by the Ministry for Education, Sport, Youth, Research and Innovation in collaboration with Collaborative Lesson Study Malta, was made possible with the support of the UNESCO Office in Venice through funding from Huawei Technologies.



A lesson study observation at:
San Gwann Primary School (A)
Qawra Primary School (B)
Photo courtesy of Dr James Calleja

In *Privacy* and in *Health*:

Reconciling Data Protection
and Scientific Progress

Author: Timothy Alden



*Can Europe protect privacy without paralysing science? **Dr Roxanne Meilak Borg** believes it can. The promise of data-driven medicine rests on access to some of the most intimate details of our lives. Yet the notion of public interest means that such data should, under certain conditions, be made accessible to researchers. Where does one draw the line and distinguish between privacy and bureaucracy? Meilak Borg's research confronts Europe's struggle to balance the right to privacy with the collective good of scientific progress.*

In democratic societies, the concept of the public interest anchors decisions that shape health, security and innovation. Few areas test this notion more acutely than scientific research that depends on personal health data. Scientific progress promises better treatment, prevention and public health planning. These are all outcomes that serve the collective good. Yet, these same activities depend on the intimate details of individuals' lives, testing the line between public benefit and private intrusion.

At the same time, advancements in digital technology, including AI, are making it harder to safely anonymise personal data. Amid this tension, Dr Roxanne Meilak Borg (Ph.D. candidate at UM's Department of Media, Communications & Technology Law, under the auspices of the Data Integrity and Stewardship Research Cluster) emerges as a scholar seeking a resolution that allows for a research environment that respects privacy but which does not paralyse progress. Under the supervision of Prof. Mireille M. Sant, her work reframes data protection as an enabler of science rather than its adversary, contending that genuine public benefit depends on empowering responsible researchers with the access they need to serve society as a whole.

A EUROPEAN VIEW OF PUBLIC INTEREST

Meilak Borg explains that 'there is always a balance that has to be made between public interest and privacy. If one gives more importance to one side,

there is the risk of weakening the other. In my research, I ask about the extent of the public's interest in having scientific progress that would benefit individuals and society. Where does the balance lie? And does this notion of balance change across cultures or places?'

While the understanding of public interest may differ across countries, Meilak Borg emphasises that at the



Dr Roxanne Meilak Borg

European Union level, there are established definitions, approaches, norms, and legal instruments. The laws and regulations have been agreed upon by the Member States, the European Parliament and the European Commission. The end result is a compromise text. In the realm of electronic health data, the most prominent and relevant item, which Meilak Borg addresses in her research, is the General Data Protection Regulation (GDPR). On its own, GDPR is the EU's core law on personal data protection, designed to protect privacy and empower citizens in how their data is handled, stored and used. Meilak Borg explores GDPR's dual role when it comes to health data – enabling research in principle, yet also restricting it in practice.

Meilak Borg addresses the circumstances set out by the GDPR for researchers to work with health data, which is treated as special-category data, meaning it is prohibited from processing unless specific exceptions apply. It is the GDPR that outlines the general guidelines under which researchers may access health data for research. Currently, the standard approach to accessing health data is by consent. However, Meilak Borg argues that obtaining consent from individuals is not only burdensome but also impractical, given that consent can later be withdrawn. Furthermore, consent implies a direct link between the researcher and the patient, which is not always the case. The data may be held by an institution, and the researcher may not be directly involved with the patient, rendering the requirements of GDPR in these circumstances difficult to implement.

ANONYMISATION AND YOU

GDPR does not apply in cases where data is anonymised, and it points to anonymisation as a solution to a researcher's trials and tribulations. In the case of electronic health data, however, the problems are numerous. First of all, given its specific and personal nature, it is difficult to truly anonymise data in today's world and guarantee complete patient privacy. Pseudoanonymised data, which strips directly identifying information such as names, ID numbers, or contact details, is still treated as personal data by GDPR

and is thus not any less protected or restricted in its accessibility. Meilak Borg further warns that complete anonymisation of some health data would render it useless for certain kinds of inquiry, such as genomic research. On this, she elaborates:

Technological developments have changed the meaning of anonymisation. Today, it is much easier to identify who the data belongs to. While we describe data as anonymous, it could still lead one to the person. As data protection law does not apply to anonymous data, if researchers could provide an ironclad guarantee that the data used for research would not be identified, then there would be no problem. However, technology presents ever-greater risks that health data could be used to identify individuals.

This further points to AI being another technological frontier presenting increasing challenges in this regard, particularly since advanced computer programmes and algorithms can rapidly analyse large datasets, and identify individuals by detecting unique patterns and combinations of attributes.

Nonetheless, the GDPR does account for public-interest scenarios in which researchers engage with health data. However, Meilak Borg argues that the GDPR is long-winded and convoluted in its attempt to create exceptions that allow researchers to rely on public-interest arguments to access data. This vagueness has created space for Member States to adopt differing approaches in their implementation of GDPR. For instance, the Belgian Data Protection Act recognises anonymisation as the preferred default for researchers, yet allows researchers to pseudoanonymise data when it is not possible to carry out the research otherwise.

Similarly, there are further exceptions that allow research to be carried out with non-pseudoanonymised data when even that is not enough to enable the research to otherwise be conducted. Meilak Borg states that Malta's Data Protection Act takes much the same approach, though less rigidly so, and refers to this as a waterfall approach, given the tiered levels of ▶



anonymisation. The particular circumstances in which local and national laws allow researchers to work with health data address the GDPR's need for 'appropriate safeguards' to be established for researchers to work with health data.

THE FUTURE OF RESEARCH WITH ELECTRONIC HEALTH DATA

Nonetheless, Meilak Borg warns that the status quo represents a fragmented approach across Member States. Even when avenues are established for researchers to access health data, these can still be burdensome. It must also be considered that health data is not only governed by GDPR but also by medical confidentiality laws, biobank rules, copyright laws and other policies. There is therefore a missed opportunity for harmonisation.

In her research last year, Meilak Borg anticipated the passage of the recently adopted European Health Data Space (EHDS) Regulation. This is an EU law which entered into force in March 2025, establishing a common legal and technical framework for the use and sharing of electronic health data. It represents the EU's most ambitious attempt to resolve the fragmentation that has long frustrated researchers under the GDPR. Meilak Borg predicted that, if implemented well, the EHDS could provide the harmonised safeguards and governance

structures that GDPR lacked, thus giving scientists a clearer, lawful route to access health data for secondary use while maintaining strong protection for individuals. Her concern now, however, is that the system might replace one layer of complexity with another.

Although the EHDS establishes common standards and national Health Data Access Bodies to manage permits and ensure pseudonymisation, its procedures remain rigid. This marks genuine progress towards a European research framework, but the balance between efficiency and oversight – the very tension Meilak Borg set out to study – may continue to test Europe's promise of privacy-respecting innovation, especially since it must still be implemented across several stages. Its full impact is hence yet to be determined.

Looking ahead across the continuation of her research, Meilak Borg expresses a desire to eventually influence the drafting of legislation, regulation, or policies. She states that she aspires 'to draft practical recommendations for researchers. These may take the form of guidelines or codes of conduct, offering practical solutions to researchers to facilitate their work.' Her work thus promises to continue charting a path between principle and practice, between the real language and the lived realities of scientific research, while also incorporating the evolving lessons of the continually implemented legislation, regulation and policy. **T**

Architecture and STEM

Putting the AI in Notarial Archiving

Author: **David Mizzi**

The Notarial Registers Archive, once the Cinderella of local archives, boasts over 20,000 documents of deeds spanning back to the 15th century. But trying to find anything is like looking for a needle in a haystack. What if we could use AI to streamline the process?



There's a joke about the legality of chopping my neighbour's tree if a branch crosses over my property. And if I can chop off an encroaching branch... well, anyway, the point is that property disputes are unsurprisingly common. After all, good fences make good neighbours. But how do we decide where the property line actually is? And how can I prove that he's secretly been edging the wall that divides our fields closer?

If you've ever had a tiff with your neighbour, you'll know that the first step is to pay a visit to a notary. After that, it's off to the Notarial Archives to try and find the original (or a copy) of the deeds which determined the exact property boundaries. But with over 2 km worth of historical documents, there's a chance your neighbour dies of old age before the dispute can actually be settled.

MORE THAN JUST NOTARIAL RECORDS

However, the notarial archives are so much more than just a means of settling squabbling neighbourly disputes. After all, the work of notaries goes beyond properties and buildings. Essentially, any legal or social contract throughout history needed to be drafted by a notary, including insurance, dowries, marriages, adoption, as well as inheritance. The notarial archives offer a snapshot of everyday life across time. 'They are historical documents, so they benefit our historical heritage. There is the *Kantilena*, the oldest Maltese poem. Then there is the research potential – a lot of information still needs to be tapped. Then there is current research, for example, you might want to learn about your property,' explains Dr Joan Abela, Director of Operations at the Notarial Registers Archive and Senior Lecturer at UM's Department of History. Whether you're a recent homeowner looking into how far you can extend your property, trying to find out about your family tree, or conducting research into 17th-century fashion trends, the Notarial Archives

are a treasure trove. But, with over 20,000 volumes written in legal Latin, the challenge lies with actually finding (and understanding) what you're looking for.

Hence, the NotaryPedia project. For Dr Abela, Prof. Charlie Abela (Lead Investigator of NotaryPedia and Associate Professor at UM's Department of Artificial Intelligence), and Charlene Ellul (Research Support Officer on NotaryPedia, and Chief Knowledge Officer at the Notarial Registers Archives), the idea is to digitise the archives and combine them with AI. 'We're trying to solve a number of problems, mainly, making the content accessible to the many researchers who visit the archives on a daily basis,' explains Prof. Abela.

'Usually, the first thing these researchers see when entering the archives is a catalogue,' explains Ellul. 'The catalogue gives an overview of the metadata pertaining to a document. Examples of metadata include information about who created the document, the dates, and the number of folios. However, to search for something specific, such as a specific area of land, you'd start with the notary and work your way manually through every single document until you find what you need,' she explains.

And if you thought that slugging through legal documents was a chore, remember that most of these documents are written in a mix of legal Latin (because Latin wasn't already hard enough), a sprinkle of Sicilian and a few Maltese-isms thrown in for good measure.

TEACHING LATIN TO YOUR AI

While ChatGPT can probably handle drafting a passive-aggressive note to your neighbour, having an AI understand the entire contents of the notarial archives requires a methodical approach. 'There is a pipeline,' explains Prof. Abela. 'First, we start from the availability of digitised manuscripts. These would be the manuscripts that have been photographed using special equipment >



Repository room at the Notarial Registers Archive, with shelves of bound historical registers.
Photo courtesy of the NotaryPedia Team

at the archives. From those digitised manuscripts, we extract the textual element within each document.' Yet, it is not just the text that makes these volumes valuable. 'Researchers might be interested in other aspects of

the manuscripts, such as the quality or material of the paper, or even the doodles found in the margins,' adds Prof. Abela. So this data also needs to be recorded.

Once the digitised documents are transcribed into a machine-readable format, the next step is to verify the transcription. Paleographers – persons who read ancient texts – comb through the transcribed document before passing it on to the next phase of the pipeline – training the AI to extract information. 'NotaryPedia will be a growing knowledge structure. We are expecting more documents to enter this pipeline, so we need this kind of continuous learning mechanism in place,' says Prof. Abela. Training the AI to extract that information is Ellul's area of expertise. All of the extracted information is then fed into a knowledge graph, but what exactly is a knowledge graph?

'Wikipedia, for example, is a knowledge graph. All those hyperlinks connect various topics together,' explains Ellul. A knowledge graph has two elements – the schema and the data layers. The schema is how we understand the world, including its places, persons, and objects. The data layers, on the other hand, are the actual information. So the data 'Malta' would be mapped to a place, and a nobleman called 'Johannes' is mapped to a person. In this way, the AI understands that Malta is not a person or an object, but a place. For NotaryPedia, 'the schema is how we see the notarial world, but from an abstract perspective,' says Ellul, 'while the data is what we've extracted from the deeds. For example, a relation between two persons in a deed is mapped into the schema, the way the facts are established in the notarial world.'



A notarial register displayed at the folio of a deed, illustrating the archival structure that underpins research.
Photo courtesy of the NotaryPedia Team



A schema-level view of NotaryPedia's AI-driven knowledge graph, where deeds become structured, linked data. Photo courtesy of the NotaryPedia Team

Think of the schema as the grammar rules or definitions. 'You have these vocabularies that define what an actor is, what a notary is, what a place is. All that information is kept separate,' says Ellul. It is a standardised semantic layer, and it helps the AI to make sense of the information it is being given. 'It's not enough to say "this person is a notary," but what does notary mean? Basically, everything needs to be defined and a meaning given.' However, there is an advantage to taking this methodical approach. By using internationally accepted vocabularies, NotaryPedia can be linked to other archives.

'Let's say I have Johannes the nobleman, and Johannes has been mentioned in a manuscript found in another archive. This archive is also using a graph, so we can easily create a link between the archives. Ultimately, it allows archives to be linked, rather than be siloed,' explains Ellul.

'By linking content between two archives, the knowledge graph is going to be much richer for researchers both locally and abroad. People who have been mentioned in notarial deeds would possibly also be mentioned in other documents, so we want to be able to link to other local archives, such as the Cathedral archives,' adds Prof. Abela.


DEFINING DEEDS

While AI is the ideal candidate for processing large swathes of data, it turns out even AI struggles to read certain handwriting. Notaries often employed a number of scribes so that while two documents might be signed by the same notary, they would have completely different handwriting. As a result, the AI

might be able to recognise one deed, but not the other.

In the past, notaries were also extremely economical with their paper. 'Paper was an added expense, especially since it needed to be imported, so the notary tried to use all the available space. Apart from being bound by law to leave wide side margins, notaries were also required not to leave empty spaces,' explains Dr Abela. Deeds might have pages where one deed ends and another, completely unrelated deed begins. 'There was even a case when one notary treated a deed as his own personal diary, describing an earthquake that occurred while he was writing the deed,' adds Ellul.

Besides these exceptional cases, there is the sheer volume of texts that need to be processed. However, the team is both optimistic and determined. 'We are creating a model, so others can build upon it. We are investing a lot of time establishing the foundations of the model,' says Dr Abela. While the pipeline can be adapted to different types of archives, Ellul points out, 'it is also important to have the guts to do something that works for us.'

Prof. Abela concludes, 'This is a project close to my heart. Even though I come from the realm of AI, whenever I speak to Charlene or Joan, I'm always learning a lot. It's important that researchers aren't just limited to their area. Expanding into different fields allows you to apply what you know and grow and learn.' 

NotaryPedia is a 3-year project which started in January 2025 and is a collaboration between the Notarial Archives Foundation and the University of Malta. The project is funded by Malta's Ministry for Culture, Lands and Local Government.

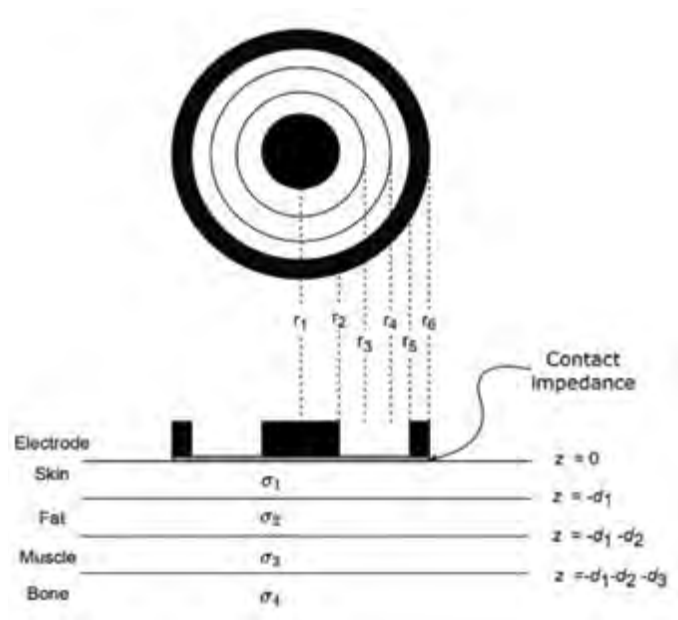


MATH AT THE ANKLE

A New Route to Bladder Control

Author: Christian Keszthelyi

What if numbers and mathematical equations could do away with invasive bladder control medications by applying electrodes to someone's ankle? **Prof. Cristiana Sebu** tells **THINK** magazine how biology can be translated to applied maths, and how a simple solution could improve the lives of many patients.



An illustration of the electrode configuration

Prof. Cristiana Sebu from UM's Department of Mathematics uses applied mathematics to solve a practical problem: how to activate a nerve safely and accurately from the skin's surface. By rethinking electrode placement and shape, her team aims to activate the correct nerve in the ankle with a gentle current. This could eliminate the need for wires inside the body, reducing procedures and complications for people with bladder control issues.

RETHINKING ELECTRODE DESIGN

The story started years ago in the United Kingdom, where Sebu collaborated with colleagues interested in functional electrical stimulation (FES) – the practice of using small currents to activate nerves and muscles for therapy and training. FES has helped paraplegic athletes row, aided stroke rehabilitation, and offered relief in pain management and epilepsy. But the standard two-electrode

setup – think of two ECG-style pads stuck to the skin, with current flowing between them – has a flaw. As Sebu puts it, people using these electrodes regularly 'get burns on the skin because you need to inject quite a bit of current'.

The problem is not the electricity itself, but how current density builds up at the edges of standard pads. This can create hot spots that damage the skin. Sebu's research team proposed a new electrode shape that could reduce current density peaks while achieving more localised activation of specific nerves.

The suggested new design consists of a central disk electrode and a surrounding annular ring. This setup focuses the activation under the centre of the probe and permits more current to be applied without harming the skin.

First, they used mathematics to work out the physical model and then showed that the electrode design can be optimised for different patient builds. Mary Grace Cassar, a recent doctoral graduate, led the project. She scanned her own ankle

with an MRI, built a 3D model, and ran simulations to determine whether the new probe could activate the posterior tibial nerve near the ankle.

The posterior tibial nerve is well known to urologists. Stimulate it, and you can influence bladder function via connected pathways – a technique that underpins several therapies today. The catch? Much of the current practice relies on implanted electrodes or configurations that are awkward to place around the ankle. In outlining the project's turning point, Sebu notes that her student demonstrated that the posterior tibial nerve can be activated at a specific depth using the newly designed electrodes placed on the skin surface. Crucially, bladder control can be achieved by placing surface electrodes on the ankle, rather than using implanted electrodes.

That shift – from inside to outside – matters. Implanted systems can work very well for the right patients, but they are undeniably invasive, expensive, and not without risk. 'One in three patients who are using implanted electrodes need further



Dr Mary Grace Cassar (left) alongside Prof. Cristiana Sebu (right), at her Ph.D. graduation

surgery to remedy a situation,' Sebu says, citing problems like broken or misplaced electrodes. Complications are not rare. 'In 15% of cases, you might have infections, and you might start to have bowel problems in 5% of cases because you don't only activate the nerve which controls the bladder, but also other surrounding nerves,' Sebu says.

The complicated set of trade-offs make justifying the use of implanted systems rather difficult to accept if you do not have to. 'If you can achieve the same results with surface electrodes, why should a patient go through several surgeries to remedy any problems that might occur with implanted electrodes?' Sebu says.

The ankle-friendly probe aims to make surface stimulation practical, precise, and comfortable. 'With the standard geometry of electrodes currently in use, you don't have enough space to place two electrodes on the ankle to activate the tibial nerve. But with our little probe, you have enough space to place it on the ankle and activate the posterior tibial nerve,' she says.

Because the innovation lives in geometry and modelling rather than exotic materials, the setup could be made affordable and straightforward. 'It's very easy to produce, and you can just buy them off the shelf,'

she says. Many applications are connected via two wires to a small power source – the sort of wearable controller that could fit in your pocket. Even in cases requiring continuous therapy, the device must remain wearable at all times.

The goal here is not only bladder control. 'It applies to all the other applications of this technique,' Sebu notes. She mentions a non-exhaustive list: FES for paraplegic training, bladder and bowel control, strengthening of the muscles and physical fitness, seizure prevention in epilepsy, post-stroke rehabilitation, treatment of drop foot, and pain management. In each case, the same core advantage – localised surface activation with less damage to the skin – could help clinicians activate deeper nerves more comfortably.

BRIDGING MEDICAL GAPS

Even though the device is simple, getting it used in clinics is not. In Malta, Sebu's team does not have links with medical practitioners. They have published three papers from Cassar's Ph.D., but Sebu is not sure whether anyone in medicine is aware of the work. What is missing are connections, awareness, and clinical trials. This gap is both a challenge and an opportunity.

This is where mathematics helps build trust between different fields.

'Mathematics is the key to everything,' Sebu says. 'We are in a physical setup, where we inject a current on the surface of the skin, and we want to mathematically determine the distribution of the electrical field within the tissues.' Get that right, with validated models tied to MRI-derived anatomy, and you can tell a clinician not only that a surface FES should work, but precisely where to place the electrodes, their sizes, and other design parameters for a given patient.

She offers a framing that many medical readers will appreciate: 'Have you heard of MRI? Have you heard of X-ray tomography? Have you heard of CT scans? Engineers developed the machines, but the reconstruction algorithms are developed by mathematicians,' she says. Every time an image is reconstructed from measurements made outside the body, 'you want to infer the inner structure of the body from the collected data, and this is an inverse problem.' FES targeting has a similar logic: measurements and models, tuned to a person's anatomy, guiding where and how to stimulate.

Mathematics allows for personalisation in Sebu's approach.



A Finite Element Method (FEM) mesh of the ankle

With MRI-based models, clinicians can plan electrode placement for each patient's anatomy. Once these plans are made, they can be turned into simple products like stickers and straps, rather than requiring surgery.

Sebu is clear-eyed about the limits of what a mathematician can achieve alone. 'It's up to the clinicians to apply it practically. The doctors have access to patients who need to use this technique for different applications. They can experiment based on our mathematical results as they should know where to place the electrodes. They should know how to set the electrode configuration to achieve maximum activation,' she says. On her side, she is ready to run all the numerical simulations needed to build some trust within the community and convince the doctors to try this novel configuration.

Sebu feels a sense of urgency. It is hard to start and maintain collaboration between different fields. She feels frustrated that the contributions of mathematicians are often overlooked by other disciplines, perhaps because mathematics is seen as more theoretical. Yet its value becomes clear in practical applications, just as in this study on using surface FES for bladder control.

Without connections between fields of study, good ideas may

never be used in practice. This does not have to happen. The medical community does not need to wait for a special device maker. The key parts are already available: published mathematical models, MRI-based designs, a simple electrode layout that labs can make, and a clear clinical target in the posterior tibial nerve.

TURNING MATHS PRACTICAL

The next steps are straightforward. Although FES technology is already used in areas such as FES rowing, pain management, and post-stroke rehabilitation, adopting FES for bladder control using surface electrodes will still necessitate meeting stringent ethical, regulatory, health and safety, and clinical requirements before any testing on human subjects can begin.


With these obligations in place, researchers and clinicians would first need to identify patient groups for whom bladder control remains a severe quality-of-life burden despite existing treatment options. Based on these cohorts, they could then prototype the ankle-mounted probe within a safe, fully regulated research environment and initiate small, carefully designed studies. These trials should compare

patient comfort, skin integrity, and symptom relief against both the standard two side-by-side disk electrode configurations and, where appropriate, implanted systems. From there, the findings could be shared openly, allowing hospitals and research groups across borders to iterate, validate, and refine the approach together.

Sebu's request is practical. If there is funding and a clinical partner, she can help adapt the models for specific uses. The goal is to turn a mathematical idea into a regular clinical practice, making neuromodulation easier and more comfortable.

Sebu offers a chance to try a more straightforward method: less current where it is not needed, more where it is, for fewer burns and surgeries.

'The know-how is up there for anybody to use,' she says about their findings, provided the community gets 'a bit more aware that there's another electrode configuration that can be customised for special patients' builds and needs.'

Mathematics has tangible results when someone uses a small probe on their ankle, feels a gentle buzz, and regains part of their daily life. The mathematical equations make this possible. Collaboration does the rest. 

Switching the Light:



A New Era of Smart Glazing
for the Mediterranean
Built Environment

Left: Different switching states of the prototype switchable insulated glazing unit under investigation
Photo courtesy of Etienne Magri

Author: **James Moffett**

Architect and doctoral researcher within the Faculty for the Built Environment, Etienne Magri explores how adaptive glazing could redefine comfort, privacy, and energy efficiency in buildings exposed to intense Mediterranean sunlight.

 In a bright Maltese afternoon, sunlight floods the island's limestone façades, glinting off glass windows along the skyline. For architect Etienne Magri, this abundance of light represents both an asset and an enduring architectural challenge. 'I am an architect and civil engineer by profession, having been engaged in private practice for over 26 years,' Magri states. 'One of my interests has always been the human-building interaction and the sense of wellbeing that our buildings need to instil within their occupants.'

Magri's career has led him to an ambitious research project under the supervision of Prof. Dr Vincent Buhagiar from UM's Faculty for the Built Environment and Prof. Dr Mauro Overend from TU Delft (Netherlands). In his research, Magri aims to tackle one of the Mediterranean's most overlooked environmental paradoxes: how to let light in without letting comfort out. Buildings should not only look attractive, be well organised for their intended purpose, and remain structurally sound, but as Magri notes, 'they need to perform well in creating an indoor

environment that allows a sense of comfort and wellbeing – a matter that is so very often overlooked in the spaces that we create.'

MEDITERRANEAN LIGHT: A BLESSING OR A BURDEN?

The Mediterranean climate, with its long hours of sunshine and crystal-clear skies, is often celebrated as a natural gift. But for architects, it presents a technical and sensory dilemma: how to manage the intense, often harsh sunlight that can overwhelm interior spaces. 'Daylight in buildings situated in a Central Mediterranean climate presents a

key architectural challenge. One is not simply trying to capture light. Instead, the challenge involves finding a way to manage an abundance of intense sunlight to prevent overheating and glare,' Magri explains. The Mediterranean region enjoys a substantial number of days with clear skies and strong, direct sunlight, with outdoor light levels reaching up to 100,000 lux. Lux is the unit of measurement for how bright a surface appears to the human eye. As such, the higher the lux value, the stronger the illumination. In such conditions, conventional design strategies, such as relying on internal blinds and static external shading, are not always effective.

This creates a common scenario for occupants of glass-heavy Mediterranean buildings: blinds closed for much of the day to reduce glare, which block the outside view in the process, lights turned on indoors, and air-conditioning running constantly. The tension between abundant daylight and visual comfort motivated Magri to explore adaptive glazing technologies. These are systems capable of being adjusted in real time to respond to changing sunlight and user requirements. ➔



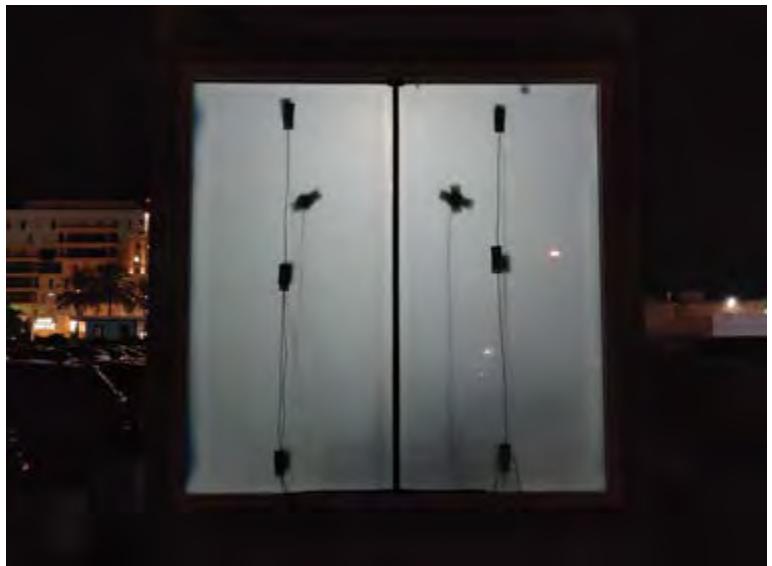
Etienne Magri

THE SWITCHABLE REVOLUTION

Unlike traditional static glass, switchable glazing offers adaptability and responsiveness. 'Switchable glass, commonly known as smart glass or dynamic glass, is an adaptive type of glazing that can instantly and reversibly change its appearance and properties, specifically its level of transparency, opacity or privacy, and tint, in response to an electric current or heat,' Magri explains.

This transformation is made possible through the lamination of switchable formulations within Indium Tin Oxide (ITO)-coated Polyethylene Terephthalate (PET) films laminated between sheets of glass. Within these layers, materials respond to low-voltage inputs, altering the light transmittance and appearance of the window. Two specific technologies underpin Magri's current research: Polymer-Dispersed Liquid Crystal (PDLC) and Suspended Particle Device (SPD) glazing. In PDLC technology, liquid crystals are embedded randomly within a polymer film. When in the off state, the crystals scatter light, giving the glass a frosted appearance. Applying a low voltage aligns the crystals, allowing light to pass through and making the glass clear or transparent.

In contrast, SPD technology uses tiny rod-shaped particles suspended in a liquid layer. When in the off state, the particles are dispersed randomly, blocking most light and heat and giving the glass a dark tint. Applying a low-voltage charge aligns the particles, permitting light to pass and rendering the glass lightly tinted or nearly clear. While these technologies are increasingly being used in high-end vehicles and aircraft, Magri's research seeks to combine their benefits for architectural applications.



Top: The twin environmental testing chambers for the collection of thermal and visual performance data

Middle & Bottom: View of the effect of the switchable privacy interlayer within the prototype switchable insulated glazing unit

Photos courtesy of Etienne Magri

'The concept behind this research is about the potential of combining the distinct benefits of both these technologies for deployment in the architectural field, specifically façade glazing,' he says. This combination has led to the development of a dual dynamic insulated glazing unit (IGU) – a layered assembly in which PDLC and SPD technologies work together to control glare, daylight, and privacy.

BALANCING COMFORT AND FUNCTIONALITY

A fundamental question in daylight design is how to maintain a visual connection with the outdoors without suffering from glare or overheating. Test results show that even in 'an extreme case when a person is sitting at a desk facing the window, with the sun in the field of view, the switchable window with the SPD layer in its darkest state is capable of reducing the level of glare to an acceptable level recommended by the European Standards.'

Importantly, the combination with PDLC allows users to preserve or block their view at will. 'While keeping the outer PDLC layer switched on, thus in a fully transparent state, the view outside of the building can be effectively retained,' Magri explains. 'If privacy becomes an issue at any point, the external PDLC layer can be switched off for a complete disconnection of the external environment, thus converting a transparent window into an opaque, wall-like element.'

In controlled tests, the improvement is striking, not only in terms of comfort but in the potential for energy savings. This is because occupants are less likely to resort to artificial lighting or blinds. Magri emphasises that glare control is just one aspect of the system's appeal. The dual glazing offers a multi-layered

solution that addresses privacy, adaptability, and sustainability.

By combining both PDLC and SPD technologies, the system would allow an individual to adjust privacy, natural light, and glare levels in various combinations. The unit can also be adjusted remotely through a wireless controller or using a mobile phone app. This adaptability extends to energy management. 'With this capability, one can start looking at the concept of "switching off the windows" when a space is not in use,' Magri adds. This could allow for space to be potentially shielded from excessive heat gain while reducing air-conditioning demand.

REIMAGINING THE FAÇADE

While Magri's primary focus is on window units, his research has also opened up intriguing possibilities for integrating switchable glazing into external architectural elements, such as overhangs and shading devices. 'Façade retrofitting is a critical strategy for modernising old structures, often done to address a building's poor energy performance and outdated appearance,' he notes.


His studies show that solar-PDLC laminates could be applied not only to windows but also to switchable overhangs that modulate sunlight dynamically. Such an approach could significantly reduce material use in retrofits. 'Further development of this concept would mean that a building façade can have its visual and thermal performance improved without having to replace the glazing. In this way, lesser quantities of glass would be used alongside lesser quantities of switchable films, both resulting in lesser costs and wastage.'

The switchable glazing assembly is still at an experimental stage, as focus is directed more towards the academic aspect of the subject.

The next steps involve real-world testing, which has already begun. Two prefabricated portacabins have been transformed into controlled test environments. 'The reference portacabin has been fitted with a conventional insulated glazing unit with static solar control coatings, whereas the other features the prototype switchable IGU.' Over the coming months, the research team will monitor thermal performance and comfort levels. The results, Magri hopes, will 'give us further insight into this exciting field of adaptive façades.'

SEEING THE FUTURE THROUGH A SMARTER WINDOW

What emerges from Magri's research is not simply a technological innovation, but a rethinking of architectural interfaces – how glass mediates light, heat, privacy, and perception. In a region where sunlight is both abundant and challenging, this new generation of glazing could help architects design spaces that are healthier, more comfortable, and more energy-efficient. The implications extend beyond Malta or the Mediterranean. As global urbanisation drives demand for glass-heavy buildings, adaptive façades could play a key role in reducing cooling loads and improving wellbeing in cities worldwide.

For Magri, however, the motivation remains deeply human. 'Nowadays, people spend most of their time indoors,' he reminds us. 'So if architects fail to create comfortable spaces in their buildings, they would not have executed their professional task effectively.' His work invites architects to rediscover what windows were always meant to do – not merely separate us from the outside world, but connect us to it in a way that feels right. 

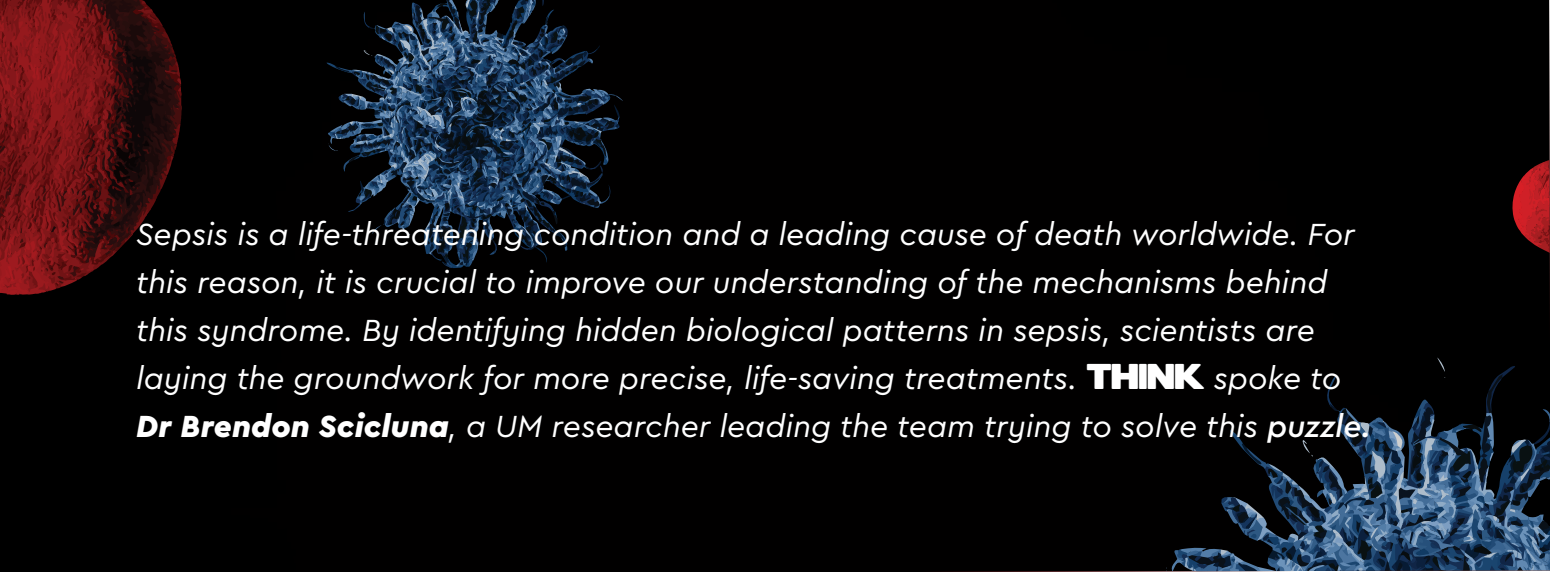
Life Sciences and Medicine



Three Types to Help Them All:

HOW BIOLOGICAL PATTERNS IN SEPSIS COULD IMPROVE PATIENT TREATMENT

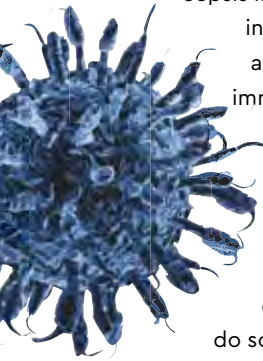
Author: [Sofia Dias](#) 



Sepsis is a life-threatening condition and a leading cause of death worldwide. For this reason, it is crucial to improve our understanding of the mechanisms behind this syndrome. By identifying hidden biological patterns in sepsis, scientists are laying the groundwork for more precise, life-saving treatments. **THINK** spoke to **Dr Brendon Scicluna**, a UM researcher leading the team trying to solve this puzzle.

Sepsis is one of the most formidable challenges that modern medicine faces. Each year, it kills millions of people worldwide and remains one of the leading causes of death in our hospitals. Despite decades of research and hundreds of clinical trials, doctors still struggle to treat sepsis patients effectively.

That challenge is exactly what motivates Dr Brendon Scicluna (Department of Applied Biomedical Science, Faculty of Health Sciences).



'Sepsis isn't just about the infection itself; it's about the body's own immune system launching a dysregulated response that ends up damaging its own tissues and organs,' he explains. 'The question is this: Why do some patients recover while others, with a similar infection, decline so rapidly? My inspiration comes from trying to solve that puzzle.' The problem, says Scicluna, is that sepsis has been treated as a single disease for too long. 'Right now, treatment remains largely supportive, where antibiotics are prescribed to fight the infection, and other measures like fluids, mechanical ventilation, and vasopressors are used to

keep organs functioning. But, this doesn't address the root of the problem – the patient's specific immune response that has become dysregulated,' he says.

Scicluna's research aims to change that by moving sepsis treatment into the era of precision medicine, by understanding the different biological subgroups of sepsis patients. 'We can see that Sepsis Patient A is very different biologically from Sepsis Patient B. This reasoning will pave the way for new clinical trials where we don't just give a new drug to a thousand random sepsis patients.' Instead, these clinical trials will allocate specific treatments to subgroups of patients who are most likely to benefit from them.

DECODING THE IMMUNE RESPONSE

To make sense of these differences, Scicluna and an international team of researchers compiled data from two large patient cohorts, comprising over a thousand sepsis cases in total. Their findings, published in *Nature Medicine* in October 2025, revealed three distinct Consensus Transcriptomic Subtypes, or CTSs.

"Transcriptomic" refers to gene activity happening inside a cell at a specific moment,' Scicluna

explains. 'Think of it as a snapshot of our approximately 20,000 genes that are switched "on" or "off", and of how the dial of gene activity is turned up or down. We analysed this gene activity in the white blood cells of sepsis patients.'

The result was striking: the patterns of gene activity were not random. Instead, they clustered into reproducible biological groups that emerged across data from multiple countries. 'We call these "Consensus Transcriptomic Subtypes" because our findings were validated against the independent work of several other international research groups, including those in the UK, USA, and Africa,' he says. 'It proved that we weren't just seeing a pattern in our own data, but a real, reproducible biological signal that others were also seeing.'

THREE BIOLOGICAL "PERSONALITIES"

Each subtype tells a different biological story, and this is the core aspect of sepsis-related research. 'We found that the patient subtypes have distinct biological "personalities", so to speak,' says Scicluna.

- CTS1, an inflammatory subtype, is characterised by an immune system in overdrive with high activation of inflammatory



Dr Brendon Scicluna



Dr Brendon Scicluna (far right) with members of the Translational Immunology and Infection Lab at the University of Malta, investigating immune responses in sepsis and ageing
Photo courtesy of the Translational Immunology and Infection Lab

pathways. This is accompanied by a "cytokine storm", which is a pathological reaction involving the uncontrolled and excessive release of inflammatory signalling molecules, called cytokines, by the innate immune system.

- CTS2, the blood-clotting subtype, shows 'marked disturbances in blood clotting,' says Scicluna. He notes specifically the breakdown of blood clots, which is a crucial part of wound healing called fibrinolysis. 'If this process is not properly regulated, it can lead to numerous complications. This subtype of patients is the most severe and has the highest risk of death,' he adds.
- CTS3, the adaptive immune subtype, displays a relatively more balanced immune response. 'Biologically, they appear to have a lymphocyte-centred response compared to the other two subtypes with signs of a more "normal" response to infection, though they are still stressed,' Scicluna notes.

Identifying these subtypes required immense collaboration and data harmonisation between research groups, which presented a significant challenge in this research. 'Every hospital, every lab,

every country has slightly different protocols, divergent treatment approaches, different machines, and different patient populations,' says Scicluna. 'When you put all that data together, the biggest challenge is filtering out this "noise" so that you can hear the true biological signal coming from the patients themselves.'

The team compared three classification methods developed independently by research groups in the Netherlands (Scicluna's lab prior to relocating to Malta), the UK, and the USA, finding a common overarching signal. To ensure their findings were robust, Scicluna and his team validated the findings in a cohort from Uganda, Africa, as well as an independent randomised controlled trial in the UK. 'It's like three different maps, drawn by different cartographers, all pointing to the same hidden treasure,' says Scicluna. 'It gave us enormous confidence that these molecular subtypes aren't a statistical fluke, but represent true, distinct biological states.'

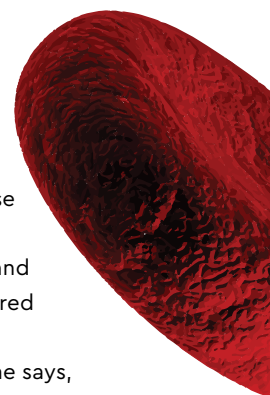
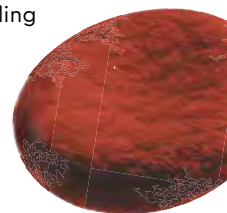
WHEN A TREATMENT CAN HELP OR HARM

Perhaps the most significant clinical insight came when the team revisited data from a previous corticosteroid clinical

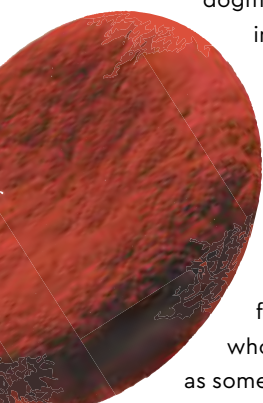
trial – a common anti-inflammatory treatment used in sepsis. Classifying patients by their CTSs revealed a concerning pattern.

Corticosteroids are harmful to CTS2 patients. 'For decades, clinical trials for promising sepsis drugs have failed, one after another. Our work, and the work of others in this field, strongly suggests why,' Scicluna points out. 'These trials were enrolling all sepsis patients without considering the immune status of the patient. It's very likely that a drug helped one subtype (e.g., an anti-inflammatory helping CTS1 patients) while simultaneously harming another (e.g., the same drug making CTS2 patients more immunocompromised). In the final analysis, these opposing effects would cancel each other out, and the trial would be declared a failure.'

The CTS framework, he says, 'gives us a new lens to re-analyse that old trial data, as well as potentially repurposing treatments that were shelved. More importantly, it provides a blueprint for designing new trials that are smarter, safer, and targeted to the right patients from the start.' ➔



RETHINKING INFLAMMATION



This breakthrough involves challenging outdated medical dogmas that have, for instance, contributed to the inconsistent and sometimes inappropriate use of corticosteroids. 'Medical teaching still draws heavily on 19th-century ideas from Rudolf Virchow, who viewed inflammation as something inherently harmful and thus needed to be suppressed,' says Scicluna. 'But inflammation is not uniformly bad. In fact, in many acute illnesses, specific inflammatory pathways are crucial for recovery.'

Scicluna contrasts this with the work of Elie Metchnikoff, who saw inflammation as a core element of the body's housekeeping and repair system. 'When that balance is disturbed, the immune system mounts an inflammatory response to restore order,' he says. 'In the case of CTS2, our research suggests that this subtype reacts poorly to corticosteroids for several biological reasons,' from oxidative stress to clotting disturbances and hormone-related mechanisms. 'Altogether, these findings help explain why a one-size-fits-all approach to corticosteroid therapy can be risky. The biology of each patient subgroup matters, and that's what CTS classification aims to reveal,' he concludes.

A ROADMAP FOR THE FUTURE: TOWARDS FASTER AND SMARTER DIAGNOSIS

The challenge now is translating this knowledge into clinical

practice. 'A full transcriptome analysis takes days, and in sepsis, you have hours,' says Scicluna. 'The solution is to develop a "classifier" – a much simpler, faster test that looks for a small handful of key biomarkers. Instead of measuring 20,000 genes, we identify the two or five that can accurately predict which subtype a patient belongs to.'

Scicluna's team and several international partners are working on rapid diagnostic tools based on the same principle as PCR or blood protein tests. 'The goal is to get a result in under an hour,' Scicluna explains. 'We are not there yet, but this is the most active area of development. Widespread implementation is likely still a few years away, but it's the critical next step.'

At the Translational Immunology and Infection Lab, based at UM's Centre for Molecular Medicine and Biobanking, the next phase of work is already underway. 'First, we are refining and validating the rapid diagnostic classifier. Second, we are working to better understand the biological mechanisms that drive each CTS subtype,' says Scicluna.


This includes a new collaboration with Jilin University in China, through a project funded by the Xjenza Malta Internationalisation Fund (SINO-MALTA-2024-40) as part of the IMMUNO-P Project. 'We're exploring how generative AI and other machine-learning tools can predict which treatments are most likely to work for each subtype, focusing particularly on immune and metabolic pathways,' he explains. 'The early results are extremely promising.'

Ultimately, the team aims to launch a randomised controlled trial in which sepsis patients

are classified as CTS1, CTS2, or CTS3 within the first hour of hospitalisation and treated accordingly. Scicluna adds that 'this is the only way to definitively prove that a subtype-driven approach can save lives.'

AN IMPORTANT MILESTONE

For Scicluna, the success of this project and its publication in *Nature Medicine* represents a significant milestone for science and patient care. 'This kind of work is only possible through a massive global collaboration,' he emphasises. 'It brings together clinicians, immunologists, microbiologists, data scientists and, most importantly, the thousands of patients who selflessly consent to take part in these studies.'

After decades of slow progress, Scicluna believes that the field is finally turning a corner. 'We are moving away from a one-size-fits-all approach towards truly personalised treatment – one that recognises every patient's unique biology,' he says. 'Because at the heart of it all, this research isn't just about data or classifications. It's about giving patients and their families a better chance at recovery and hope for the future.' 

Further Reading:



Scicluna, B. P., Cano-Gamez, K., Burnham, K. L., Davenport, E. E., Moore, A. R., Khan, S., Hinds, C. J., Cremer, O. L., Khatri, P., Sweeney, T. E., Knight, J. C., & van der Poll, T. (2025). A consensus blood transcriptomic framework for sepsis. *Nature Medicine*, 31, 4119–4130. <https://doi.org/10.1038/s41591-025-03964-5>



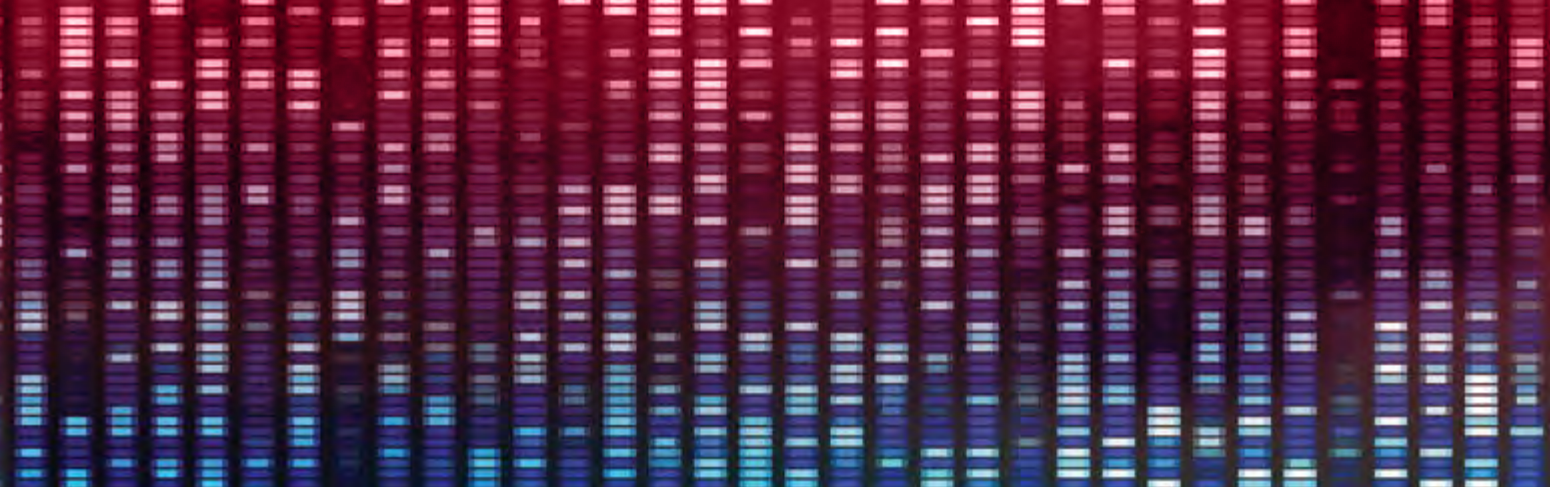
TargetMI:

Unravelling the Molecular Roots of Heart Attacks

Author: **Courtney Ekezie**

*Cardiovascular disease remains a leading cause of death worldwide, claiming millions of lives each year. Across Europe alone, over 60 million potential years of life are lost annually to cardiovascular deaths. At the University of Malta, **Prof. Stephanie Bezzina Wettinger** and her team are leading TargetMI, an EU-funded project that aims to examine the molecular pathways behind myocardial infarction, commonly known as heart attacks, and pave the way for targeted prevention and treatment.*





For Prof. Stephanie Bezzina Wettinger, the project's principal investigator and coordinator,

TargetMI is the culmination of nearly two decades of collaboration and research.

The idea for TargetMI developed from her earlier work with Prof. Pieter Reitsma and Prof. Frits Rosendaal in the Netherlands. 'We first worked together on the SMILE Project – the Study of Myocardial Infarction in Leiden. When I returned to Malta, I set up the Maltese Acute Myocardial Infarction (MAMI) Study in 2008 so that we could study heart attacks in the Maltese population.' That partnership laid the groundwork for TargetMI, which now bridges clinical medicine, genetics, and metabolism in an effort to reveal who is most at risk and why.

Unlike traditional genetic studies that focus solely on one aspect of biology, TargetMI takes a *multiomic approach* – it combines genomic, proteomic, and metabolomic data to reveal how different biological systems interact in heart disease. Each 'omic' layer tells a different story: genes are related to inherited risks, proteins reflect active biological processes, and metabolites capture how genetics, lifestyle, and environment influence

health. By integrating these layers, researchers can uncover patterns invisible to single analyses, building a more complete understanding as to why some individuals develop heart disease while others, even those with similar lifestyles, do not.

WHAT HAPPENS DURING A HEART ATTACK

The heart, a powerful muscular pump, supplies oxygenated blood to all organs around the body. To accomplish this, it depends on its own network of vessels – the coronary arteries, for oxygen. When one of these arteries becomes blocked, blood supply to a portion of the heart muscle is cut off, leading to tissue damage or death. The most common culprit is atherosclerosis, the gradual build-up of fatty deposits within arterial walls. When this plaque ruptures, it can trigger clot formation and block blood flow, leading to a heart attack.

TargetMI focuses mainly on Type I myocardial infarction, the form caused by such plaque rupture. Yet, even within this category, molecular subgroups may exist. The team aims to identify these molecular 'signatures', so that doctors will one day be able to group patients according to their biological profiles and offer more precise, tailored

treatments. This is a core principle of personalised medicine.

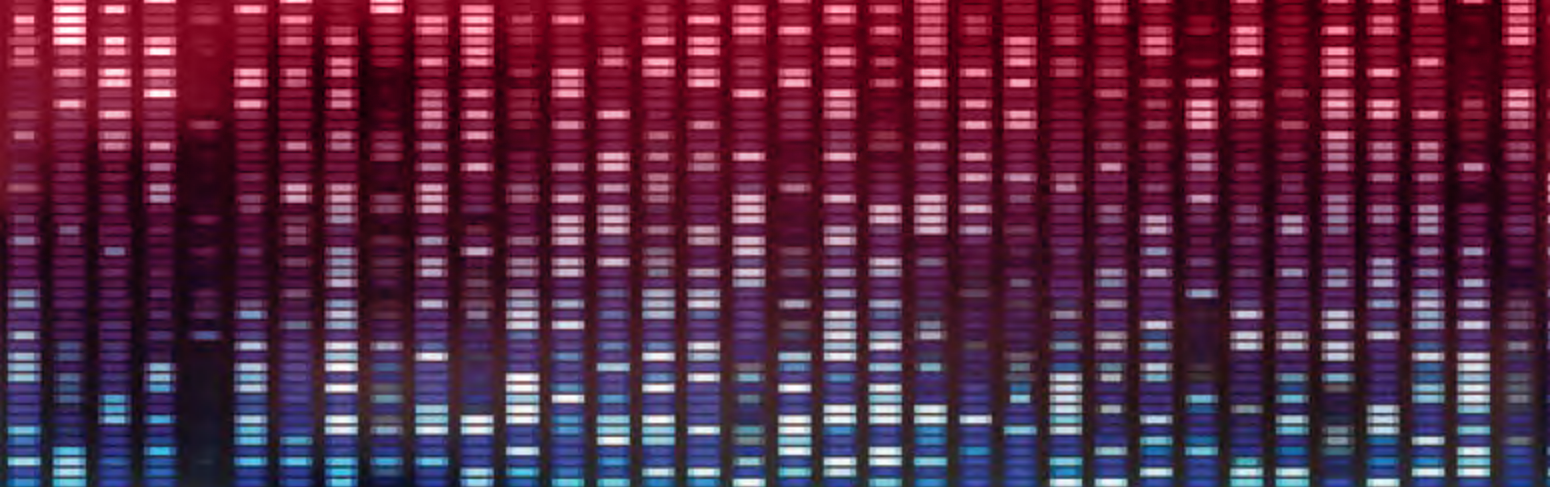
Bezzina Wettinger adds that sex-based differences play an important role. 'Men are more likely to develop plaques with a higher fatty content and thinner linings, which makes them more prone to rupture,' she explains. 'After menopause, women's risk catches up as the protective effect of oestrogen diminishes. This is why it is important to conduct separate data analyses for men and women.'

TOWARDS A NEW ERA OF PERSONALISED PREVENTION

At its current stage, the project draws primarily on samples from the MAMI Study, which includes




Prof. Stephanie Bezzina Wettinger



Top: Scientific Officer Francesca Borg Carbott working on her computer
Bottom: Samples from the TargetMI collection
Photos by James Moffett

around 1,000 participants of Maltese ethnicity. Certainly, collecting such detailed data was no walk in the park. 'The levels of molecules in blood can change depending on fasting status, time of day, or even whether the participant is seated or lying down,' Bezzina Wettinger says. 'We defined a strict protocol and kept to it for all participants. This consistency is critical.'

Using this dataset, the TargetMI team applies advanced computational analyses to link genetic variants, proteins, and metabolites to cardiovascular risk. As Bezzina Wettinger explains, 'DNA is transcribed into RNA, which is then translated into proteins – the machinery that determines, amongst other things, the levels of metabolites in our body. However, the process isn't always linear. Lifestyle factors such as smoking or diet can modify this. Understanding which biological processes are key in driving a disease helps us identify where we can intervene.'

One of TargetMI's long-term goals is to develop new risk algorithms and drug targets for heart attack prevention. The team has already built a computational tool capable of scanning vast multiomic datasets to identify genes that influence molecular pathways – a framework that could extend well beyond heart 

If we can group people based on different molecular causes that predispose them to heart attacks, we could then develop medications that target those specific causes, effectively making prevention far more efficient.

disease. 'If we can group people based on different molecular causes that predispose them to heart attacks,' she says, 'we could then develop medications that target those specific causes, effectively making prevention far more efficient.'

HAS THE PUZZLE BEEN SOLVED?

Generations of Maltese families trace their ancestry to a small founding population that later expanded in size and caused a phenomenon known as the founder effect. This makes certain genetic variants much more common locally than elsewhere, creating a unique opportunity for researchers. 'By studying the genome in a well-defined population, it becomes easier to uncover molecular clues as to why some people are more likely to suffer from heart attacks than others,' Bezzina Wettinger explains.

Interestingly, through TargetMI, the team has already identified over 35 million genetic variants, of which roughly 10% are novel – not reported in existing databases. One striking example involved a gene previously proposed in international studies as a potential drug target to prevent heart attacks. It was believed that reducing the protein produced by this gene might lower the risk. However, in Malta,

the team found a relatively large number of individuals carrying a stop-codon mutation, which is essentially a natural 'off switch' that results in lower protein levels.


Surprisingly, these individuals were not protected from heart attacks. Further analysis revealed that, actually, they had a higher risk of developing diabetes, which in turn increases cardiovascular risk. 'Although some variants may be specific to Malta or neighbouring countries, the conclusions from our findings can be extrapolated more broadly,' Bezzina Wettinger notes. 'Ultimately, we all share the same genes, which have the same function worldwide. Even from a small country, discoveries here can have global implications for preventing heart disease.'

FROM LAB TO LIFE

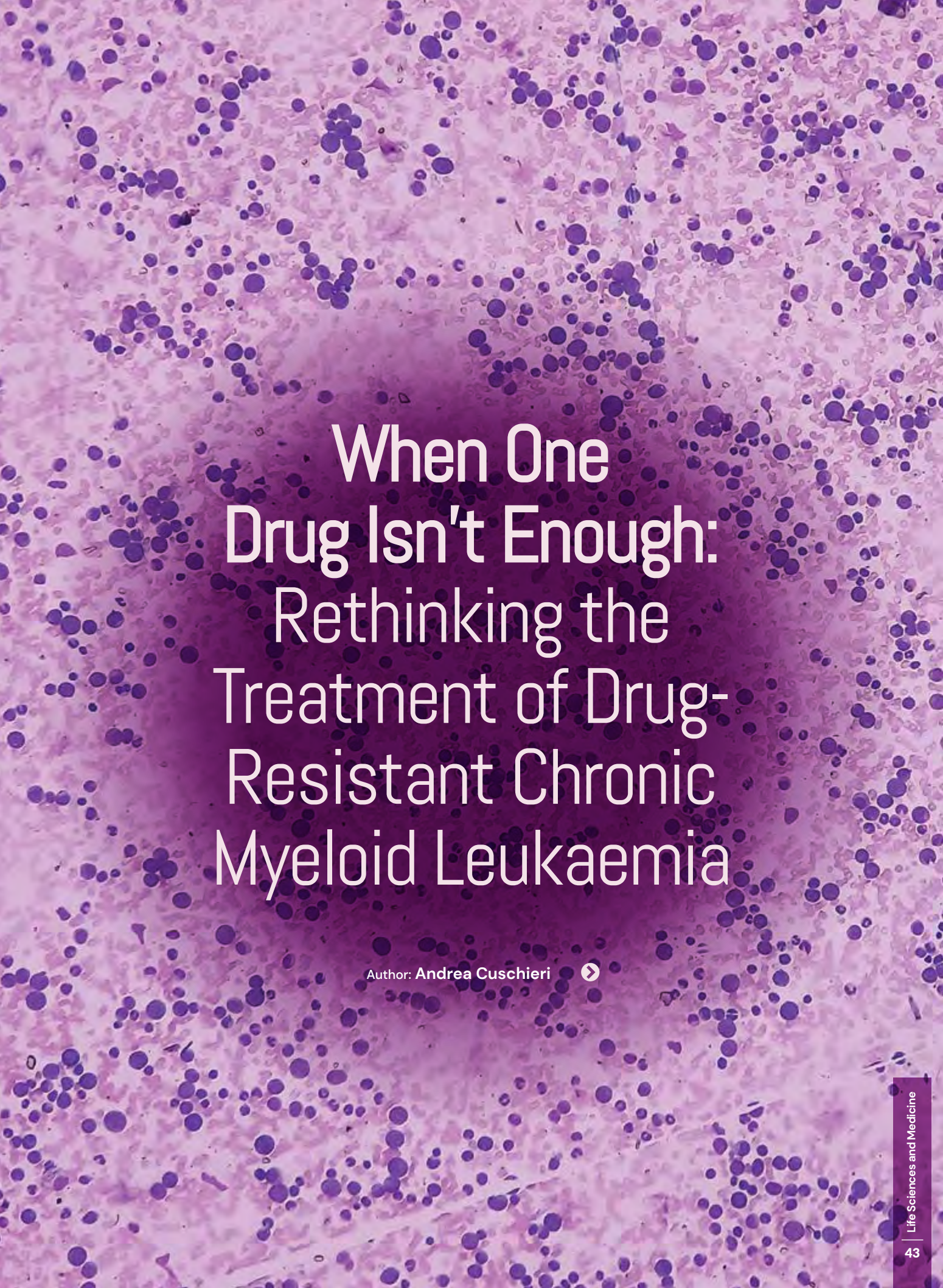
Unravelling the molecular roots of heart disease is a major scientific milestone, but translating those discoveries into clinical reality is another challenge altogether. Bezzina Wettinger explains that developing a test or medication requires rigorous hospital trials, regulatory approval, and significant investment. Here, the European Innovation Council (EIC) – the EU's flagship Horizon innovation program – plays a crucial role by

funding cutting-edge innovations from early stage to market, besides providing mentoring and training to help researchers navigate the pathway from scientific discovery to market-ready innovation.

Despite these hurdles, Bezzina Wettinger remains optimistic. 'Our healthcare professionals are highly skilled,' she says. 'Once these discoveries make it to market, integrating them into Malta's healthcare system would be simpler than it is in larger countries and the payoff would be considerable.' Preventing heart attacks is rewarding on multiple levels, as it not only saves lives but also reduces the economic burden of treatment and long-term complications.

TargetMI's success, Bezzina Wettinger stresses, is the result of a deeply interdisciplinary effort as it brings together experts in bioinformatics, clinical medicine, molecular science, and even ethics and law. It is an excellent example of professionals from different backgrounds using their skills to achieve a shared goal: reducing the cardiovascular burden in Maltese society and beyond. 

TargetMI received €4 million in funding from the European Innovation Council (EIC) as part of the EIC Pathfinder Programme.



When One Drug Isn't Enough: Rethinking the Treatment of Drug- Resistant Chronic Myeloid Leukaemia

Author: Andrea Cuschieri



When art meets science, the result can be something extraordinary. For one Maltese researcher, that intersection has become the foundation of a career dedicated to creativity, curiosity, and compassion. From tutoring students and conducting research in the lab, to painting with oils and curating art exhibitions, **Antonio Polidano Vella's** life has been a balance of expression and exploration. Looking into his scientific work, particularly his research on drug-resistant Chronic Myeloid Leukaemia, one can see how this could reshape how we think about cancer treatment.



An intracellular voyage
Artwork by Antonio Polidano Vella

Leukaemia broadly speaking, is a cancer of the blood. But what is particularly worrisome about Chronic Myeloid Leukaemia (CML) is its increasing prevalence in an ageing society – a time when patients have other comorbidities. CML starts in the bone marrow, the body's tissue responsible for creating cells present within our blood. Defective production of these cells leads to leukaemia.

'Imagine your bone marrow as a factory that makes blood cells,' explains Antonio Polidano Vella (a Doctoral researcher with UM's Department of Anatomy). 'In CML, that factory makes an error in the production line and starts overproducing certain cells.' The system that should be carefully making red and white blood cells just stops listening to the rules.

The main culprit behind CML is a genetic accident known as the BCR-ABL1 fusion gene, which drives the abnormal cell growth. Fortunately, medical science has developed drugs called Tyrosine Kinase Inhibitors (TKIs), the most famous being *Imatinib*, that specifically target the cellular pathways that result from this rogue fusion gene. 'Patients typically take Imatinib as a daily oral medication,' he says. 'It's not a cure, but for many, it keeps the cancer under control.'

However, as with many cancers, there's a catch: resistance. Over time, some people living with CML stop responding to the drug as their cancer cells learn to evade the effects of treatment, leaving them with few treatment options.

Many resistances are due to further mutations within the BCR-ABL1 fusion gene, but other genes may also be involved in these changes.

WHY CML RESEARCH MATTERS

CML is not like cancers caused by smoking, diet, or inherited mutations. 'It's one of those cancers that doesn't commonly have a direct environmental or lifestyle-related cause,' he explains. 'It isn't something you can easily prevent or see coming.'

That virtual inability for prevention and the suddenness of diagnosis, Polidano Vella says, is what motivated him to act. 'This reality motivated me to find alternative medications for this cancer. In particular, I wanted to find new treatments which could overcome resistance, meaning that they would work even on types of this leukaemia that no longer respond to medicines currently given in the clinic.'

His passion isn't just scientific – it is deeply humanitarian. 'Everything I did during my research had a direct goal: to make the lives of those suffering from CML better and give hope to patients who no longer respond to publicly available drugs. That's what makes the long hours and sacrifices worth it.'

A NEW HORIZON: COMBINING FORCES AGAINST CANCER

Polidano Vella's latest study was part of the Cancer Therapeutics laboratory of the Centre for Molecular Medicine & Biobanking, supervised by Dr Anaisse Cassar,

herself a UM Ph.D. graduate, and co-supervised by Prof. Pierre Schembri-Wismayer. Polidano Vella's latest work pushes forward the therapeutic strategy for how resistant cancers are treated. His studies show that combining Imatinib with another class of drugs called epigenetic modifiers can resensitise resistant cancer cells, making them vulnerable to treatment once again.

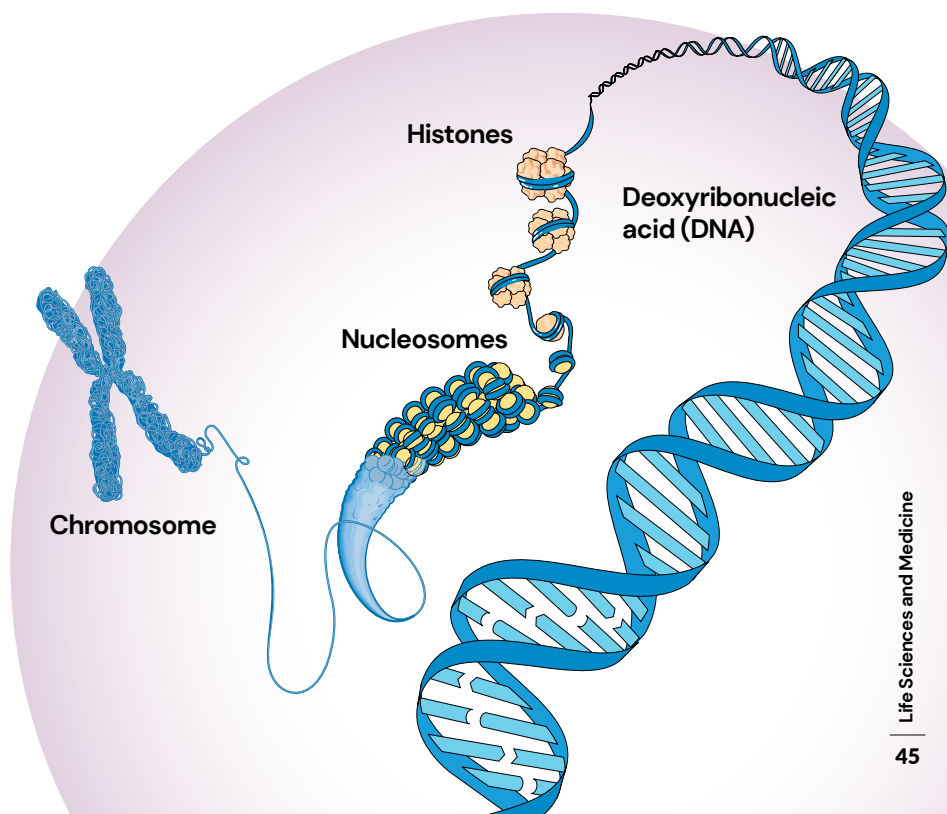
'Epigenetic-modifying drugs change the availability of DNA by influencing how your DNA is packaged inside a cell,' he explains. DNA is an extremely long chain of molecules, acting as a code that contains all the instructions for the cell. To keep things organised, the cell wraps and folds this code into structures called chromosomes. By modifying how tightly or loosely that DNA is packed, these drugs can control which genes are turned on or off.

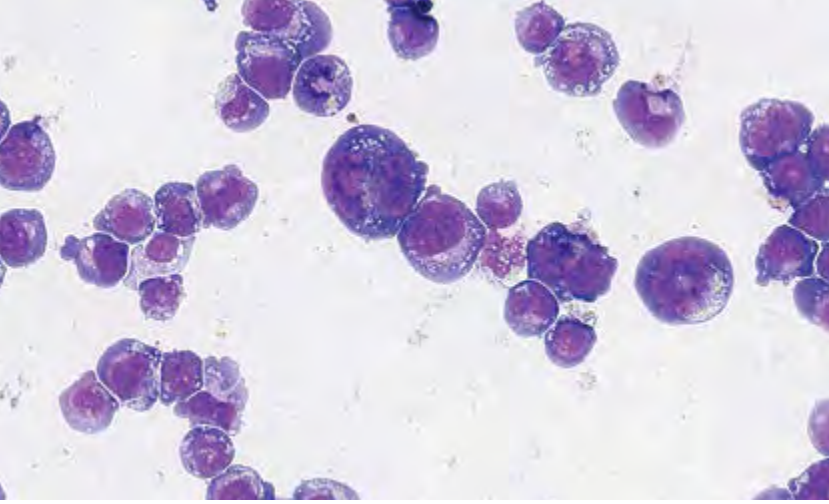
This might sound abstract, but the results are concrete: when these drugs are paired with Imatinib, the previously resistant cancer cells start responding again. 'It sheds light on combination therapy,' he says, 'where more than one drug is used together to target the cancer.'

WHY ONE DRUG ISN'T ENOUGH

In medicine, there has long been a search for the magic bullet – a single, perfect drug that could cure a disease. But as cancer research evolves, that vision is being replaced with a more nuanced approach.

'Cancer cells are chaotic,' Polidano Vella says. 'There is usually more than one process going wrong at the same time. Combining drugs allows scientists and clinicians to target multiple weak spots in the cancer. It makes therapy more





Lab CML cells
Image courtesy of Antonio Polidano Vella

Antonio Polidano Vella

effective and reduces the risk of resistance, since cancer cells struggle to adapt to multiple drugs at once.'

This principle isn't unique to CML. It's becoming a cornerstone of modern oncology. Combination therapy has improved outcomes in other cancers too, from breast cancer to melanoma. While Polidano Vella's research focused on CML, it fits into this modern era of oncological management. He explains, 'This became a natural next step in the battle against cancer after numerous cases of cancers, not just CML, became resistant to treatments, especially when only one drug is used.' Thus, research is 'moving away from the current "one-size-fits-all" approach' to keep on innovating and improving the lives of people living with cancer.

THE POWER OF PERSONALISATION

Another crucial insight from his research lies in personalised medicine – the idea that each person's cancer behaves differently, even if diagnosed with the same disease.

In his studies, Polidano Vella found that 'resistant CML cell colonies cultivated from a common CML sample respond differently to the same treatments. This supports the idea that the "one-size-fits-all" approach doesn't always work.

Personalised therapy means tailoring treatment to each patient's unique cancer genetics and behaviour.'

Interestingly, his research also suggested that not all TKI-drug resistance stems from additional mutations in the BCR-ABL1 gene. 'Together with my supervisors, Cassar and Schembri-Wismayer, we discovered that even without additional mutations in that fusion gene, some cancer cells still behave differently,' he says. 'This suggests other genes are influencing resistance, thus adding another layer of complexity, but also opportunity, to how we understand CML.'

CHALLENGES ON THE ROAD TO THE CLINIC

Despite the promise of his findings, bringing new cancer treatments from the lab to the clinic is no easy feat. 'Cancer research is very expensive and demanding,' Polidano Vella admits. 'There's always more to do and more questions to answer, but funding and workforce are limited. Additional support and better research networks would help push projects like mine forward.'

Even when the science works, the translation into clinical use can be a long and difficult journey. 'Going from an idea to the laboratory bench and then to the clinic are two separate, time-consuming and expensive paths,' he explains. 'There

are hurdles at every stage – legal, regulatory, and commercial. Even when everything works scientifically, moving into the clinic becomes an entrepreneurial challenge as much as a medical one.'

THE HUMAN SIDE OF SCIENCE

For all the data, chemicals, reagents, and microscopes, the heart of this research is profoundly human. 'I urge the general public to notice and appreciate the hard work being put into cancer research,' he says passionately. 'The treatments we take for granted are the result of years of effort and billions of euros in investment worldwide.'

He's also proud of what's being achieved locally. 'Malta, while comparatively humble in its size and scientific workforce, is the cradle of many bright scientists who are well-deserving of further funding and resources to bring their ideas to life, and improve the lives of suffering patients.' **T**

Antonio Polidano Vella's research into treating drug-resistant Chronic Myeloid Leukaemia (CML) using combination therapy is funded by the Ministry of Education and Xjenza Malta, and guided by his primary supervisor, Dr Analisie Cassar, and co-supervisor, Prof. Pierre Schembri-Wismayer.

Social and Behavioural Sciences

THE DARK SIDE OF THE WEB

How Does Technology Facilitate Child Trafficking?

Author: **Sofia Dias**



Child trafficking is one of the most complex crimes worldwide. It thrives in the digital space, where technology is used to recruit, control, and exploit victims. By uncovering how these online networks operate, researchers are discovering new ways to disrupt them. **THINK** interviewed **Dr Aitana Radu**, who is working to close the gaps that allow children to fall victim to these schemes.

Child trafficking remains one of the most difficult crimes to prevent, investigate, and prosecute. Hidden behind gaming avatars or social media handles, traffickers are constantly reinventing their operating methods. For Dr Aitana Radu (Department of Information Policy and Governance, Faculty of Media & Knowledge Sciences), understanding and disrupting these tactics has become both a professional mission and a personal cause.

'I have worked for over ten years on digital investigations of transborder crime, such as migrant smuggling, trafficking and the production and sale of false documents. When it comes to trafficking, child trafficking is one of its worst forms, due to the profile of the victims,' she says. 'I am also a mother, so working on topics that can help safeguard children worldwide is a priority for me, both personally and professionally.'

With a background in intelligence studies and years of practical experience investigating

organised crime, Radu offers a unique perspective on the role of technology in modern trafficking. She coordinated the EU-funded DISRUPT project in Malta, which aimed to identify the weak links in Europe's ability to prevent and investigate the sexual exploitation of children, while also finding new ways to address these issues.

THE INVISIBLE CRIME

In order to better understand child trafficking, it is essential to understand the definitions of 'recruitment' and 'exploitation'. Recruitment refers to the initial act of luring, obtaining, or attracting a child. Exploitation is the ultimate purpose of trafficking and encompasses various forms of abuse, including sexual exploitation.

Although trafficking leaves a digital footprint, it rarely appears where it would be most useful – at the beginning. 'It is present, but mostly in the exploitation phase, which is too late if we are seeking to prevent the crime,' explains Radu. Recruitment is much harder to detect. Traffickers often operate in public online spaces,

such as gaming platforms like Discord and chat forums like Reddit. 'They make sure to stay undetected by quickly moving conversations to private channels or servers,' she adds. There, they can use two strategies: *hunting* or *fishing*.

In hunting, traffickers actively search for children showing signs of vulnerability, such as a teenager posting about loneliness or family conflict. Fishing, on the other hand, involves posting fake job offers or modelling opportunities to lure potential victims. Traffickers can build relationships based on fear or affection, or sometimes both. 'Platforms also don't help, as age verification mechanisms for children are often too weak, and limitations on befriending children on these platforms can often be circumvented,' says Radu.

Technology can also be used for control. For example, traffickers may record victims without their knowledge and use those images to blackmail them. 'This actually happens a lot to boys,' she notes. The internet's anonymity makes it easier to hide such crimes. Online exploitation can occur behind ▶



Dr Aitana Radu

'Even adult victims of trafficking find it extremely difficult to provide such testimony,' says Radu. 'For children, this is even harder, due to their age and the relationship they would have built with the trafficker.'

paywalls or through seemingly legitimate subscription platforms, providing traffickers with both income and anonymity.

The problem is aggravated by the complex nature of victimhood itself. Children may trust their traffickers, be dependent on them emotionally or financially, or even be trafficked by family members, which makes detection almost impossible. 'Children may be carrying out what on the outside looks like a normal life, while actually being sexually exploited online,' explains Radu.

A LEGAL MAZE

Even when suspicions arise, prosecution is far from straightforward. 'Not all police forces are allowed to conduct undercover online investigations of trafficking,' Radu points out. 'This is the case with the Malta Police Force, for example. And just monitoring online spaces to catch signs of child trafficking is unsustainable, due to the sheer amount of data involved.'

The law itself is unable to keep up with the speed of digital crime. In many European countries, investigations rely heavily on victims'

testimony, which is extremely difficult to obtain, particularly from traumatised or manipulated children.

'Even adult victims of trafficking find it extremely difficult to provide such testimony,' says Radu. 'For children, this is even harder, due to their age and the relationship they would have built with the trafficker.'

Cultural and social blind spots only make things worse. Suspicion rarely arises when the trafficker is also the guardian or when exploitation happens within the home. While awareness of trafficking is growing, many societies – including Malta – have long been reluctant to acknowledge that such crimes occur in their countries.

CLOSING THE GAPS THROUGH THE DISRUPT PROJECT

The DISRUPT project, funded by the European Union, aimed to identify the information gaps that make these crimes difficult to prevent. The project focused on how digital evidence is collected, used and understood by practitioners across the EU by:

a) understanding the digital footprint of the threat and how

traffickers use social media platforms to recruit, as there are a number of gaps linked to understanding the language and symbolism they use;

b) identifying training gaps, since not all EU member states have strong digital forensic skills; and

c) understanding how to blend the operational needs for digital evidence with victim-centred and victim-sensitive approaches.

The project's recommendations integrate technology, law, and policy. However, according to Radu, the first two remain the weakest links. 'There is already technology which can significantly help digital investigations, though it is not available to everyone nor do all practitioners have the necessary skills on how to use it,' she explains. 'But you also need the legal framework that allows you to lawfully use those technologies and skills.'

MALTA'S VULNERABILITIES

In Malta, the challenges mirror those faced across Europe, but they are exacerbated by the island's size and limited resources. 'The police need more human and technological resources, and more training,'



DISRUPT Project Final Conference Meeting, marking the culmination of the team's efforts to enhance digital-led investigations, prosecutions, and judicial responses to dismantle trafficking chains of children.
Photos courtesy of Dr Aitana Radu

says Radu. 'As I mentioned earlier, for this type of case, they are not allowed to carry out undercover digital investigations, which clearly limits what the police can do.'

Societal attitudes also play a role. For years, Malta saw itself primarily as a transit country rather than a destination for trafficking. This view is slowly changing as more cases come to light. Nevertheless, the growing number of minors in the country, including those arriving as tourists or as family members of migrants, adds layers of complexity. 'Cultural factors and language barriers mean general information campaigns on these topics do not reach these communities,' explains Radu. 'And even if they do reach them, children would be very reluctant to engage with the authorities and flag any potential cases due to legal status vulnerability or simply because of an ingrained fear of the police, for example.'

Education is another challenge. 'Generally speaking, it is also difficult to educate young people on the risks, considering that they are often much more familiar with the technologies and platforms they are using than their educators,' adds Radu. This

makes prevention more difficult, as awareness campaigns must adapt to constantly changing digital trends.


A HOPE FOR THE FUTURE

Although the DISRUPT project officially ended in April 2025, its work continues through INSIGHTS – UM's Intelligence & Security Research Cluster, co-led by Radu. The Cluster conducts research to make progress on the issue of child trafficking, which can lead to the development of better training. Radu explains, 'INSIGHTS is still in its infancy; however, together with colleagues from the Cluster and external experts, we have provided training to different practitioners as part of our Department's work on this topic. Moving forward, now as part of INSIGHTS, we will continue to work with other national agencies to develop indicators for detecting the online footprints of traffickers' modus operandi, and collect more information from minors about their online behaviour.'

The goal is to shift from a reactive to a preventive approach. This requires a combination of improved law enforcement tools, greater public

awareness, and closer collaboration with tech platforms. 'There is no silver bullet,' admits Radu. 'There are a lot of things which jointly would help, such as more education and awareness, stronger investigation capabilities, greater compliance from platforms, and well-resourced agencies to deal with this topic.'

Aitana Radu remains pragmatic yet hopeful. Although the number of cases that are coming to light is rising, it is unclear whether this reflects improved detection or an increase in cases. What is certain is that trafficking will not disappear. 'It really needs to be seen as a priority,' she insists. 'Especially in countries of destination where victims are often not nationals, and so the problem may seem very remote. But in reality, trafficking affects everyone, because once networks are formed, countries of transit and destination can easily become countries of origin as well.'

In the shadows of the digital world, every message, image, or emoji could hide a story of exploitation. But projects like DISRUPT are demonstrating that the same technology which enables traffickers can also be used to stop them, if only society is willing to act. 



Is it Good for Entrepreneurs to be Good?

Author: **David Mizzi**

We're all stressed (welcome to the 21st century, baby). But while you and your colleague may face similar kinds of stress – the same nasty boss, the same ridiculous tight deadlines – the way you cope and how you feel can be remarkably different from person to person. It turns out that the way we cope with stress might just be shaped by the darker and lighter aspects of our personality.

Prof. Leonie Baldacchino examines how the dark and light triad traits of entrepreneurs affect how they deal with stress and impact their psychological well-being.



Everybody has their own strategy to deal with stress; some do yoga, others play video games, and others troll people on social media. But have you ever considered whether your personality traits influence your particular coping strategy? For Prof. Leonie Baldacchino, from the Edward de Bono Institute for Creative Thinking and Innovation at UM, this question piqued a deeper interest. 'Originally, my background is in Psychology.

After my undergraduate degree, I read for a master's degree in Creativity and Innovation and focused my dissertation research on Entrepreneurship. I then started exploring topics for a Ph.D. and discovered the psychology of entrepreneurship, and the penny dropped, it clicked! After all, entrepreneurs regularly deal with high-stress situations.

Fast-forward to recent times, and working alongside Prof. Sara Sasseti from the University of Pisa, Baldacchino initially wanted to understand how entrepreneurs' coping strategies influenced their psychological well-being. While their findings clearly indicated that certain coping strategies are associated with better well-being outcomes than others, questions remained regarding the role of personality traits.

DARK AND LIGHT TRIADS

Entrepreneurs come in all shapes and sizes. While there is the impression that entrepreneurs are ruthless and cut-throat, not all entrepreneurs are wolves of Wall Street. Still, besides Hollywood dramatisations, a handful of cases of callous practices have attracted considerable media attention, which only served to further sensationalise this perspective. Not to mention that 'a lot of research

has also already been done on the dark triad, but not so much on the light triad,' says Baldacchino.

'There is also the logic that as business leaders operate in high-pressure, volatile, and competitive contexts, then dark triad traits could help them survive and get ahead, whereas someone who is "nicer" might be more likely to end up backstabbed.' But, there is more to the dark and light triads than simply "nasty" versus "nice."

'Dark Triad and Light Triad are two clusters of personality traits, which are opposites of one another yet may coexist at varying levels within individuals. The dark triad traits are generally considered harmful, self-centred, and manipulative, while the light triad traits are more benevolent and altruistic,' she explains.

More specifically, the Dark Triad revolves around three traits: Machiavellianism, psychopathy, and narcissism. Machiavellianism involves an end-justifies-the-means type of thinking – seeing people as objects to be used. Psychopathy is characterised by low empathy and taking risks without any regard for the consequences on others. Narcissism features a sense of grandeur, being overly self-focused, and craving admiration.

The Light Triad, on the other hand, includes: Kantianism, humanism, and faith in humanity. Essentially, Kantianism is the polar opposite of Machiavellianism – treating people as ends in themselves. Humanism sees the value and worth in every person, and faith in humanity is believing that people are fundamentally good.

Granted, based on these traits, someone with a dark triad personality is hardly a person you might want to invite to dinner. However, are there any cases when such traits are desirable? 'Other studies have been carried out,' says Baldacchino, 'where in

certain stages of entrepreneurship, such as the earlier stages, certain dark traits could, theoretically, offer an advantage, such as being bold and taking risks. However, this might be short-lived, as at later stages, the light traits may be more beneficial, for example, when collaborating or working with shareholders.'

But what about when it comes to dealing with stress and mental well-being? And, how do you even measure coping with stress?

DEALING WITH STRESS

Scholars refer to different strategies to understand how individuals cope with stress. 'For this study, we applied Endler and Parker's model, which categorises different coping strategies into three distinct styles: Task-based, avoidance-based, and emotion-based,' explains Baldacchino. 'Task-based coping strategies involve taking the bull by the horns and trying to find a solution to the source of stress. Avoidance-based is putting the problem aside and focusing on something else, at least for a while. Emotion-based generally implies an emotional outburst, like getting upset or getting into an argument.'

Dealing with stress is only one aspect of mental health. Besides this, Baldacchino's study also looked at psychological well-being. This means having high positive emotions and low negative emotions, as well as general satisfaction with life over a period of time.

'Typically, task-based strategies are considered the most effective for coping, and the most beneficial for one's well-being. In fact, in our first study, entrepreneurs who used task-based coping enjoyed higher levels of well-being. However, we found that entrepreneurs who used avoidance-based coping strategies also had positive well-



Prof. Leonie Baldacchino
Photo by Martin Dimech

being,' notes Baldacchino. 'Sometimes it helps to put problems aside – just like you have incubation time in the creative process, where you put it on the back burner and then you have the "aha" moment and feel good about it.' Baldacchino notes that whereas entrepreneurs who used task-based or avoidance-based coping strategies experienced more positive emotions and life satisfaction, those >

DARK TRIAD



FAITH IN HUMANITY


LIGHT TRIAD

who used emotion-based coping strategies tended to have more negative emotions than positive ones.

When it comes to the dark and light triads, what goes around comes around. 'In our second study, entrepreneurs with light traits were more likely to use task-based and avoidance-based coping, and, in turn, had better psychological well-being. Dark triad entrepreneurs were associated with emotion-based coping strategies, which we had already seen have poorer well-being outcomes.'

Baldacchino's results are based on a quantitative, self-assessed survey completed online by 179 local entrepreneurs. 'For this study, we felt that an anonymous online survey was the optimal way to collect data. This helps to minimise any social desirability bias in the results,' she explains. Essentially, the promise of anonymity ensures that participants don't feel compelled to answer questions in ways that would be viewed favourably by others, thereby leading to more honest responses and accurate results.

Clean categories and tidy explanations are always satisfying. Nice people cope better with stress, and

nastier people don't. However, there is much more to it than that. It's not about ranking one set of traits above another. Instead, it shows how personality shapes the way stress is managed, and how those coping strategies, over time, affect well-being. It's not that light traits make better entrepreneurs, but that they make the entrepreneurial journey more psychologically sustainable. As Baldacchino puts it, 'it's good for people to be good.' 

Further Reading:

Baldacchino, L., & Sasseti, S. (2025). The effects of coping strategies on entrepreneurs' psychological well-being under uncertainty. *Strategic Change*, 34(2), 253–265. <https://doi.org/10.1002/jsc.2613>

Baldacchino, L. (2023). *The effects of entrepreneurs' dark and light traits on their coping strategies and psychological well-being*. Paper presented at the EURAM (European Academy of Management) Annual Conference, Dublin.

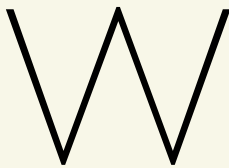


GROWING COMMUNITY

Author: **Jonathan Firbank**

*Homegrowing is a sustainable cornerstone of many lives, producing fantastic food while improving the physical and mental health of a growing community. **Cynthia Caruana** is currently completing a Ph.D. research project in which she investigates these holistic benefits and forms strategies to help new growers. She speaks with **THINK**'s **Jonathan Firbank** about what it takes to home-grow, and what homegrowing gives back.*





Wherever there's a little space and time to tend

it, people have found solace in homegrowing. Growing your own food is a fundamental part of who we are. The process is embedded in our history, influencing how we relate to ourselves and each other. Its benefits – those beyond the simple work-to-food equation – have been understood for millennia. However, things understood since olden days are often understood in old-fashioned ways. Homegrowing is rarely a viable primary food source nowadays, and often competes with modern lifestyles. But the self-improvement, self-esteem, and community developed by homegrowing is too often understated. Another conversation proving too quiet concerns the strategies we need to reintegrate homegrowing into over-optimised lives. So, the question is this: how exactly are lives improved by homegrowing, and how can we start?

Cynthia Caruana is completing her Ph.D. under the supervision of

Dr Censu Caruana at UM's Centre for Environmental Education and Research. Her project combines two things required to reintegrate homegrowing into our lives. First, the need for more quantitative and qualitative data on homegrowing. Second, the need for planning and training resources for those who are new to food cultivation. Caruana's interest in the subject began with teaching work. It's easy for us to forget, but some of the most impactful and communal homegrowing happens on school grounds, as we are taught about our environment. As Caruana puts it, 'I'm a teacher. I have spent ten years teaching biology at a government school. This led me to a master's in sustainability within schools, and following from that, I took on a new job as an Eco-Schools teacher.'

Eco-Schools, known locally as EkoSkola, serves as a global framework for Education for Sustainable Development, fostering a transformative educational environment that empowers students of all ages to become active agents of change within their communities. It has throughlines

that continue in her current work, a holistic interest in the contact points between community and sustainability, and an action-oriented approach. 'One project I found particularly inspiring was called *We Eat Responsibly!* – a multinational effort to make use of unused land on school grounds. Seeing those spaces being used so positively was a joy to see.' Nonetheless, Caruana wanted to apply these lessons beyond schools, amidst a broader area throughout our communities. Another source of inspiration came with the global lockdowns, as the pandemic led to mass interest in hobbies with a self-care element. Homegrowing was no exception. The limited areas people were confined to were often transformed into green spaces for the betterment of people's physical and mental health.

THE BENEFITS OF HOMEGROWING

It is easy to think reductively about homegrowing. As it is a productive act, we might overly focus on its product. Homegrown produce is, of course, often better



than a shop-bought alternative. It is free from the constraints of mass production, and the homegrower does not need to sacrifice flavour or quality in service to efficiency. But a normative household would

be hard-pressed to homegrow a significant proportion of its own food, due to modern limitations on free time and green space. 'I don't think that on a family level, growing on a small scale could

produce enough food for self-sufficiency. However, the literature shows numerous advantages beyond that. For example, a positive impact on one's mental wellbeing, or knowing that your work has resulted in something pesticide-free.' As with other hobbies, homegrowing is more about the journey than the destination. The process has a host of physical and mental health benefits. These range from the intuitively beneficial fresh air and exercise, to the subtler balms like engaging more deeply with seasonal change.

ALLOTING METHODOLOGIES

As such, Caruana's first research question was 'to see what motivates people to grow their own food, and to understand the challenges they face.' She notes that her research 'uses a mixed-methodology approach, with this first stage being a quantitative survey.' This survey also yielded data relating to the identification of different settings in which homegrowing takes place. It's very easy to assume that homegrowing essentially means >



Cynthia Caruana



private allotments and gardens, but as educators like Caruana will understand, schools are a crucial environment. Here, the holistic benefits are more pronounced, as homegrowing in schools is explicitly educational. 'Next is to identify strategies,' Caruana says, noting that these would be tailored to specific settings and benchmarked against UNESCO's Education for Sustainable Development practices. This is done in order to 'promote homegrowing and its many established advantages.' Caruana specifically lists education on sustainability among these strategies, due to it being an important part of early curricula.

Caruana has completed this first phase of her research: 'I have compiled massive amounts of results, which will need to be filtered since, obviously, some tests don't yield significant results. I'm working on filtering these at the moment, while also working on a thematic analysis of interviews.' This is essentially the second stage of Caruana's work, with the third and final stage being 'action-oriented'. 'We can talk forever, but unless there is something impactful which leads to clear

action, I feel as though the project would be missing something.'

To that end, Caruana plans to present a training program with the dual role of promoting homegrowing and informing its implementation. This follows some groundwork: a qualitative investigation of an existing program, and surveying participants to better understand what does and does not work. Finally, the very last part of Caruana's research 'is the implementation of a community garden' – a process which is well underway. 'This is a new initiative which connects a school and an elderly residence.' The intergenerational aspect of this underscores a crucial point. With a community garden, 'community' can be the operative word. As people interact over a shared project, communal growing spaces break the increasingly stratified age gaps in our culture. Information and produce are exchanged regularly in these spaces, sparking and sustaining neighbourliness and friendship. This may prove a subtle antidote to the growing isolation of the 21st century.

At this point, a piece of unused land has been divided into plots

and an expression of interest was issued to students and their families for those who want to grow their food here. 'Through observation and discussion, I am implementing a kind of iterative cycle.' Insights from this process will inform the aforementioned training program. 'I'm trying to see what works, observing the knowledge they gain and the advice they give.'

COMMUNAL FEEDBACK

Qualitative feedback is vital to this multi-stage process. Engaging with biodiversity was brought up as a particularly strong reward. One family mentioned that gardening a plot gave their children time 'away from gadgets' – an increasingly rare boon. But conversely, communal gardening is compatible with digital communication. The gardeners Caruana works with make use of a group chat, sharing photos of interesting flora and fauna as well as tips to overcome the challenges that beset any garden. 'The fabric of the community really comes together in these moments, which particularly helps encourage newer gardeners.' This help is a crucial part of homegrowing. Caruana finds



Small-scale growing from different contexts including pots on a rooftop, a school setting and a community garden. *Photos courtesy of Cynthia Caruana*




that gardeners are far less likely to quit when they share information and resources, suggesting that a communal effort results in more than the sum of its parts.

Another recurring point of interest is the need to 'start small' – something that is mentioned in feedback and has proved strategically successful. It makes homegrowing iterative and manageable, averting the chance that a new gardener may feel overwhelmed by the work they've taken on. Given that the benefits are holistic (having as much to do with socialising and self-esteem as putting food on the table), this approach might be a particularly effective way of enriching one's life. It is also highly compatible with the main impediment to self-sustainability – available space.

'Space can be a problem for homegrowing, but I've had the opportunity to speak with local

councils who might have space available for communal gardens.' Caruana also mentions vertical wall gardens, which are a beautiful addition to any urban environment. However, she notes that greening projects rarely, if ever, allocate space for communal growing and recalls that two rare Maltese ventures into public allotments were short-lived. This was likely due to a lack of coordination and strategy – a void that Caruana's work seeks to fill.

'I will provide the groundwork for what motivates homegrowers and how best to overcome their challenges,' Caruana says. Still, she is keenly aware that her research is, itself, part of a broad community of effort and ideas. 'There needs to be a mix of good strategies, available space and technical expertise for homegrowing to really work. That's what it will take if we want to break ground in Malta.' 





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