DECEMBER 2018 • ISSUE 26

THINK

IDEAS • MALTA • RESEARCH • PEOPLE • UNIVERSITY

ISSN 2306-0735

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EDITORIAL

TECHNOLOGY

Our team at **THINK** has dedicated the last issue of 2018 to technology, the seemingly unstoppable force that has permeated the world around us, for good or bad. As communicator Jason Silva said: 'Technology is, of course, a double edged sword. Fire can cook our food but also burn us.'

Technology can be dangerous, but it can also protect us. Swiss artist, filmmaker, and researcher Dr Adnan Hadzi analyses artificial intelligence and privacy invasion through art (p.16), while food technologist Dr Sholeem Griffin describes how, together with her colleagues, she is developing algorithms that will allow ready-made food-testing to be heaps faster (p.28). Moving on to seemingly miraculous feats, geneticist Dr Rosienne Farrugia shares some new advancements in gene analysis that will potentially help develop treatment and dramatically improve patients' lives (p.24). Dr Ing Marc Anthony Azzopardi also discusses how tech and innovation may be just what Malta needs to bring the manufacturing industry into the 21st century (p.22).

Technology can benefit society through companies. Ideas need to be turned into sustainable businesses. Andras Havasi shares his thoughts on the academic entrepreneur who could spearhead the effort (p.52). Meanwhile, Prof. Russell Smith tackles companies already set, from established plumber services to tech startups, with a new model that assesses their business health. His work could revolutionise how entrepreneurship is taught, saving many from failure (p.46).

Beyond all this, the issue also discusses the arts (p.44), female empowerment (p.12), climate change (p.13), and the fishing industry (p.60)—all to make you **THINK** about that fire that sustains us.

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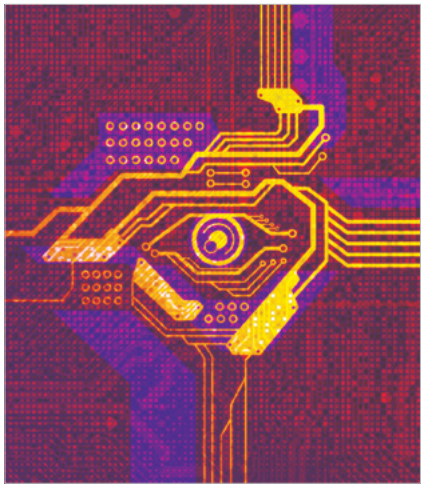
COVER STORY



TECHNOLOGY

Abstract and polychromatic, Gabriel Izzo's cover for **THINK** Issue 26 depicts the transfer of power and data through circuit board pathways. Ultimately this very same power is what moves us forward in the world, a metaphor for enlightenment.

TECHNOLOGY FOCUS

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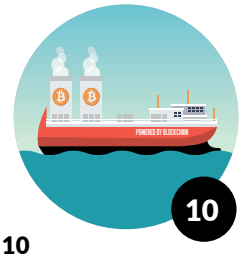

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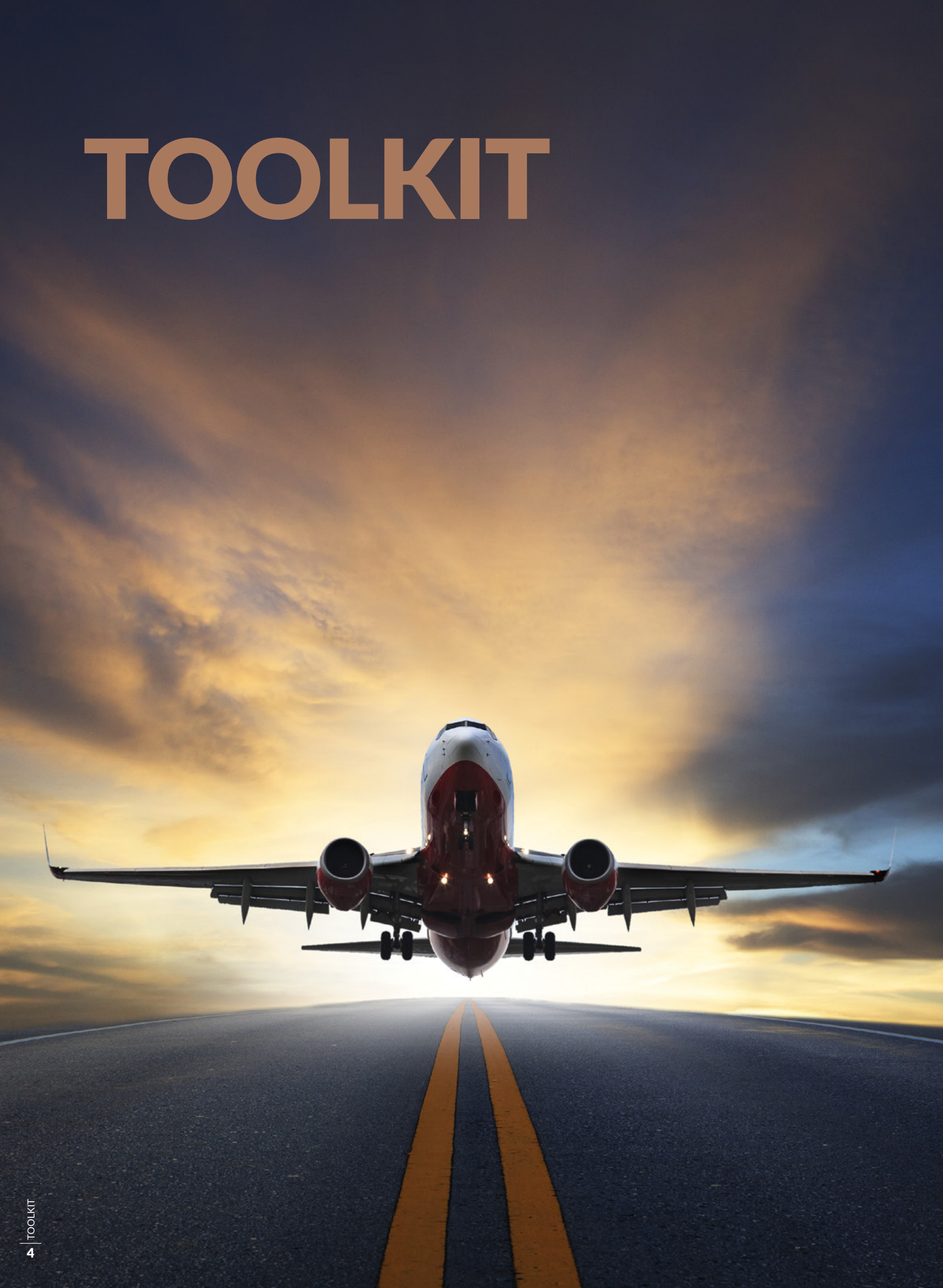


Up, up and away

How do aerospace research engineers test new cockpit technologies without having to actually fly a plane? Answer: flight simulators. These machines give pilots and engineers a safe, controlled environment in which to practise their flying and test out new technologies.

In 2016 the team at the Institute of Aerospace Technologies at the University of Malta (IAT) started work on its first-ever flight simulator—SARAH (Simulator for Avionics Research and Aircraft HMI). Its outer shell was already available, having been constructed a few years back by Prof Carmel Pulé. From there, the team built the flight deck hardware and simulation software, and installed all the wiring as well as side sticks, pedals, a Flight Control Unit (FCU) and a central pedestal.

The team constructing the simulator faced many hurdles. The biggest challenge was coordinating amongst everyone involved in the build: students, suppliers, and academic and technical staff. Careful planning was crucial.

The result is a simulator representative of an Airbus aircraft. However, it can also be easily reconfigured to simulate other aircraft, making it ideal for research purposes and experimentation. The Instructor Operating Station (IOS) also makes it possible to select a departure airport and change weather conditions.

One of the first uses of SARAH was to conduct research on technology that enables pilots to interact with cockpit automation using touchscreen gestures and voice commands. This research was conducted as part of the TOUCH-FLIGHT 2 research and innovation project (read more about this in Issue 19).

Going beyond the original aim of SARAH being used for research purposes, the IAT is also using the technology to educate graduates and young children in the hope of sparking an interest in the field. Earlier this year, a group of secondary school students flew their own virtual planes under the guidance of a professional airline pilot.

Airline pilot testing IAT technology
Photos by Dr Ing. Jason Gauci

Looking ahead, the IAT plans to incorporate more state-of-the-art equipment into SARAH to increase its capabilities and make the user experience even more realistic. There are also plans to build other simulators—including a full-motion flight simulator and an Air Traffic Control simulator—and to connect them together to simulate more complex scenarios involving pilots and air traffic controllers; a scenario that would more closely resemble the experience of a real airport.

Preparing for takeoff in a controlled testing environment
Photo by Leonardo Barilaro

WITHOUT BORDERS

Bursting the RRI bubble

Relationships are based on trust, communication, and mutual respect. The same can be said of Responsible Research and Innovation (RRI). Behind all the new ideas, it all boils down to a group of people, hailing from different walks of life, coming together to try and create a better future for everyone.

At the fourth annual NUCLEUS conference, researchers, academics, science communicators, creatives, and business people flocked to the tiny isle of Malta to share their stories and attempts to embed RRI into their institutions and communities. As everyone settled in, dialogue flowed among delegates and the room was abuzz. University of Malta pro-rector Prof. Godfrey Baldacchino opened the conference with a question: How similar are universities and Valletta, the fortified capital that was hosting the conference? Having been constructed following Malta's infamous Great Siege, the Knights encased Valletta in massive bastions, allowing only four small entry points. 'Valletta is an island on an island,' Baldacchino said. 'Are universities the same? Are we trying to protect our own?' The question had many heads nodding in response.

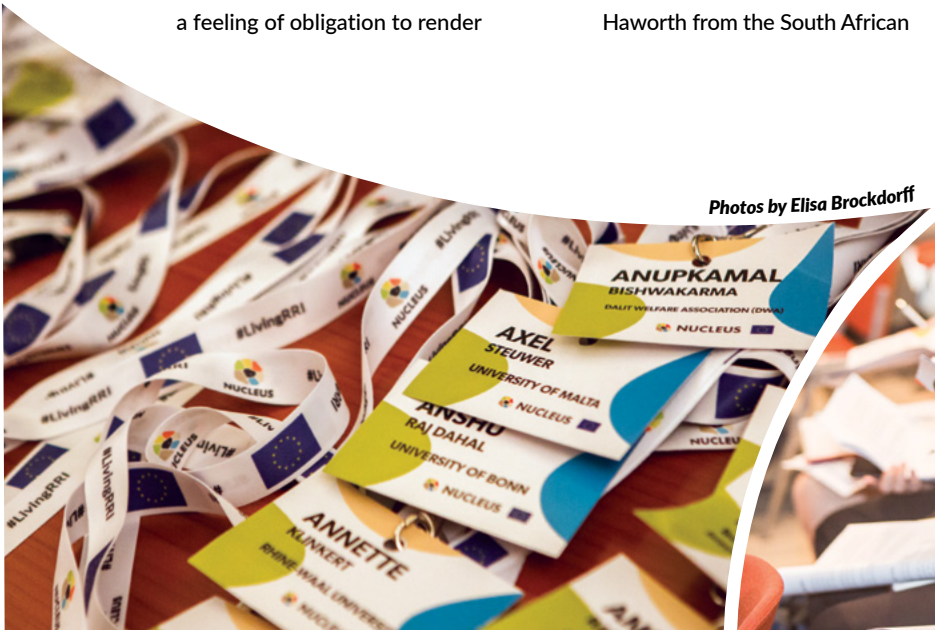
Most people in the room expressed a feeling of obligation to render

'Valletta is an island on an island,' Baldacchino said 'Are universities the same? Are we trying to protect our own?'

knowledge more accessible, more relevant, and more digestible to a wider audience. But they encounter a myriad of challenges. Engaging with publics or policy makers isn't easy. It means addressing different needs in different ways, sometimes even pandering to whims and flights of fancy. Most people noted issues with time, funding, and resources, calling for processes to be formalised. Others pointed to a lack of creative skills and, sometimes, general interest across the board. What also quickly emerged was frustration with the term RRI itself, creating confusion where there needn't be any.

With all of these difficulties, however, came solutions. Dr Penny Haworth from the South African Institute for Aquatic Biodiversity, said that in her experience 'we need to look at what universities are already doing and work smart. Win hearts and minds.' University of Malta's Nika Levikov also pointed out that 'there are a lot of people practicing RRI who are not conscious of it.' And for those who do not believe it to be a priority, for those who do not want to engage? 'You have to set them aside and show them it is possible in a way they understand,' says Zoran Marković from MISANU, Serbia.

Picking up Baldacchino's thread on bringing down the walls of universities and research institutions, Dr Annette Klinkert from Rhine-Waal University of Applied Sciences in Germany summed up her main takeaway from all the discussions. 'What we can learn here is that it's time to burst the bubble in which we work. Especially this field of RRI. It is time to leave our cosy little community with our results.' The results are the various projects that NUCLEUS has been championing over the past years, bringing research to its audiences. 'All the projects are useless if they can't merge and get out [into society and communities],' she emphasises. 'If they don't merge, they're pointless. It is time to burst the bubble.'



Photos by Elisa Brockdorff

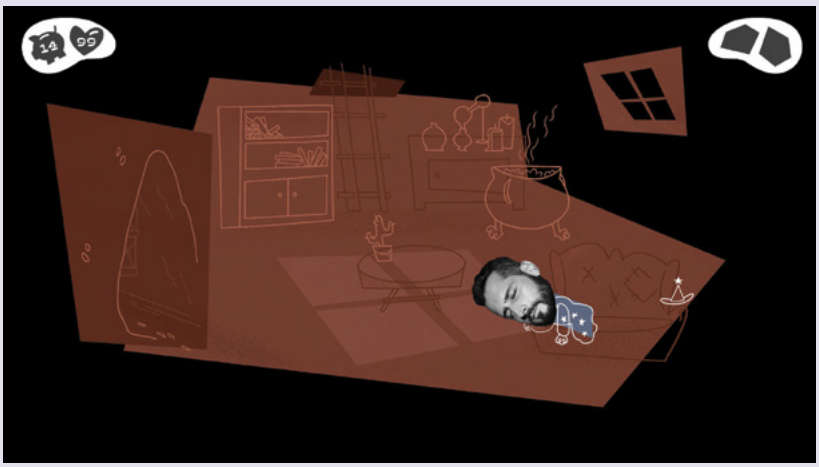
DESIGN

Come *Here*!

A pointed index finger can mean many things. It can direct our attention to something, show us which way to go, or demand silence. It all depends on context—the situation in which it is used. This is what philosophers refer to as 'indexicality'. And yes, you guessed it, the word 'indexicality' comes from the name of that particular finger.

At the University of Malta's Institute of Digital Games, Prof. Stefano Gualeni has been playing around with this concept. Featuring the voice acting talents of independent game developers Emily Short and Pippin Barr, Gualeni has created a video game called Here, designed for players to engage with (and get confused by) the concept of indexicality. *Here*'s gameplay poses the question of what it means when we say 'here' in a game world, and how many meanings of 'here' can exist side-by-side in a video game. It uses the trope from Japanese Role Playing Games of going on quests to retrieve bizarre items from classic locations. Spooky caves and castles are all part of the repertoire of locations that players can explore. But then, where do you go if 'here' is your instruction? What if 'here' isn't where you think it is? What if you're supposed to go upside down instead?

To try the game yourself, visit www.*here.gua-le-ni.com*



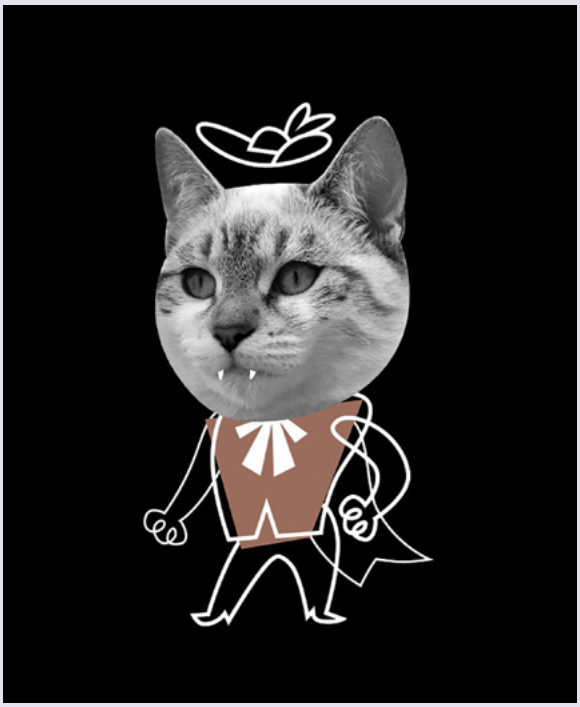
Top: *Here*’s start screen

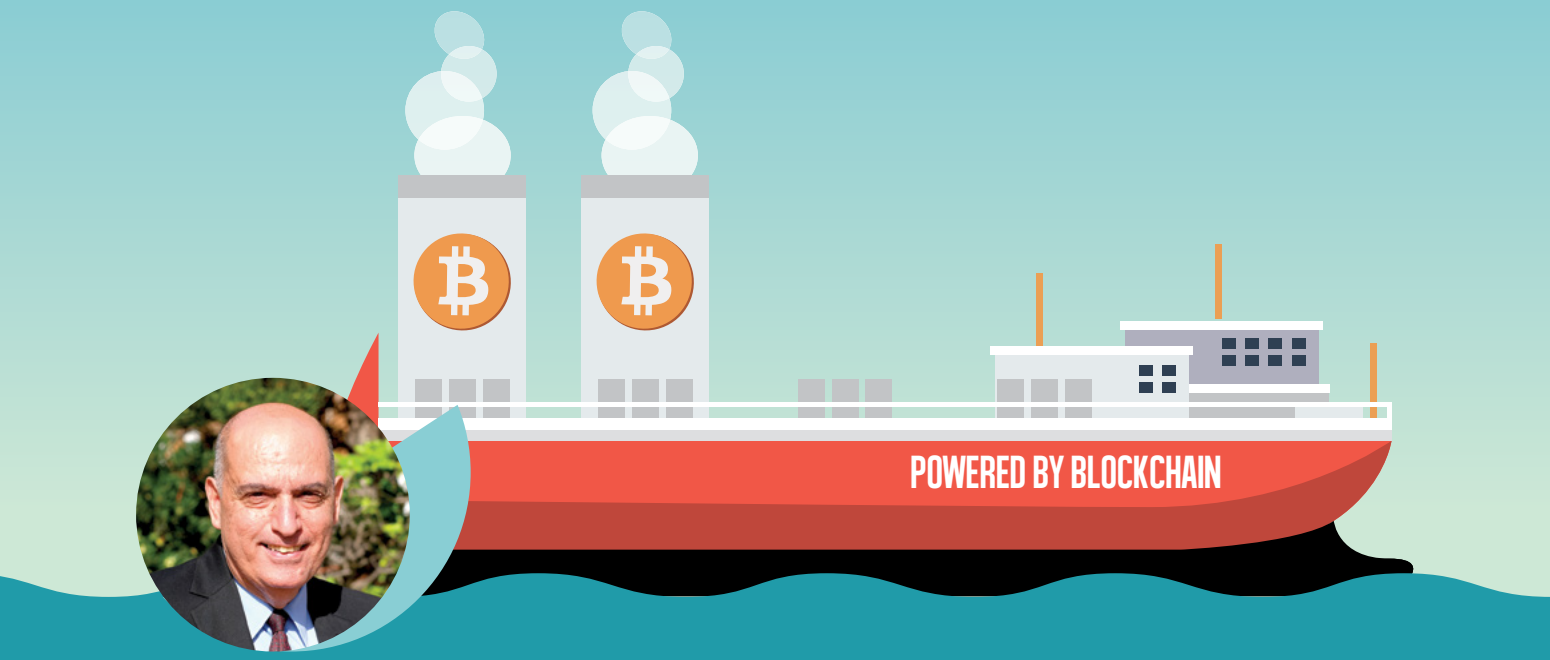
Left: Screen grab from *Here*

Bottom, left: Bird character of the game, in idle mode

Bottom, right: Wessel, cat character in the game, in commenting pose

All concepts provided by Prof. Stefano Gualeni
Artwork by Rebecca Portelli





Blockchain: Not just bitcoin

Prof. Aldo Drago

Blockchain is still a big unknown, even for some professionals. Blockchain and the Distributed Ledger Technology (DLT) have been made infamous by Bitcoin, a digital payment and peer-to-peer monetary transaction system that bypasses banks and third party endorsements. But DLT and the Blockchain protocol can be used for other purposes.

Blockchain's greatest strength lies in its decentralised architecture. It allows transactions to be shared openly across independent nodes, verified by encrypted checksums that give each closed block a distinct, indelible signature. All these connected transactions, chained within a common system, make tampering practically impossible. Blockchain is irrevocable, affordable, flexible, and secure.

But what about other applications of these concepts. What if we were to apply such technology to every data exchange? Data and information in the digital age is spearheading the evolution of services and product development, serving a continuum of user demands at all levels and scales, boosting research and innovation applications. Indeed, data is nowadays considered a key ingredient for competitiveness, and this is not about to change anytime soon.

The greatest bottleneck is data sharing. Data production is growing and covering many realms but unfortunately most of it remains locked up in closed databases, enterprises, and institutions. Unofficially it is estimated that the world generates 16 zettabytes of data annually (that's 16 billion terabyte laptops), but only 1% is analysed. The problem is that data is withheld by data collectors who consider data hoarding to be a right. Where data is released it does not usually flow to users. As a result, we now have institutions running massive centralised databases, often conducting data archaeology, compiling it at local, regional, and global scales. They address the needs of different user groups, but they also impose licensing procedures that ultimately restrain the power of free data flows, establishing unnecessary monopolies.

Blockchain can unleash the full power of data by providing a system for seamless, efficient and secure data transactions. It can lead to so many applications, such as eliminating the need for shipping documents in the transportation of goods, and making the freight and logistics industry more time and cost efficient. Data could be funnelled into artificial intelligence systems to create high performance human-machine interfaces, self-automated robots, cars, and ships. These devices, with information from big data, would be able to learn from their mistakes and autonomously adapt to changing environments. In medicine, large data sets would prove priceless in drug and treatment design, doing away with the constraints of limited sample sizes. The application of such technologies is limited only by our own imagination.

A new digital revolution is looming ahead. Are we ready to be amongst the first to take this leap into the future?

Waste's carbon footprint

Margaret Camilleri-Fenech

When people think about the impact waste has on our environment, they usually think about toxic materials in landfills, the land they take up, and the animals harmed by irresponsible waste disposal. But there is more. Our garbage also contributes to greenhouse gases (GHG) in the atmosphere.

Greenhouse gases from waste generation tend to be carbon-based. Direct emissions include both the methane released from organic material deposited in landfills and carbon dioxide emissions from transport, incineration, and recycling plants. Other potential sources are the combustion of fossil-derived carbon in incineration systems and the release of nitrous oxide during nitrification in compost piles (an important step in the nitrogen cycle where bacteria in soil oxidise ammonia and form nitrates and nitrites). A possible solution can be found in resource recovery and using the waste we produce as a secondary material, even to replace virgin materials or fuels. The bottom line: as a country, we need to develop a more circular economy.

Landfills are major contributors to GHG emissions. Landfill gas, which is 50% methane, is produced when biogenic carbon (emissions that originate from biological sources like plants, trees and soil) is deposited in landfills. Every tonne of methane released into the atmosphere absorbs 28 times as much heat energy as carbon dioxide does. Within the EU, this problem is tackled through the Landfill Directive (Directive 99/31/EC) which requires that all waste be treated in Mechanical Biological Treatment Plants before landfilling. These plants serve to both reduce volume and stabilise waste, ultimately reducing GHG emissions. Another end-of-pipe technology is the collection of gases released from landfills.

Climate change policies rarely consider waste. We associate waste generation with material loss, but carbon and material efficiency go hand-in-hand. The best example can be drawn from food waste which contributes to 3.49 G tonnes of GHG emissions, according to estimates by the Food and Agriculture Organisation (FAO). This figure includes a full lifecycle analysis of each commodity.

FAO made a shocking discovery when comparing projected food waste figures to countries' total GHG emissions. The results showed that if 'Food Waste' were a country, it would rank as the world's third biggest emitter after the USA and China. Emissions from food waste amounted to more than double the total levels of GHG emissions from road transportation in the whole of the USA in 2010 (1.5 G tonnes).

There is no doubt that the world needs a holistic approach to waste management; one that leaves a positive impact on GHG emissions from all sectors of the economy including hospitality, construction, manufacturing, and services. More proactive approaches, such as that being adopted through packages like COM (2014) 398 'Towards a Circular Economy: A Zero Waste Programme for Europe', should be lauded.

Technological, material and product innovation is admirable, but we need to make more effort to pair this with an awareness of the connection between waste and GHG. This will have a ripple effect, influencing raw material resource management, the promotion of waste reduction at source, and recycling. Put simply, material efficiency and the closing of loops is an automatic contribution to carbon efficiency—waste not, want not. T

STUDENTS

Can the EU empower women in Afghanistan?

Rebecca Zammit

The European Union's success relies on positive relationships—cooperation and good will is key. The EU's Development and Cooperation Policy exists to support these connections. Its focus is on external relations, establishing partnerships with developing countries and channelling billions of euros to them every year. The European Commission plays a crucial role in this regard, managing and implementing directives on behalf of the EU.

But what do we really know about the effectiveness of EU aid in helping citizens in developing countries? And how far is female empowerment part of this agenda? In short—we don't know much!

Research in this area is scarce, and this is what prompted me to tackle this question myself, under the supervision of Dr Stefano Moncada. My specific focus was on assessing whether the EU is committed to gender equality and female empowerment, taking Afghanistan as a case study. I reviewed all the available aid programming documents from the last financial period, and assessed whether the EU was effectively supporting Afghanistan to achieve the fifth Sustainable Development Goal (SDG) of gender equality. I adopted a mixed-method approach, using content analysis and descriptive statistics. Basically, this meant coming up with a very long list of keywords related to gender, and checking how many times these words appeared in the policy documents. Whoever invented the 'ctrl + F' function saved my academic life!

The results of my research were pretty surprising. I found that the EU is now focusing much more on gender empowerment on the ground in Afghanistan than it did a few years ago.

According to my data, and when comparing this to previous studies, it appears that the EU's commitment to supporting this goal is growing over time. However, I also found that there is substantial room for improvement, as the attention given to such issues is rather conservative, and not equally balanced across all the SDG targets. For example, the need to increase women's employment is mentioned many more times than the need to support female education or political participation. This is surprising as education is key to many other improvements in wellbeing. Nevertheless, I believe the overall results are encouraging and important, not only to highlight improvements in the effectiveness of the EU's development and cooperation policy, but also in reply to a growing sentiment that puts into question the EU's capacity to manage, and lead, in key policy areas. We can only hope that this continues exponentially.

This research was carried out as part of a Bachelor of European Studies (Honours) at the Institute for European Studies, University of Malta. The dissertation received the '2018 Best Dissertation Award'.

Food, gender and climate change

Precious Shola Mwamulima

Food is one of life's constants. Yet, what we eat has major ramifications on global climate. Food production uses up major resources: it accounts for more than 70% of total freshwater use, over one-third of land use, and accounts for just shy of 25% of total greenhouse gas (GHG) emissions, of which 80% is livestock. Yes, that steak you just ate has had a direct impact on the world's climate!

There is something of an oxymoron in the world's food ecosystems. Overconsumption is linked to major health problems like obesity, cardiovascular disease, diabetes, and certain cancers that together account for up to 71% of global deaths. On the other hand, there are around one billion people in the world who suffer from hunger and underconsumption. All of this is compounded by problems of food loss and waste. This raises important questions related to the ethics of worldwide food production and distribution.

Food production and consumption is determined by many factors: population numbers, incomes, globalisation, sex (biology), and gender (socio-cultural) differences. The combination of a sedentary lifestyle and an unbalanced diet, high in red, processed meat, low in fruits and vegetables, is a common problem in many developed countries. And this impacts not just human health, but also biodiversity and ecosystems.

Supervised by Prof Simone Borg, I chose an exploratory research design with embedded case studies. The aim was to analyse the dietary patterns of men and women. I wanted to critically question the power relations that feed into socio-economic inequities and lead to particular food choices. I used both quantitative and qualitative methods, modelling the life cycle assessment and scenario emission projections for 2050 in Malta, Brazil, Australia, India, and Zambia among males and females aged 16 to 64.

The four dietary scenarios I took into consideration were present-day consumption patterns (referring to the 2005/7 Food and Agriculture reference scenario), the World Health Organisation (WHO) recommended diet (300g of meat per week and five portions per day of fruit and veg), vegetarian/mediterranean/pescatarian diets, and the vegan diet. From there, I measured ammonia emissions, land use, and water from cradle to farm gate, with a special focus on gender.

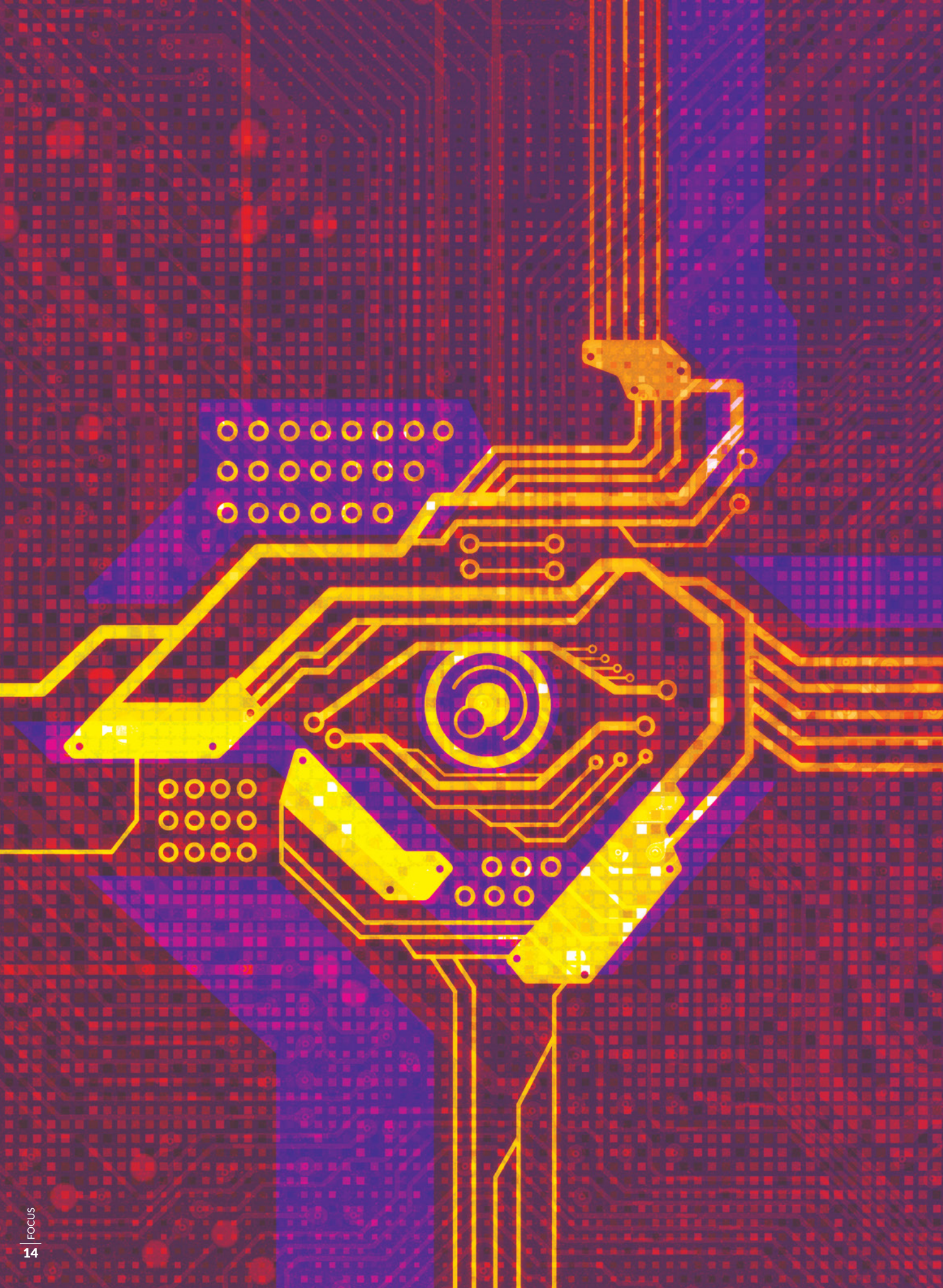
The findings were alarming, indicating that none of the five countries are able to meet emissions reductions under current dietary patterns. If we were to adopt the WHO recommended diet, GHGEs would be cut by 31.2%. A better result would be gained from a vegetarian diet, which would slash emissions by 66%, while a vegan diet comes out on top with a projected 74% reduction.

Some interesting points that arose were that the Global Warming Potential is higher in men in all countries due to higher meat consumption. Zambia and India would benefit the most from the proposed dietary shifts in absolute terms, while Australia, Malta, and Brazil would feel the positive impacts on individual levels in per capita terms, reducing carbon footprints considerably.

> *If we were to adopt the WHO recommended diet, GHGEs would be cut by 31.2%.*

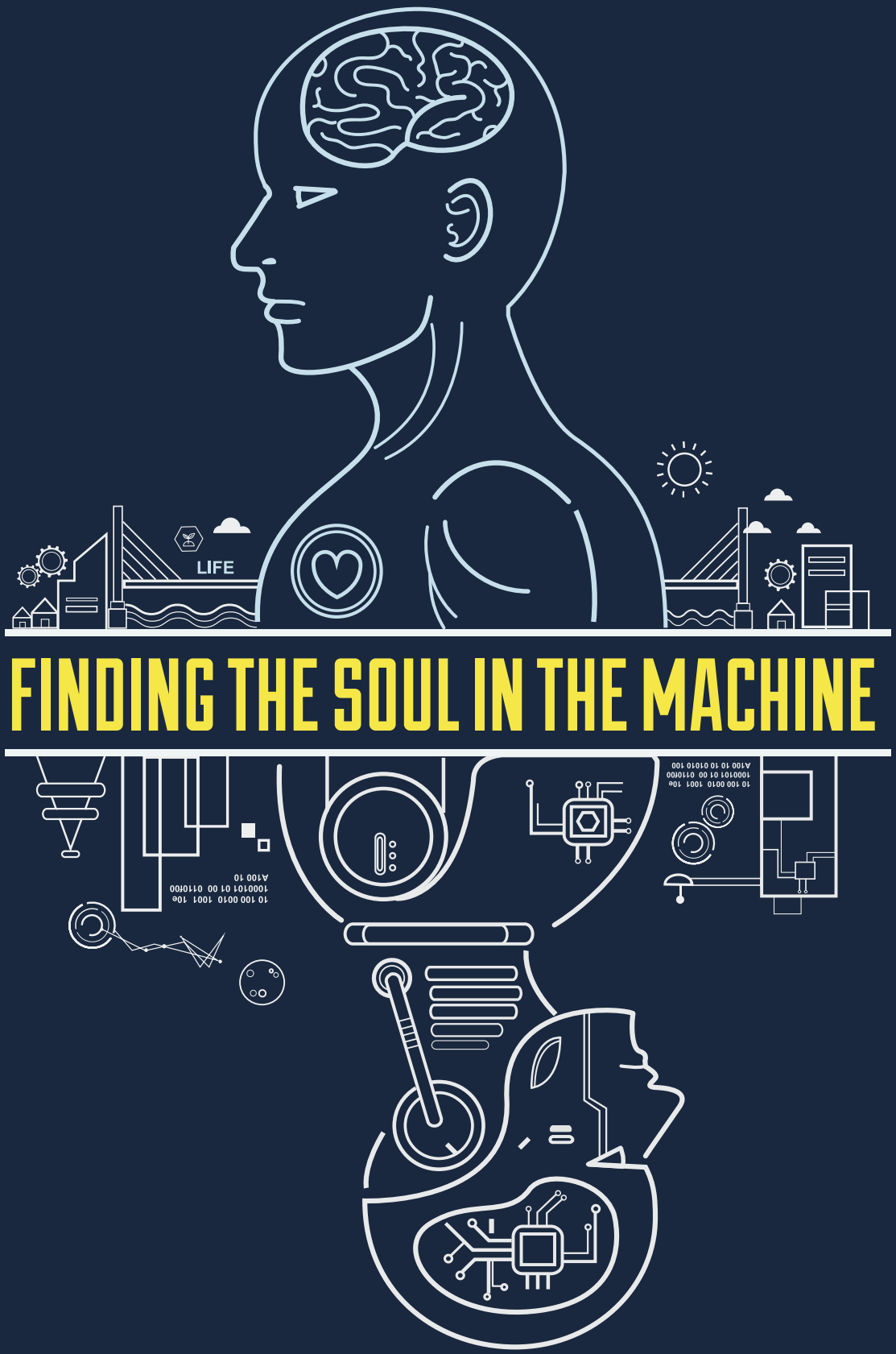
Reduced meat consumption substantially lowers dietary GHG emissions. We need to prospectively consider the interplay of sex and gender, and develop climate change, health, and microeconomic policies for effective intervention and sustainable diets. Adopting a flexitarian diet that is mostly fruits and vegetables, with the occasional consumption of meat, can save lives, the planet, and economies—some food for thought!

This research was carried out as part of a Master of Science (Research) in Climate Change and Sustainable Development at the Institute of Climate Change and Sustainable Development, University of Malta.



TECHNOLOGY

Technology can hurt us but also transform us. It has seen us evolve from fire-wielding societies to hyper-linked communities. Our FOCUS touches on topics derived from researchers at the University of Malta. They talk about the implications of artificial intelligence, genetics, manufacturing, and food.



FINDING THE SOUL IN THE MACHINE

Swiss artist, documentary filmmaker, and researcher ***Dr Adnan Hadzi*** *has recently made Malta his home and can currently be found lecturing in interactive art at the University of Malta. He speaks to* ***Teodor Reljic*** *about how the information technology zeitgeist is spewing up some alarming developments, arguing that art may be our most appropriate bulwark against the onslaught of privacy invasion and the unsavoury aspects of artificial intelligence.*

What does art really 'do'? Right. Let's step back and give this loaded thought a good, proper, well... think. Does art have any other function beyond its simple—and often much-maligned—ability to allow us to escape the humdrum or unpleasant realities of life by offering us an aesthetic transport of some kind? And if we're talking about art on the opposite side of the spectrum—the actively political, the openly provocative—is that stuff not better served by organising protests, by petitioning politicians, by running for office ourselves?

Admittedly, this is a very crude characterisation of what art could potentially be and the kind of force it continues to radiate worldwide. But it's also a handy crucible with which to preface my conversation with Dr Adnan Hadzi, a documentary filmmaker, transmedia artist, and now lecturer on interactive art (Department of Digital Arts, Faculty of Media and Knowledge Sciences, University of Malta).

Hadzi cut his teeth on various art collectives around Europe. In London, he spent a sizeable amount of time in institutions like Goldsmiths University, where he rode a wave of collaboration with new media art collectives which, among other things, seek to eviscerate our relationship with omnipresent and ever-more invasive technology.

What emerges from our conversation is just how much the very assumptions we tend to have about both art and the technological hegemony are in dire need of analysis, dissection, and meditation.

'It's not so much about revealing what's out there,' Hadzi tells me halfway through our chat, 'because I think a lot of what underpins these technologies is actually quite obvious. And it's not even about being provocative per se—which is the first thing that a lot of people mention when they look at some of the work I've documented or done. I think, really, it's simply about creating a space in which these things can be discussed.'

It's a discussion, however, that Hadzi fears we may be having 'far too late, perhaps.' The exponential growth of certain technologies we

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1. ***Delivery for Mr Assange*** **- dual screen view of performance**
2. **Exhibition: reconstruction of Mr Assange's room - outside**
3. **Poster illustrating tracking of parcel during performance**
4. **Exhibition: reconstruction of Mr Assange's room - inside**

Photos by Mancia/Bodmer, FBMstudio

have invited into our lives may already have brought us to a point of no return. But if we stave off the doom and gloom, even for a little bit, we're all likely to find that a better understanding of the evolving nature of the Internet would make us feel that little bit more aware, and that little bit more empowered.

Hadzi's work and research interests continue to fuel this strand of inquiry and creation. In parallel to his research focused on media ethics, Hadzi was a regular at the Deckspace Media Lab. There, he helped coordinate the Deptford.TV project. Together with his subsequent work on the Creeknet Project, Deptford.TV—accessible online—engages with the local community of Deptford in South London by creating an online 'data hub' of sorts.

The initiative's website explains how Deptford.TV 'functions as an open, collaborative system that facilitates artists, filmmakers, researchers, and participants of the workshops to store, share, edit, and redistribute media. The open and collaborative nature of the Deptford.TV project demonstrates a form of shared media practice in two ways: audiences become producers by managing their material, and the system enables contributors to organise their productions and interactions.'

In short, it is a plea for both democratic accessibility of data and a general transparency about how that data is disseminated and consumed, filtered through processes that could be broadly described as new media art.

'I believe that art has a very strong claim on these realities, and can create a very necessary discursive space which is sorely missing,' Hadzi says, bringing up the tragicomic case of how the internal dynamics of complex algorithms—such as those which underpin our financial system—tend to be opaque even to those who operate them.

It is an approach that is pushed to further refinement by one of Deptford.TV's collaborators, the !Mediengruppe Bitnik collective.

Hadzi has limited involvement with the collective, fully crediting the project's founders, Domago Smoljo and Carmen Weisskopf, as its main driving force. Yet his close-to-the-

***Random Darknet Shopper* exhibit**
Photo by !Mediengruppe Bitnik

Goods bought by *Random Darknet Shopper*
Photo by !Mediengruppe Bitnik

Detail: items bought by
Random Darknet Shopper
Photo by !Mediengruppe Bitnik

bone involvement with the group makes him an astute commentator on the implications of their work.

Operating between Zurich and London, the collective has initiated a wide variety of projects, installations, and artistic 'happenings'. All of them share one thing in common: their engagement with contemporary information technologies.

Among the most prominent was certainly *Delivery for Mr Assange*. The live video project documented the journey of a package sent by post to Wikileaks founder Julian Assange, famously exiled within the Ecuadorian embassy's confines in London. Beyond the attention-grabbing effect of featuring Assange himself—'of course this added a political currency to the initiative,' Hadzi says—the main aim of the project was really to delve into notions of privacy. The simple, picaresque journey of the little package, and the small camera that had been snuck into it to stream its travels live on Twitter, successfully undermined the privacy of all involved.

'The postal workers who were filmed wrapping and delivering the package, they have their own private spaces and their own rights too,' Hadzi notes, rights which were compromised by the recording device which captured them as the package headed to its celebrity recipient.

However, Hadzi is also quick to note that the operations of the collective are entirely legal, suggesting that this is somewhat part of the problem. If such a ubiquitous use of surveillance technology is perfectly fine with the authorities, then critiquing it becomes even more urgent.

'Indeed, the collective has very strong ties with media law and ethics experts, and they have fact-checkers in place to ensure that nothing they do crosses any clear legal lines,' Hadzi adds. But the nature of the beast is that these lines tend to be murky. An explicit case is the collective's 2014–2016 experiment, *Random Darknet Shopper*.

As the title already suggests, the project involved a custom-made algorithm sent out into the 'Dark Web' (the Internet's black market) with a budget to purchase stuff at random. As was eventually displayed in an installation based on

We've reached a point, perhaps, where the machines are pretty well-fed; they have enough data to evolve and start talking to each other.

8 12
9
10 11

8. Dr Adnan Hadzi (in front of art work *What Will Fall* by Aidan Celeste)
9. *Boattr* research project
10. Dr Hadzi fixing and operating the boat
11. Kingswood junction, British Waterways
12. iStreet.TV for *Container* project, May Pen, Jamaica
Photos by Natascha Sturny

the intervention at the Kunst Halle Sankt Gallen, Switzerland, a lot of the algorithm's $100 Bitcoin budget went to relatively harmless purchases.

But the randomised system also ended up buying a pack of ten yellow ecstasy pills.

'This of course brings up the question of whether a pre-programmed but randomly operating system can be held responsible for committing crimes,' Hadzi observes. In fact, the artists were eventually cleared of any charges, precisely because the public prosecutor believed that the project raised questions that are of public interest.

The idea of machine learning is an urgent concern for Hadzi and one that he believes should be addressed sooner rather than later.

'We've reached a point, perhaps, where the machines are pretty well-fed; they have enough data to evolve and start talking to each other.'

It may be an alarming point, but it's also yet another argument for art to be allowed to do its work with full autonomy–never averting its gaze from contemporary realities and technological developments, while also refusing to 'ingest' them without questioning their implications.

Now that he's settled in Malta, I find myself asking whether Hadzi deems the island an interesting space from which one can continue to observe these multidisciplinary—and highly topical—intersections.

'Yes, I believe so. One of the main things I find very interesting is how the academic sphere in Malta has made it a point to fuse media studies with the cognitive sciences. I think this particularly pertinent nowadays, when the effect of things like social media on our brains is becoming very much apparent.'

Among other projects, Hadzi also looks forward to helping create an 'immersive pipeline' in Malta, a space for all people to discuss pressing matters related to privacy, surveillance, and artificial intelligence in a welcoming space that acknowledges the problems but doesn't shy away from them.

Being immersed in the heady and uncertain world can do one's head in. Having spent some years operating from a boat on the British Waterways, Hadzi and his partner have just moved from the bustle of Mosta into the comparatively sedate enclosure of Fontana, Gozo, and that feels somewhat relevant to our discussion.

But ignoring these dynamics will not assuage our anxiety. Instead of endless polemics, let's process it through art. T

PUSHING FOR MALTA'S INDUSTRIAL RENAISSANCE

With all the cranes strewn across the Maltese landscape, it appears that the construction industry is one of Malta's primary economic drivers. But there are other, less polluting ways of generating income. ***Dr Ing. Marc Anthony Azzopardi*** *discusses MEMENTO, the high-performance electronics project that could pave the way for a much-needed cultural shift in manufacturing.*

Malta had a booming textile industry. Factories imported denim fabric which people sewed into jeans for relatively little pay. The garments were cheap to make and cheap to sell, and companies raked in the profits. Years later, the economics changed: cost of living on the island shot up and higher wages saw thin profits dwindle. The denim industry died in 2007.

The lesson Malta should have learnt from this is that we need to add more value to the items we develop and produce, in order to make the effort sustainable and profitable. But the same mistakes are being repeated now. The local manufacturing industry is still suffering and underperforming in terms of growth and return on investment. It needs an intellectual renaissance.

This was the starting point for the MEMENTO Project.

Led by Dr Ing. Marc Anthony Azzopardi, the engineering team at the University of Malta created an advanced camera system capable of capturing synchronised high-speed video. It works like a 'time microscope,' allowing engineers, scientists, and enthusiasts to visualise super fast events, analyse them, and learn from them. Anything from ballistic impacts, to lightning bolt propagation, the inner workings of human cellular machinery, crack propagation in fracturing materials, and plasma physics experiments—these microsecond events can all be observed with MEMENTO.

'The system is unusual in that it consists of multiple cameras connected via high-bandwidth fibre-optic links to a central real-time processing hub that also provides them with a precise time reference,' explains Andre Micallef, MST Audio Visual Ltd. director and electronics designer. Going into more detail on the time reference, Azzopardi explains: 'We need precise synchronisation to guarantee correspondence between the frames captured from different cameras—and we own the IP

Third Row (left to right): Jamie Willoughby, Andrew Spiteri, Karl Galea
Second Row: Luke Vassallo, Marc Azzopardi, Reuben Mizzi
Front row: Alec Fenech, Andre Micallef, Andrea Vella, Michael Brockdorff
Absent: Darren Cachia, Roberto Drago

[Intellectual Property Rights].' This is important when the video needs to be processed for 3D video reconstruction of the recorded event, for example.

The MEMENTO camera system can process the footage in real-time and export the raw video stream at full resolution and full frame rate. Applications for this tech are varied. The stream can be used for machine vision, allowing a fast robot to manipulate items around it. We see this in action on factory assembly lines where robot arms rapidly sort through items, discarding defective parts.

Taking things a step further, the fast video stream can be used to mimic human hand-eye coordination—visual servoing. With more cameras and low latency, the system can control complex operations. Think driverless vehicles on the highway, cruise missile control, satellite rendezvous operations, or keeping supersonic trains like the Hyperloop on track while levitating magnetically.

Some might say that the team has set its sights on lofty goals, but Azzopardi stands firm. Fully aware of the strengths and limitations of the Maltese context, the industry, and the University's R&D setting, the team chose its target market segment carefully—speciality electronics—to ensure that the system is commercially competitive, while being environmentally sustainable and holistically beneficial to the local economy.

'Engineers strongly influence the direction that their industries take and must therefore act responsibly. Our country is suffering under some heavy industries that do not generate enough income in relation to the environmental impact and the number of people they employ,' says Azzopardi, pointing a finger at the construction industry.

'Malta is also small. Other heavy industries like oil refining, metal smelting, or nuclear reprocessing cannot be accommodated without jeopardising all our lives in the process. We need to generate value by putting our minds to things rather than risking polluting everything we have. However, we also need to move away from producing items and services that are based on foreign IP, because that saps away from the value that can be added to our local economy,' he adds.

With MEMENTO the focus is on producing high-end, high-value, and low-volume products built on a protected local IP and considerably more unpublished knowhow. 'These kinds of products require extensive advanced engineering—highly trained minds—but relatively little in raw materials,' Azzopardi notes.

'We want to add €10,000 of locally generated intellectual value to every €1,000 of imported materials, and not the other way around, because that is the only way we can sustain good salaries in the future, without trashing the beautiful country we want to live in,' adds Azzopardi. 'That kind of decision must be taken at the project planning stage. MEMENTO is our first contribution in this direction—and won't be the last.'

MEMENTO is a consortium between UM and MST Audio Visual Ltd. It secured close to €200,000 of funding, covering a three year period of intense development, from the Malta Council for Science & Technology through FUSION: The R&I Technology Development Programme.

ANALYSING THE BUILDING BLOCKS:

GENE SEQUENCING FOR DISEASE TREATMENT

A staggering amount of diseases can be traced back to a genetic cause. ***Dr Rosienne Farrugia*** *talks to* **THINK** *about her team's efforts to use genome sequencing to eventually secure timely treatment for some very serious conditions.*

Being able to plan ahead is crucial in the field of medicine. Think of all the debilitating (and potentially life-threatening) diseases that can be nipped in the bud with a full, time-sensitive analysis. As it happens, a Maltese team of researchers have been leading the way in high-throughput sequencing (HTS), which can shed light on the true causes of some prevailing ailments.

Using HTS, researchers can read a person's entire DNA sequence and identify differences in the code which may be the cause of diseases.

Through their decade-long research, geneticist Dr Rosienne Farrugia, her colleague Dr Stephanie Bezzina Wettinger, and their team of students have been looking at ways to tackle 15 different diseases using HTS technology. Should the work proceed as planned, the results could be life-changing for many.

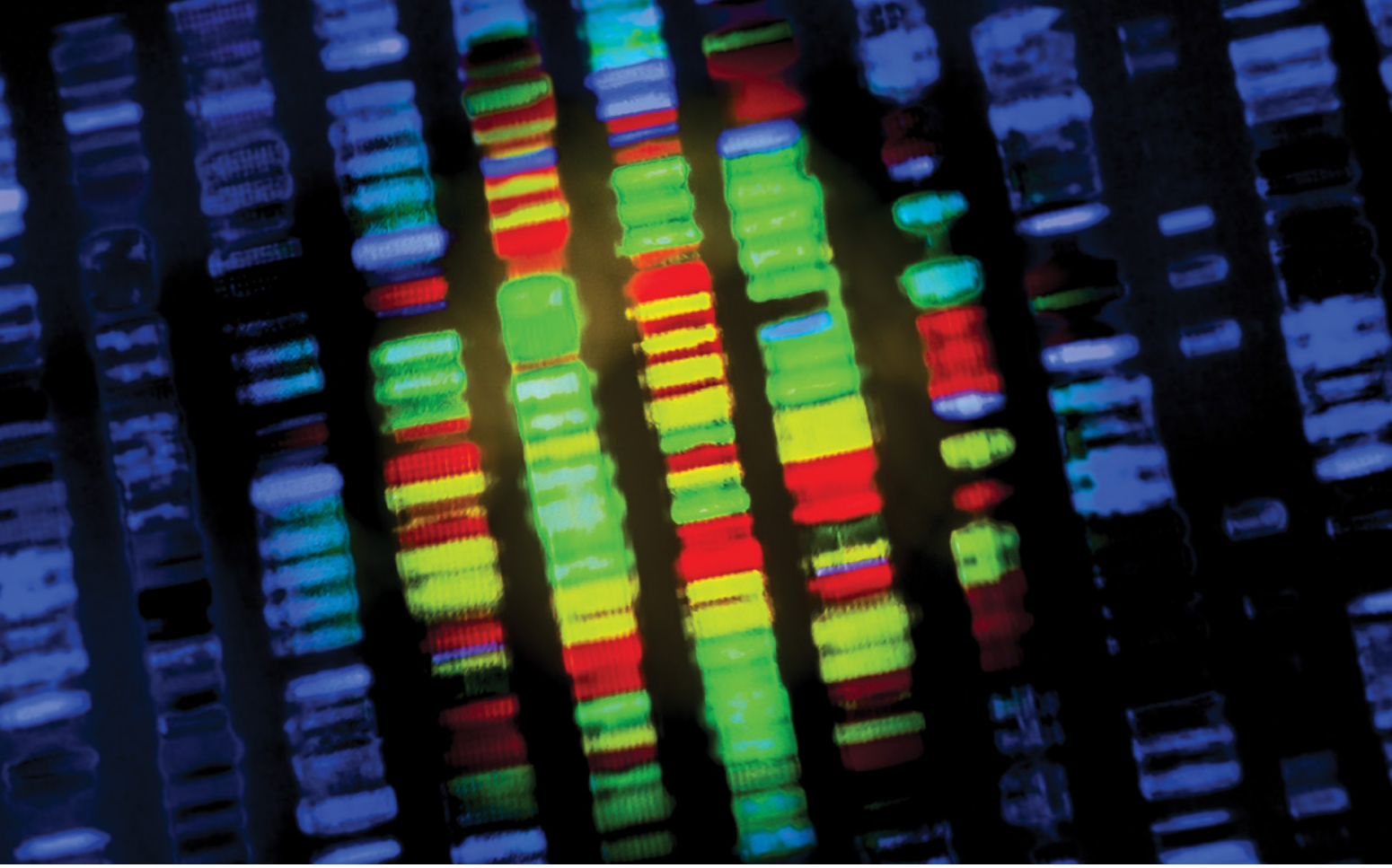
NEEDLE IN A HAYSTACK

The Maltese population is genetically unique. 'We have atypical genetic variants and a particular population structure owing to founder effects followed by an exponential population expansion that started 500 years ago,' says Farrugia. Founder effects happen when a new population is established by a very small number of individuals. When this population expands, some rare genetic variants become over-represented, whilst others are completely missing. This has resulted in the Maltese population being burdened with some rare conditions, such as atypical phenylketonuria, a serious hereditary disease.

Farrugia and her lab have been engaged in identifying the causes of a particular disorder called polycystic kidney disease (PKD). This is a renal disorder that affects millions across the globe, causing an accumulation of kidney cysts which lead to kidney shutdown and the need for lifelong dialysis. Honing in on a number of Maltese families that suffer from the disease, Farrugia and her team have analysed their DNA, using HTS to identify a novel mutation that has been causing the disease. Understanding the genetic cause for such a disorder in a family will allow the team to run tests on family members before symptoms arise so as to find out who can benefit from potential new treatments that would delay the disease.

Parkinson's disease is another condition the research team is investigating. So far, they have pinpointed a unique genetic variant: *LRRK2* p.N618S. This variant appears to increase the risk for Parkinson's disease and seems to be unique to the Maltese population. Previous work coordinated by Bezzina Wettinger also

This has resulted in the Maltese population being burdened with some rare conditions, such as atypical phenylketonuria, a serious hereditary disease.



DNA sequencing

identified *LRRK2* p.G2019S—a different pathogenic mutation that is known to cause Parkinson's disease. But what does this mean in practice? As it turns out, the discovery can help with diagnosis.

'Testing individuals for the *LRRK2* p.G2019S variant could help doctors and patients determine whether the genetic defect is present,' says Farrugia. This said, Parkinson's disease is a complex disorder; the result of environmental and genetic interaction where variants may be present in a number of genes. To date, the genetic cause in many patients remains unknown and testing is inconclusive. As work progresses, the team will be able to identify more variants, with patients benefiting from better testing. In a few years, all we will need is a single test—one experiment that will sequence all the patient's genes. 'We are currently recruiting young individuals who have Parkinson's disease to get this work started,' says Farrugia.

Idiopathic hypogonadotropic hypogonadism (IHH) is a condition that blocks sexual maturation and has also attracted the attention of the lab. The condition can result in infertility, leaving the patient bereft of secondary sexual characteristics. In collaboration with local endocrinologists, the team plans to recruit all known Maltese patients with this condition to find out the local genetic causes. 'IHH research is still at an early stage. So far, we identified candidate genetic variants, but none of them completely explain the clinical picture. We need more time to find the more elusive causes,' asserts Farrugia.

KNOWLEDGE IS MORE THAN POWER

What Farrugia stressed repeatedly during our talk is the far-reaching potential applications of her team's research, and its ability to change people's lives for the better.

Her passion for this type of research developed many years ago when reading for her MPhil. Back in the late 1990s, she was investigating the genetic cause of two rare diseases that led to severe neurological degeneration and cerebral palsy. Her results showed that both were metabolic conditions that could be treated through dietary control and daily medication. Amazingly, early treatment and strict compliance led to normal development and a vastly improved quality of life.

The first stage of this process—making the leap from speculation to reality—involves translating the genetic and biological findings into practical medical applications. It is a process whose initial stages are currently being put into practice by the Department of Applied Biomedical Science at the University of Malta. Farrugia concedes that real breakthroughs only occur when the research gives way to usable medical solutions, and this is why 'understanding the genetics

Dr Rosienne Farrugia
Photo by James Moffett

'Dopamine was given to wheelchair-bound paralysed children, and an hour later, they were walking again!'

thoroughly is so important,' she says. 'It underpins the treatment and development of the right drugs.'

That is not to say that the scene out there is a total drought; certain treatments are already available and can be repurposed for other conditions provided the genetic defect and the pathway it disrupts are spotted through the intelligent analysis of gene sequencing technology.

Farrugia cites a striking example in which patients had been told that they would spend their entire lives in a wheelchair until a specialist neurologist suggested a dopamine trial, dopamine being a natural chemical needed for brain cells to transmit messages. 'Dopamine was given to wheelchair-bound paralysed children, and an hour later, they were walking again!' Farrugia's research into the genetic causes of the disease will help diagnose other children before they become wheelchair bound.

'Genetic analysis of the patients' genes singled out a common defect in all of them: a severe loss-of-function mutation in a key enzyme in dopamine synthesis,' Farrugia says. These individuals had a genetic defect that made them unable to produce dopamine. 'This means that now individuals at risk can be genetically tested at birth and treated earlier, avoiding the irreversible effects if the disease is identified late.'

STRENGTH IN NUMBERS

Genomic data is bulky. All of a person's genes contain enough data to fill several DVDs. Processing all of this data requires a lot of time and effort. Time and effort that is far beyond what any one individual can realistically manage. It requires nothing short of an entire bioinformatics *workforce*, so to speak.

Thanks to TrainMALTA, an EU funded H2020 Twinning Grant, Maltese scientists are being trained in bioinformatics and the use of model systems (by the University of Cambridge and Katholieke Universiteit Leuven) for the analysis and validation of high-throughput sequencing data. All of this will hopefully lead to concrete treatments for patients.

FUTURE CHALLENGES

So what's the next step? Farrugia is quick to emphasise that a lot more needs to be done. They need to do more exploratory work into further fields, and set up the necessary structures that will see this research area flourish.

According to Farrugia, there needs to be a focus on bioinformatics, a specialised field that underpins all biological research that generates big data sets. For genomics research to achieve its maximum potential, bioinformatics has to grow and develop in parallel. And this is only possible if one adopts a 'triangulated' approach between researchers from various disciplines—a collaboration between life scientists, bioinformaticians, and statisticians—to ensure that the most is made out of this rich field, and that data is analysed in a timely and accurate manner.


What's lurking on your lunch?

In our modern, fast-paced lives, more of us are turning to convenient ready-to-eat meals. But with short shelf lives and high demand, food safety tests just aren't quick enough anymore. ***Dr Sholeem Griffin*** *tells* ***Becky Catrin Jones*** *how an innovative collaboration between microbiology and computing is tackling this challenge.*

Let's be honest: very few of us make our lunch from scratch every single day. Although meal prepping trends are slowly catching on, bags of ready-to-eat salad, dips, and cheeses remain very tempting—especially when they can stop you from consuming last week's lasagne. Such convenient healthy choices mean that we don't need to think as hard about what's going into our lunchbox. But is this food-on-the-move culture really as healthy as it seems?

As with all perishables, bacteria and fungi will slowly multiply on your food long before you actually see anything 'growing' on them. With most things, this can be controlled at production thanks to batch testing which screens for any pathogens that could develop into bigger problems later on. This happens with ready-to-eat foods too; the trouble is that turn-around on the results cannot keep up with production. The way these tests are conducted in pre-packed foods also differs—assessing batches rather than individual items. This means that foods are often already in our shops and fridges when a problem is identified. In these cases, suppliers have to recall the items, resulting in both angry customers and serious fiscal repercussions.

The need to speed up this analytic and laborious microbial process is clear. But if culture tests performed in food safety checks aren't quite making the cut, what else can be done?

Biomedical engineers Dr Owen Falzon and Prof. Kenneth Camilleri, and quantitative microbiologist Prof Vasilis Valdramidis from the University of Malta are working with local dairy product producer Farm Fresh Ltd. on a new method of online testing. Rather than waiting a week for bacterial culture results, why not determine what might be growing on the food right now? Their idea combines a novel imaging technique with new algorithms to produce a real-time map of any bacterial or fungal growth. This is possible through a technology known as hyperspectral imaging.

Hyperspectral cameras and the DSLR you take on holiday work similarly, making use of light at different wavelengths to produce a picture. While your camera can only pick up what your own eyes can see, visible light with wavelengths between 450 and 700 nanometers (nm), hyperspectral imaging can record a far wider range. This means that visual and infrared light can all be picked up by the same system. Microbes, the common term for all bacteria or fungi that grow on our food, can reflect light at these higher wavelengths. By scanning the products with this light, one should be able to see exactly where the microbes are.

With this idea and some funding support from MCST, Falzon and Valdramidis identified a capable young scientist who was up for the challenge. Dr Sholeem Griffin was on the lookout for a project that would bring her a wealth of

From left to right: Dr Owen Falzon, Prof. Ing. Kenneth P Camilleri, Dr Sholeem Griffin, Prof. Vasilis Valdramidis
Photo by James Moffett

new skills. 'I started looking for postdocs in Malta. When this one came up it really appealed to me, and luckily I got it!' she says.

Griffin's PhD was in immunology and metabolism, studying infertile dairy cows and ways to encourage milk production. With a background in general microbiology and molecular techniques, she was keen to undertake a project that would combine this experience with the opportunity to learn more about coding and high-performance bioinformatics—both essential expertise for a future life scientist.

When starting a new project, it is critical to get a good grasp of the field by spending some time reading literature on the topic. Griffin thought she would have at least a week or two after arriving in Malta to get the required reading under her belt and get going. But reality trumped expectations in this case. 'When I arrived, my first instruction was to learn how to make *ġbejna*,' Griffin recalls with a smile. 'So I spent the first few weeks making cheese, feeding it to people and getting them to compare it to shop-bought *ġbejna* to work out whether I was on the right track. It was good fun!'

And so the food microbiology lab at the Faculty of Health Sciences at Mater Dei turned into a mini cheese-production plant where Griffin tried to work out a way to make reproducible cheese in a sterile environment. Making *ġbejna* takes around two days, and the cheese can then be matured for as long as desired for it to acquire its unique flavour. Unpasteurised milk is combined with rennet and bacteria called lactobacilli. With some mixing and incubating, these combine to make curds, paving the way for the cheese. This mixture is then potted in small slotted cups and left to drain for around 24 hours. Cheeselets

Their idea combines a novel imaging technique with a high-power computer and new algorithms to produce a real-time map of any bacterial or fungal growth.

The Maltese cheeselet inspected for microbes using hyperspectral imaging
Photo by Dr Sholeem Griffin

are given another 24 hours to dry, and can then be used for study.

But if the cheese is produced in a sterile lab, surely we shouldn't see any microbial growth? 'The important thing to note is that *ġbejna* is made from unpasteurised milk,' highlights Griffin. 'The milk is not sterile, so no matter what conditions the cheeselet is kept in, things will start cropping up after about a week.'

When this happens, the cheese can be scanned using the hyperspectral imaging techniques. Light emission is recorded from all around the item and combined so as to give as much information as possible. The aim is to differentiate clean from contaminated cheese, and then identify which organism might be causing the problem. Scanning in this way produces masses of data which needs to be collected and sorted into a format that is easier to understand. This is where the coding comes in.

Griffin and Falzon are developing algorithms to analyse the data, turning a mass of numbers into a much more consumable format. These algorithms can be adapted based on the subject food and can account for the presence of bacteria that we know belongs on the cheese. 'There's no use flagging up lactobacilli for example, when without it we wouldn't get cheese production in the first place!' says Griffin.

The plan is to have these readings translated in real time and use them to spot any differences while each cheeselet is being scanned. However at such an early stage in the project, the main challenge for Griffin is understanding how to write code specific to the question at hand: 'My greatest achievement at the end of the project will be to look back and say that I have conquered some coding,' Griffin notes.

Hyperspectral imaging is not a foreign concept to food production industries; it is already used to distinguish tainted from edible fruits and to highlight any damaged areas during processing. Applying this on a microscopic level is what's new and exciting. But what makes this project really unique is the complex algorithms that are written to make sense of all this data. 'The collaboration between IT and life sciences is still not commonplace,' Griffin remarks. 'Projects like this provide the opportunity for young scientists to learn and move with the changing climate.'

It's still early days and this project has a long way to go before mass food production can be revolutionised by hyperspectral imaging. But with such a sound theory and an enthusiastic collaboration between (micro)biology and computing, it's hard to imagine that we won't all be scanning our salads for unwanted colonies in the near future.

Samson carrying the gate of Gaza
Photo by Jim Haberman

THE BIBLE IN STONE

EXCAVATIONS OF AN ANCIENT SYNAGOGUE AT HUQOQ, ISRAEL

Buried inside an unassuming hill in Israel's Lower Galilee is a magnificent ancient synagogue with splendid mosaic panels that have been hidden away for over 1,600 years. ***Dr Dennis Mizzi*** *writes about the project that is bringing them to light.*

Huqoq is an unimpressive place for most. But the agricultural village has held its own since biblical times, some saying it was nestled at the very heart of Jesus's Galilean ministry. In 2011, Prof. Jodi Magness (University of North Carolina at Chapel Hill) set her sights on the village for excavation. The visible remains scattered among the surface rubble, the accessibility of the site, and the fact that it had never yet been excavated made this a prime location. But when the digging started and long-lost treasures were unearthed—intricate mosaics, pottery, coins—a slew of crucial questions also arose. Questions that would revolutionise the study of ancient Judaism and of Jewish-Christian relations in antiquity.

Originally, our team set out to answer a humble, but highly loaded, question: when did monumental synagogues of the so-called 'Galilean' type emerge in Palestine? Traditionally, synagogue buildings were divided into three major architectural types, with 'Galilean' synagogues considered to be the oldest. Boasting a basilica plan with three aisles and a nave, these types of structures were often classified by experts as dating back to the second and third centuries CE. Architectural parallels with Roman temples in Syria and Asia Minor reinforced this notion. But hard evidence on the ground suggests otherwise.

Time and again project director Magness has called for a revision of synagogue chronology, but deeply entrenched ideas are hard to let go of in the highly contentious field of biblical archaeology.

In this specific case, the challenge to traditional chronology has serious ramifications for the understanding of Jewish-Christian relations in late antiquity. The excavations at

Volunteers hauling rock from excavation
Photo by Jim Haberman

Dr Dennis Mizzi

Prof. Jodi Magness

Passing sandbags
Photo by Jim Haberman

'The mosaics decorating the floor of the Huqoq synagogue revolutionise our understanding of Judaism in this period,' says Magness.

Huqoq sought to shed light on this issue of chronology—but then, the discovery of mosaics gave the project a new dimension altogether.

THE SITE

Huqoq's story starts several millennia ago. Archaeology and literary sources show that the site was inhabited as early as the Bronze Age, with subsequent occupations in the Iron Age, the Persian, Hellenistic, Roman, Byzantine, Islamic, Medieval, and Ottoman periods, as well as during the British Mandate of Palestine.

The synagogue itself was buried under 1,600 years of history—literally! The building was abandoned, but it is unclear when this happened or why. But while it lay derelict, life in the adjacent village at Huqoq—parts of which have been exposed in our excavations—went on. Then, between the twelfth and thirteenth century, a large monumental building was constructed a metre above the synagogue, reusing some of its walls. This building fell into disuse over centuries until eventually, a thick layer of fill accumulated across the entire area, burying the building. In the eighteenth and nineteenth centuries, the resultant open space was used for cooking, and it was characterised by numerous tabuns (bread ovens) and fills of ash. This occupation layer

was sealed by the modern village of Yakuk, which was established in the late nineteenth and early twentieth century, destroyed by fire in 1948, and then bulldozed in the 1960s. In the early 2000s, the mound of rubble from the demolished village was the most distinguishable feature on the surface.

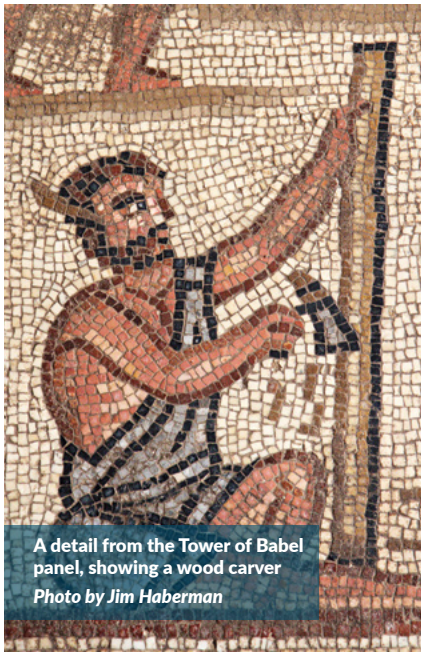
But, readers may ask, how did we know that there was an ancient synagogue of the Galilean type here? Partly, this was deduced from the scattered architectural remains on the surface. By the end of the very first season, the team had unearthed a few nicely cut stone blocks which proved to belong to the eastern wall of the synagogue.

Excavations in subsequent years also confirmed Magness's thesis: despite the fact that the Huqoq synagogue was of the Galilean type, pottery and C-14 dating indicated, in no uncertain terms, that it could not have been constructed before the fifth century.

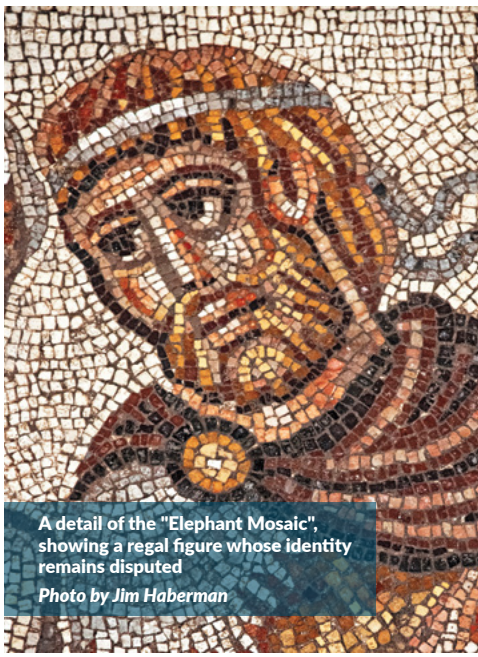
AND THEN, THERE WERE THE MOSAICS...

The discovery of mosaics was unexpected, albeit not completely surprising. We knew that the synagogue was paved with a mosaic floor because of the hundreds of loose tesserae collected as we were going down. But finding loose tesserae is never a good thing! It means that the floor they belonged to has been heavily damaged, if not completely destroyed. So it was rather exhilarating when one fine day in June of 2012, one of the field-school students scraped the hard surface of a mosaic still in situ. Staring straight at him was a face that hadn't seen the light of day in centuries! Since then, summer after summer, the team has exposed one stunning mosaic after another. In contrast to other sites with similar features, the Huqoq mosaics stand out because of their rich, diverse, and exceptional visual content.

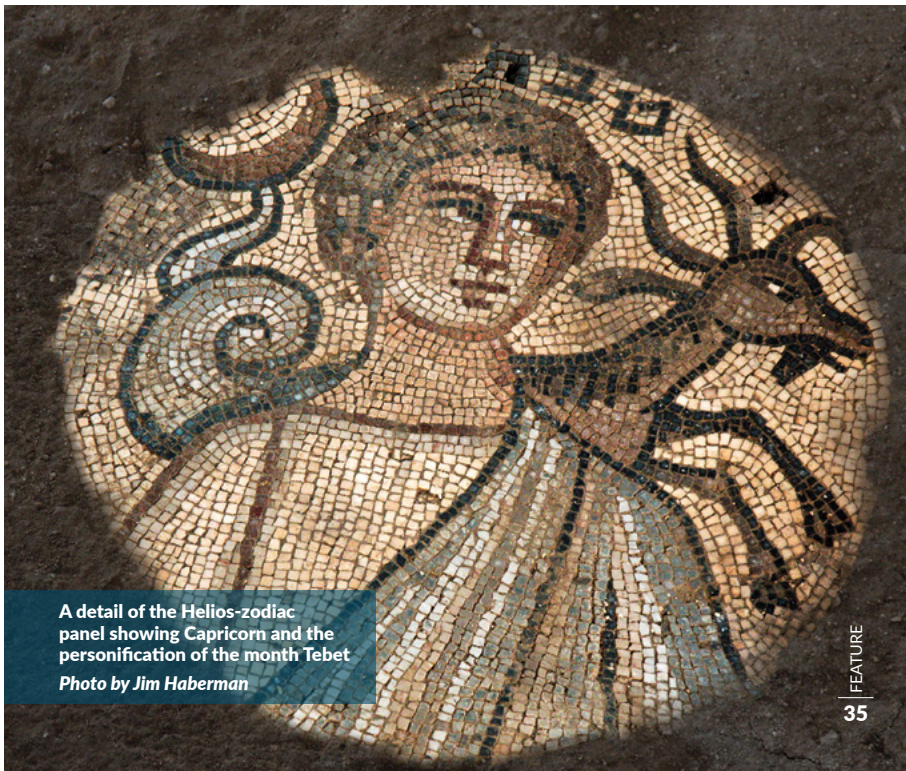
One of the field-school students at work
Photo by Jim Haberman



A detail from the Tower of Babel panel, showing a wood carver
Photo by Jim Haberman



A detail of the "Elephant Mosaic", showing a regal figure whose identity remains disputed
Photo by Jim Haberman



A detail of the Helios-zodiac panel showing Capricorn and the personification of the month Tebet
Photo by Jim Haberman

Right:
Aerial view of the Huqoq synagogue

Right, opposite page:
Plan view of the Huqoq synagogue

Photos by Griffin Aerial Imaging

So far, we have excavated approximately two thirds of the synagogue, and it will take up to three or four more years to complete its exposure.

Many of the panels portray episodes (or variations thereof) taken directly from the pages of the Bible, including the story of Noah's ark (Genesis 6–9), the Tower of Babel (Genesis 11), the drowning of Pharaoh's soldiers in the Sea of Reeds (Exodus 14–15), the sending of the spies into Canaan (Numbers 13), Jonah and the fish (Jonah 1–2), as well as a representation of the eschatological prophecy in Isaiah 11:6, accompanied by an inscription reading 'a small child shall lead them.' These scenes are extremely rare or completely unique in the setting of ancient synagogues. In addition, there is one panel—what we have dubbed the 'elephant mosaic'—which has now become synonymous with the project owing to its exceptional quality and elusive nature. There is a strong probability that this panel depicts a non-biblical episode, which would be a first for synagogue mosaics.

'The mosaics decorating the floor of the Huqoq synagogue revolutionise our understanding of Judaism in this period,' says Magness. 'Ancient Jewish art is often thought to be aniconic, or lacking images. But these mosaics, colourful and filled with figured scenes, attest to a rich visual culture as well as to the dynamism and diversity of Judaism in the Late Roman and Byzantine periods.'

The Huqoq mosaics also shed light on a vibrant Judaism that was not afraid to borrow ideas and motifs from the surrounding Graeco-Roman culture. As Magness notes, 'one of the distinguishing features of the Huqoq mosaics is the incorporation of numerous classical (Graeco-Roman) elements such as putti, winged personifications of the seasons, and—in the Jonah scene—harpies (large birds with female heads and torsos representing storm winds).' There are several indications that the artistic programme was influenced by macro-regional trends, and there are evident links with far away centres such as Antioch. The fact is that Jews borrowed motifs from the Graeco-Roman world and made them their own, much like Christians did when they started to represent Jesus. In the current politically charged climate, where 'foreignness' is perceived as a serious threat to European and local identity, this is a stark reminder of the fallacy of cultural purity.

The mosaics also help us unearth long-lost traditions and appreciate the fact that the past comes to us highly filtered. Some of the biblical scenes, for example, depict a variation of the biblical

episodes that reach us today, indicating the circulation of supplementary traditions. The panel of Jonah shows him being swallowed not by one, but by three fish! This actually reflects an interpretative tradition which plays creatively with the original Hebrew text. Before Huqoq, the earliest attestation of this tradition was in some Jewish and Islamic medieval manuscripts. Our discovery demonstrates that it was already in circulation in the fifth and sixth centuries, and it was popular enough to find itself depicted on a costly mosaic floor.

In the end, the richness of the mosaic programme and the monumental nature of the synagogue show that the notion of a declining Jewish population suffering under the oppression of Christian rule is inaccurate. Jews actually flourished in the Byzantine period.

THE ROAD AHEAD

Archaeology is a destructive science, and so the responsible practice is usually to leave a substantial part of the site unexcavated, so that future archaeologists with better techniques and technology can test the original results. This was our plan as well. But the mosaics changed everything.

As Magness explains, 'once we discovered the first mosaics in 2012, it became clear we had to uncover the entire building, as leaving parts unexcavated would have immediately attracted other archaeologists looking for spectacular mosaics, thereby defeating the purpose of leaving it for future generations.'

So far, we have excavated approximately two thirds of the synagogue, and it will take up to three or four more years to complete its exposure. After that, our hope is that the site will be developed for tourism by the Israeli government.

Huqoq serves as a pointed reminder of the colourful nature of society, past and present. Many often assume that Judaism was a monolithic entity in antiquity. This includes scholars, many of whom are influenced by rabbinic texts, which are, of course, biased and selective. But synagogues like the one at Huqoq are recovering alternative Jewish voices and counter narratives. This is why we cannot emphasise enough the importance of our archaeological findings. The site invites us to challenge the notion of monolithic identities, to refute sweeping statements, and to never accept what we are told, or what we read, uncritically. T

SMALL ISLANDS, **BIG RESEARCH**

Small island developing states are vulnerable and need unique solutions to overcome the hazards of climate change. ***Dr Stefano Moncada*** *writes about research which tries to find the right answers to a complex problem.*

There are 52 small island developing states (SIDS) in the world, of which 38 are members of the United Nations. While they may differ in many ways, these countries also share certain features that distinguish them from other country groups. Most of their socio-economic activity is centred around bustling coasts and is reliant on ocean resources. This makes their fragile, smaller markets vulnerable to extreme weather and climatic shocks.

We rarely hear about SIDS in the mainstream media. We mostly encounter them on those list articles that rank '20 places you HAVE TO visit before you die.' Vanuatu, Fiji, Mauritius, Maldives, Jamaica; you were probably day-dreaming about one of these before coming across this article. Sadly though, their beauty, much romanticised, is increasingly at risk. Their high degree of vulnerability and exposure to external shocks is severely impacting people's livelihoods, challenging existing infrastructure, and making everything relatively more expensive when compared to larger states. With climate change, SIDS are experiencing a further layer of complexity which poses a threat to their very existence. Some islands simply cannot cope with extreme weather events; others are slowly disappearing due to rising sea levels.

Our research tries to understand these problems and find solutions.

Our team investigates the links between climate change and development in SIDS. We identify climate impacts and try to understand how communities react to them. We question existing policies: do they provide adequate support, helping countries to become more resilient and to bounce back while increasing their standards of living; or do these policies actually hinder this? We also consider remote and isolated communities, often neglected by other researchers, and assess if indigenous knowledge could provide sustainable, context-specific solutions. All this work has culminated in the publication of a special issue of the *International Journal of Climate Change Strategies and Management* on the theme of 'Climate Change and Development in Small Island Developing States.' The aim of this publication was not only to contribute to the academic debate, but to also inform policy and provide guidance to governments when faced with choices in SIDS.

TAKEAWAYS

The special issue contains contributions from experts around the world.

Sociologist Godfrey Baldacchino points to some of the problems that arise when climate change impacts are based on a Western understanding of what 'the future' means. What the 'future' looks like in a rich Western country is often very different from that of a developing country. This is perhaps amplified further in SIDS, where the adoption of outsider-imposed plans, concepts, and priorities to address local concerns on climate change can waste time and effort.

Geographer Aideen Foley reiterates the importance of made-to-measure solutions in reference to climate impact assessment methods. She believes that these systems need to be better adapted to the size, boundedness, and isolation of many SIDS. Systems applied at

In a world of instant everything, patience and the ability to build on incremental knowledge has never been more important.

broader scales cannot simply be downscaled to island settings.

Adding to this, Patrick Nunn and Roselyn Kumar investigate operationalising interventions capable of ensuring effective and sustainable livelihoods. They propose harnessing the comparatively high degrees of social coherence, closeness to nature, and spirituality present in island societies.

Bioanthropologist Hilary Bambrick also presents alternatives to resource extraction and options for climate compatible development in the Pacific. This would be based on harvesting local knowledge to promote community and nature-based solutions. Knowledge can come in all forms and the merging of science and indigenous knowledge is important to raise awareness and enhance perception of climate change in island communities.

Picking up on the need to communicate effectively with a local audience, Stuart Capstick, Sarah Hemstock, and Helene Jacot des Combes examine the role of the visual arts in communicating the effects of environmental change in SIDS. In their view, different tools, such as storytelling, are needed to engage with communities and these should be integrated into formal educational and vocational training.

The reality is that the perception of the threat that comes with climate change varies from person to person. Rory Walshe, Adam Bumpus, Joelle Auffray, and Denis Chang Seng argue that the difference in perceptions on climate change issues, solutions, personal vulnerability, and the comprehension of science can help to tailor policies and solutions.

Of course, other countries have contributed to our present reality. International political theorist Milla Vaha explores how climate justice literature addresses the concerns of SIDS losing their land from the perspective of potential relocation. Do SIDS actually have legitimate rights-claims towards the international community? Two endangered states, like Kiribati and the Maldives, identified New Zealand and Sri Lanka respectively

Dr Stefano Moncada
Photo by James Moffett

Coastal erosion in tourist beaches of Mauritius
Photo by Dr Stefano Moncada

Dr Moncada conducting participatory focus groups with coastal communities in the Mauritius
Photo by Dr Stefano Moncada

as potential new homelands. Vaha investigates the responsibilities involved in these hypothetical proposed scenarios, suggesting that there is a complex relationship between the potential hosts and the relocating communities which cannot be ignored. Doing so could lead to extreme hardships and loss of human life.

BACK TO BASICS

Our findings show that what we know is still relatively too scarce. However, a promising stream of research is demonstrating how nature can become a strong ally in the battle against climate change. Soft responses and nature-based solutions, such as change in crop types, managing land use changes more sustainably, and replanting mangroves can promote better climate change adaptation and increase the livelihoods of coastal communities. As Duvat writes: 'Nature still works.'

Big engineering projects such as sea walls or break waters are not always the best possible solutions. Such projects have also been labelled 'a quick solution to an acute problem.' While support and donors can be attracted to such visible projects, excited by the 'cutting the ribbon' effect, we need to foster an element of patience that will see us reaping the rewards of effective long-term projects. In a world of instant everything, patience and the ability to build on incremental knowledge has never been more important.

The University of Malta, with its Islands and Small States Institute, the Institute for European Studies, and the Climate Change Platform, is at the forefront of international research on climate change in SIDS, leading international publications, research projects, and promoting agreements with universities and research centres, in Europe and in SIDS, to strengthen networks, advise institutions, and promote the exchange of best practices. Get involved in our work and in touch through social media [Facebook *@um.ccplatform*; Twitter *@umccplatform*] or send us an email at *ccp.research@um.edu.mt*.

Read more:
'Climate Change and Development in Small Island Developing States', *Journal of Climate Change Strategies and Management*. Website: *www.emeraldinsight.com/toc/ijccsm/10/2*

Duvat V.K.E., Salvat B., and Salmon C., 'Drivers of shoreline change in French Pacific Atoll Reef Islands', *Global and Planetary Change*, 158, 2017, pp. 134-154.

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PROTECTING PRISONERS FROM RADICALISATION

Curbing extremism and violence is high on the global agenda. With prisons known to be a breeding ground for recruiters, are we doing enough to protect our inmates? ***Michela Scalpello*** *writes.*

This year, on the afternoon of May 29, Benjamin Herman went on a rampage in Liège, Belgium. He stabbed two female police officers, then shot them dead with their own guns, before killing another civilian. Claims from the Islamic State's propaganda agency said that Herman was a 'soldier of the caliphate.' Speaking to the media, federal magistrate Wenke Roggen said the attack was considered a 'terrorist murder and attempted terrorist murder.'

Amidst the outpouring of grief for the tragic loss of three innocent people, was an outcry—why was Herman granted leave from prison? How did no one realise something was wrong?

Prisons are known to be breeding grounds for radicalised violent extremism. Their populations are vulnerable and susceptible to influence, with little to no family ties and support networks. They're often also marginalised, burdened with identity issues and psychosocial problems. The prison environment can exacerbate a personal crisis and a search for meaning and identity, opening a window for those recruiting people into extremist causes. At the University of Malta, prison volunteer Dr Joseph Giordmaina (Prison Education and Re-Entry Programme, Faculty of Education) and former probation officer Dr Trevor Calafato (Department of Criminology) are working on a project dedicated to fighting the spread of extremist ideologies among inmates.

Funded by the European Union, the FAIR (Fighting Against Inmates' Radicalisation) project wants to educate prison operators, as well

Dr Joseph Giordmaina
Photo by Dr Trevor Calafato

Dr Trevor Calafato
Photo by Michela Scalpello

Michela Scalpello
Photo by Dr Trevor Calafato

as inmates, on the concept of radicalisation within a European setting. While at the Corradino Correctional Facility, as in Malta in general, radicalisation is not a big issue, the power of knowledge should never be dismissed. FAIR uses education as its weapon of choice, making people aware of the warning signs before something regrettable happens.

Giordmaina's interest in education as part of inmate resettlement, intertwined with Calafato's knowledge of the criminal justice system, saw them focusing on terrorism and security studies to contribute to a solution that will address the realities of radicalisation. Many are quick to judge inmates; 'Lock them up and throw away the key!' they say. But this attitude, and the isolation it results in, is what leads to terrible consequences in the first place.

With this philosophy firmly in mind, the team sought to put together a training manual outlining an innovative and eclectic approach for prison operators. The manuals that are currently available do not do this, and prison staff often admit that they do not feel competent enough to deal with radical views and radicalisation. Tempering this major security risk has been our priority.

The ball started rolling when I, Michela Scalpello, joined the team as a research support officer. My experience within the penitentiary sector proved critical in collecting data from all nine countries involved and building eleven key lessons.

The manual raises awareness and builds on knowledge related to the whole spectrum of radicalisation—from recognising the early signs, to the resettlement of released inmates. There's also a programme for prevention and disengagement from radicalisation for detainees and for gradual transition towards their release. Mentoring sessions are one of the tools that we outline. Inmates meet mentors who provide them with support, helping them through deradicalisation. There are also sessions that focus on their future transition into the community, aiding with daunting tasks such as job seeking.

Ultimately, the FAIR practices collection will be shared with the European Radicalisation Awareness Network (RAN), to create a collaborative synergy. This assessment will form the basis of efforts to scale up current practices and to outline a coherent system of detection, to allow us to hone in on early signs of radicalisation and implement the right disengagement strategies.

Although this manual is being written for use primarily among prison staff, this is definitely not the only social group who will find it useful. The tools it outlines can be used by regular citizens, empowering them to act and potentially play a hand in recognising signs and avoiding crises in their communities.

Many terrorism acts could have been controlled had individuals recognised the risk. Would the victims still have lost their lives had the Belgian authorities recognised that Benjamin Herman had become radicalised in prison? Would they have offered him prison leave? What if citizens had recognised his behaviour and spoken to the authorities? These are all questions nobody can answer but one thing is certain—the Liège tragedy is not a one-off. It is only with proper education, knowledge, and empathy, that harrowing events like these can be prevented.

Note: For further information regarding the FAIR Project, the Manual, or following training sessions send us an email at *michela.scalpello@um.edu.mt*.

Document No. 38, 1786
Artwork/photograph by Alex Attard. 2017

Atlas
Artwork/photograph by Dan Hudson. 2015

Many feel that our country is changing at an unprecedented rate. Some would even say that it has become unrecognisable. Valletta Contemporary's ***Dr Joanna Delia*** *writes about the growing appreciation for contemporary art in Malta.*

Why now? What is behind this new movement? These new ways of thinking in the local art scene?

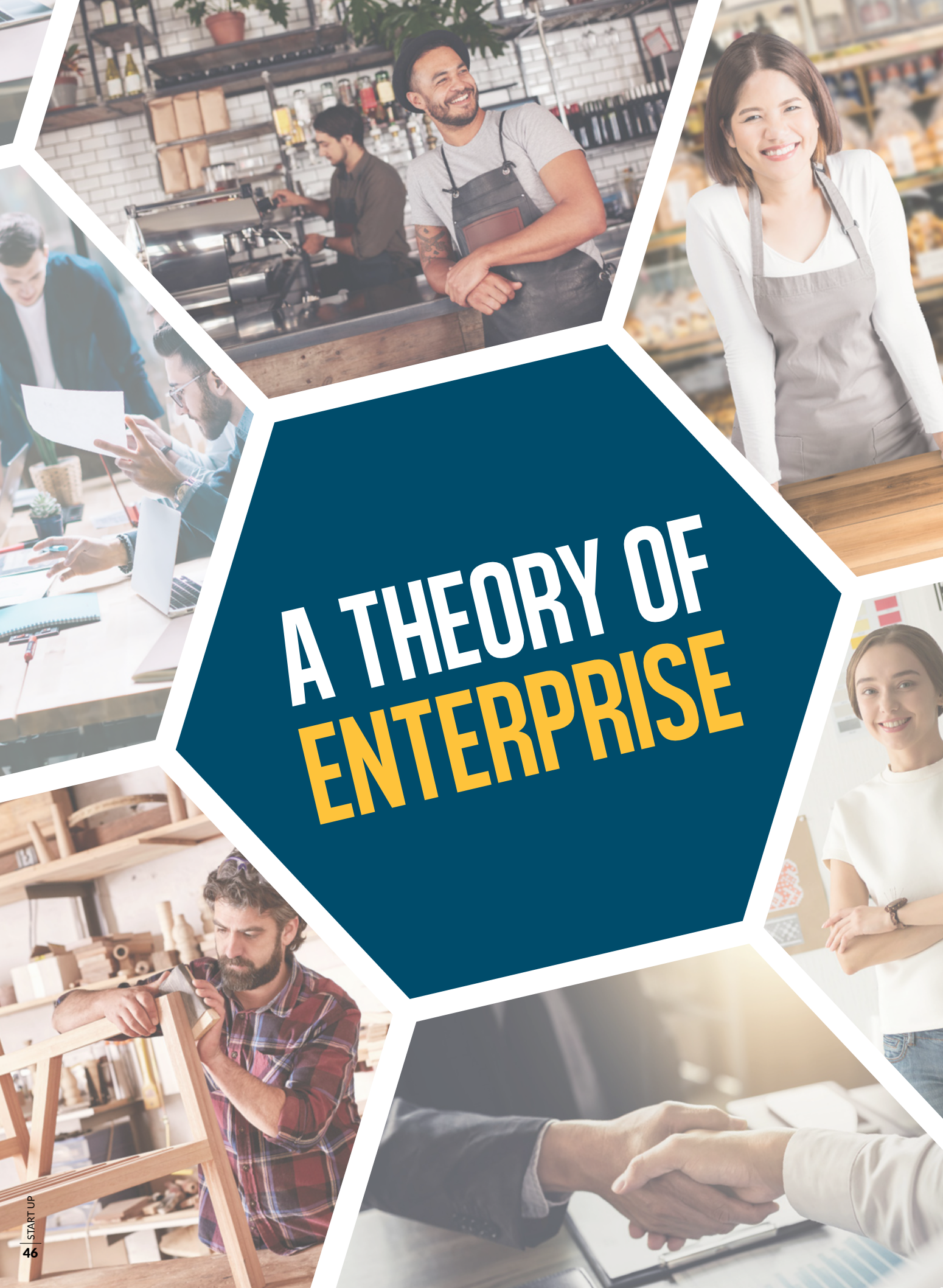
Contemporary art tells us that it is time to start questioning things—to rethink our priorities, not just as individuals but as a community. We do not only need to think laterally, but three dimensionally and with multiple senses. META foundation opened its Valletta Contemporary galleries on East Street, Valletta, in April. Three of the exhibitions held since then—*Electromorphologies*, *Parallel Existences*, and *That Golden Stain of Time*—all dealt with the concept of the passage of time.

Electromorphologies is a look-back at some of the most renowned pioneering videos in the media art world, showcasing works by artists such as Mona Hatoum and Bill Viola. *Parallel Existences*, an exhibition of contemporary fine art photography by Alex Attard, is a magnificent homage to old documents from the 600-year-old collection at Malta's Notarial Archives. The work deals with art's role in archiving precious objects that may have lost their original function and become unrestorable. These objects are shown to still retain their importance by being transformed into artworks.

Dan Hudson's video show, *That Golden Stain of Time*, tackles the eternal presence of the life-giving sun. Many perceive the sun as an instrument that marks the passage of time, as if the sun were designed and constructed for this purpose—as a timepiece that serves us. Such attitudes ignore the obvious fact that the sun predates us and will maybe out-live us. The work thus questions human attitudes of entitlement and the importance we attribute to ourselves. Ultimately, it pushes us to ask whether we may have sacrificed our heritage for the gods of economic success and the short-lived pleasures of innovation.

Contemporary art invites people to interact with the here and now through media as diverse as the world and our societies. It presents myriad of views. The exhibits at Valletta Contemporary change every month, and artists from all disciplines and backgrounds are chosen to participate. Run by a foundation whose only aim is to provide the space and opportunity for people to experience all that contemporary art has to offer, Valletta Contemporary also promises to become a patron of new ideas, of the thought-germinating, concept-shaking world that is contemporary art. Times are changing and we are all on board for the ride.

Valletta Contemporary will be hosting a fundraising initiative showcasing some of the best art by Maltese and Malta-based artists and launching its first catalogue with these works. For more information visit: *www.vallettacontemporary.com*.



A THEORY OF ENTERPRISE

*More often than not, new businesses fail. Worldwide, over half of all new startups fail to make it to the three year mark. A new business assessment model by **Prof. Russell Smith** wants to reverse this trend, and he and his team have already proven that it works. **Dr Edward Duca** writes.*

Launching a business is hard work. Writing for Entrepreneur Europe, NYC-based communications professional Derrek Newton compiled a hilarious list of metaphors linked to the startup process. People likened it to chess and football—tough sports that require mental acumen and strategy. Others said that 'starting a business is like climbing a mountain,' while yet another person compared it to joining the priesthood because it requires devotion and dedication! But there's also a darker side to all this: nearly one in three entrepreneurs suffer from depression because of their work.

Prof. Russell Smith (Centre of Entrepreneurship and Business Incubation, University of Malta) wants to make building and running a business less stressful and more accessible. But how?

He comes from a long line of teachers and engineers, so, he says: 'I am used to taking things to pieces, figuring out how they work and putting them back together again.' He couples this skill set with a unique take on the human body: 'I don't think medical research is any different [from setting up a business],' both are machines of sorts. While working for a pharmaceutical company and teaching at various universities, including Oxford, he saw business patterns everywhere. His experience allowed him to create a conceptual framework of the basic components that a company needs to succeed—'its physiology,' he explains. After that, the next step was for Smith to figure out 'how [to] diagnose what's wrong and make recommendations and interventions,' giving advice on how and when one should keep a business alive, or abandon it quickly. A model was slowly being built.

The Incumatrix™ Business Adviser was the seed Smith helped grow with Prof. Philip Wragg in Oxford, a long-time colleague and entrepreneurship co-lecturer. Smith came up with five key points for businesses, honed and tested while working 'with 5000 business founders from around the world, all of them with incredibly diverse backgrounds.'

The Incumatrix™ model could turn '70% failure at 5 years to 70% success,' explains Smith. Amongst their many students from diverse backgrounds were army veterans. In memory of a fallen friend, they trained over a thousand forces personnel many of whom had 'lost one, two, or three limbs.' These military personnel have strong values: 'good at training, teamwork, planning, they don't quit when it gets cold and dirty, they understand about setting objectives and milestones, about when to withdraw.' These qualities overlap with those needed to run a business successfully. Smith helped them link this skill set to the expertise entrepreneurs need to start a business, giving them another lifeline. War veterans could reintegrate into society and enhance their pension or benefits. Whatever walks of life

they were from, they were able to acquire 'the skills that are translatable to put together a business concept.' Their approach was universal enough to apply to each student: 'they got what we said, […] and we realised that we had got it.' A universal business model was born!

After developing the core idea and values, a golden opportunity came from the University of Malta (UM). 'Through European funding, we could do what we couldn't do in Oxford.' Smith and Wragg wanted to 'have more of a community focus' and develop a course and business model that could 'put bread on the table' but also scale up to the next unicorn: a billion dollar business.

'If we do have it right, and have got the Theory of Enterprise, then it should be used right across the board. So I see this working equally in large companies and for a person working out of their room.' And they think that they might have 'a chance to do something special here in Malta.' And this is where The Enterprise Framework comes in.

THE ENTERPRISE FRAMEWORK

So, what is The Enterprise Framework? It is composed of two parts: the first is The Incumatrix™ Business Adviser that Smith and his team have used to assess the health of thousands of businesses. As a model, it is composed of 25 squares representing the qualities that a business needs to consider. The second part is a set of 25 hexagons that assess the right support structures that a business needs to succeed, or its progress pathway through the Business Environment. To understand the beauty of how these two panels intertwine, we need to go back to basics.

The basis of enterprise, according to this model, is that an entrepreneur identifies a problem and the product or service that would act as a solution, providing benefit to the customer. This leads to some simple questions: 'Can you [the business] deliver the solution to solve a problem? Do enough customers want it? Do the customers perceive the benefits? Can the enterprise generate value [profit] for itself? Should you do this?' For Smith the most important question is: 'does it make you happy?'

An entrepreneur can come to these questions (and answers) through the model. Each of the 25 points in the Incumatrix™ Business Adviser describes a business quality, such as value proposition, sales management, cash flow forecast, commercial strategy, financial control, and so on (see picture). The intriguing thing about the model is that it can also be used to tell the story of a business.

Smith takes two plumbers in partnership as his starting point for our business narrative. Smiling, he says, 'I've never met a poor plumber, at least in monetary terms.' This earns them 4 points (marking ranges from 0=absent to 4=proficient) on production control and strategy. But they only get a 1 on owner's control as 'they don't have a partnership agreement.'

PRODUCTION

OWNERS' CONTROL	BUSINESS TEAM	MILESTONE MANAGE-MENT	BUSINESS VALUE	FINANCIAL CONTROL
BUSINESS RECRUIT-MENT	PEOPLE STRATEGY	ENTERPRISE FORECAST	FUNDING STRATEGY	BUSINESS PROFITAB-ILITY
SALES MANAGE-MENT	MARKET FORECAST	VALUE PROPOSI-TION	CASH FLOW FORECAST	ACCOUNTING MANAGE-MENT
BUSINESS MARKETING	COMMERCIAL STRATEGY	SOLUTION FORECAST	PRODUCTION STRATEGY	BUSINESS RESOURCES
BRAND CONTROL	BUSINESS INTELLIGENCE	INNOVATION MANAGE-MENT	BUSINESS SOLUTIONS	PRODUCTION CONTROL

They also have 'no idea about brand and business marketing.' With hardly a name or a logo for their business, they fail to get any marks for this. Through the Incumatrix™ Business Adviser Smith can give 'a rating from 0 to 100.' A low mark indicates an unhealthy business in need of rapid intervention or abandonment. The plumbers in our story ranked in at 66/100. They were making money, but they could do better.

After talking about plumbers, Smith quickly switches to one of the largest companies on Earth: Apple. Smith uses the model to describe how Steve Jobs returned to Apple in the 1990s after having been fired and turned the dying company into one of the most successful businesses of our time.

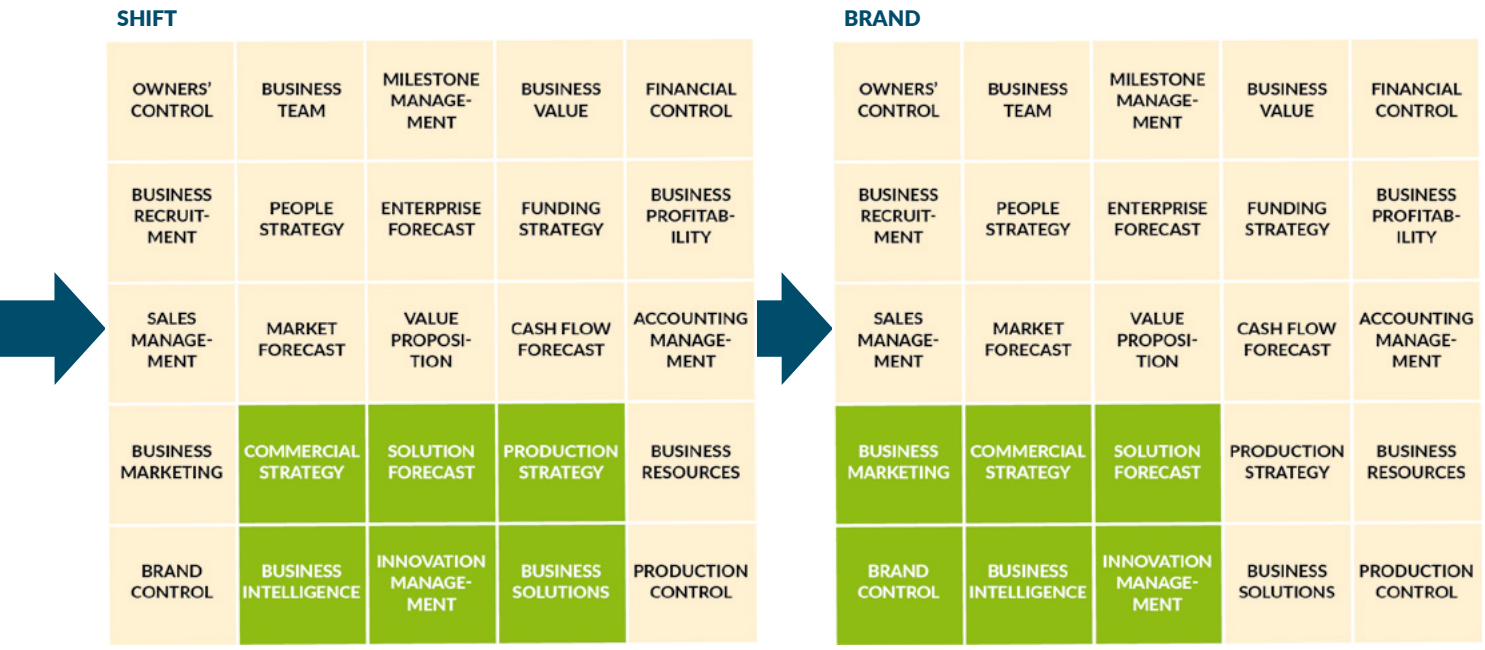
Smith used the business process feature of the model (or 3 by 2 square area). While circling the squares from 'Innovation Management' to 'Production Control', he said: 'this is what Steve Jobs saw when he went back to Apple. Apple was essentially making everything they could make. I think there were 34 products in total.' At this time, Apple was focused on production, leaving innovation to die: no innovation management, no production strategy, and a waste of resources. 'Steve Jobs drastically reduced the amount they were making.' He fired thousands of people, axed production by 70% and turned a $1 billion loss in 1997 into over $300 million in profit in 1998. According to the Incumatrix™, Jobs shifted from 'Business Resources' coming in and too many products going out, to 'Business Intelligence' and a 'Commercial Strategy.' He unveiled much fewer products, like the colourful iMac in 1998 and iPod in 2001, then shifted to the next two squares on the Incumatrix™ covering marketing and 'Brand Control.' The 'Think Differently' campaign remains one of the most famous marketing campaigns in history, cementing Apple's brand worldwide.

This simple model can be used to map what people have done, assess the current health of a business, and figure out what they need to do in the future. Smith has created a business oracle.

A BUSINESS TREATMENT

Today, Smith directs Malta's Centre for Entrepreneurship and Business Incubation (CEBI) that runs TAKEOFF, the UM's Business Incubator filled with dozens of startups. By regularly calculating a business' scores, he can both assess the health of a business over time and compare it to others. Like a family doctor, the scores let him look at current symptoms and suggest relevant treatments to keep the business healthy.

The Incumatrix™ goes hand in hand with their description of what a business needs to do; from creation of the enterprise, to its culmination—be it selling the company or floating it on the stock exchange. In addition to this, the progress pathway mentioned earlier is a hexagonal model that describes



Production > Shift > Brand

Schematic showing how The Incumatrix™ Business Adviser can be used to describe the process Steve Jobs went through when he arrived back at Apple in 1997. A 3 by 2 square can describe a 'business process', the figure shows how Jobs shifted control from one side of the matrix (production) to the other side (brand).

Prof. Russell Smith holding his invention: The Enterprise Framework, that can assess the health of any business
Photo by James Moffett

Take the leap as Ing. Joe Bartolo did skydiving. Bartolo is the manager of TAKEOFF at CEBI, University of Malta

'Steve Jobs drastically reduced the amount they were making.' He fired thousands of people, axed production by 70% and turned a $1 billion loss in 1997 into over $300 million in profit in 1998.

what environment a business needs to develop. When assessing TAKEOFF, the business incubator received excellent scores in its support structure through mentorship of companies, but failed when it came to raising private equity and venture capital. This means that startups at the UM are mostly getting stuck at the incubation and acceleration phase. To amend this, Malta needs to change its laws to allow investors to invest in local companies without being taxed. 'You have to match that [business growth] with the environment they need to thrive,' says Smith, and Malta has a tonne of potential.

STARTUP MALTA

Smith, Wragg and their team at CEBI have trained 'over 100 MEnts (Masters in Entrepreneurship) on the island. So [...] we launch the next stage.' They can shift entrepreneurs from 'starting a business themselves to helping others set up their business'—a train-the-trainer approach for business that is built on the models Smith has created, which he has dubbed 'the world's first integrated programme.'

If successful, these new mentors will contribute to training hundreds of budding entrepreneurs on a model shown to help businesses survive and succeed. Smith wants this momentum to culminate in an event called MedFest which will be held in November 2019. This activity will 'bring together ideas that are ready for investment (equity finance) with investors to showcase them and match them together,' he says. This could launch some highly successful companies in Malta, all of which will be 'helping each other, using a common framework.'

The idea could have a ripple effect, turning Malta into a hub of innovation. Dozens of companies would germinate here, then come to fruition all over the world. Malta 'can fly' but only with an 'integrated approach that fits everything together.'

THE FUTURE IS DIGITAL

The beauty of a simple model to assess a company is the speed with which answers can be given. Smith thinks that 'if all of those hundreds of components [the Incumatrix™ expert model uses a 625-point analysis] were to be considered at once people would never come back, so we have a rule: if you come and talk about your business, unless we have solved your problem in less than an hour then we don't know what we are doing.' And TAKEOFF manager Ing. Joe Bartolo reportedly performed 1000 hours of mentoring last year. Smith admits he can't 'squeeze anything more out of him,' so apart from having short handouts and a book awaiting imminent release, he sees the model's future as being online and having a touch of blockchain technology integrated within it.

Smith wants 'Malta at the centre of the map.' Imagine a digital system that lets entrepreneurs 'answer 25 questions very quickly to give them a report and recommendations' for their business. And all for free.

Entrepreneurs can repeat this every month to assess business health simply and cheaply, improving the whole island's economy. The next feature of the digital system will involve 'answering 625 questions to issue a report, a certificate that entrepreneurs can take to the bank or investor.' They plan to couple this system with blockchain technology to provide unique and secure business reports. Smith wants to automate himself.

'I really want to use [this business model] to help as many people as possible,' Smith says. He believes that entrepreneurship should be 'available for everyone in Malta; from school children learning about enterprise, to family businesses and high growth [companies].' For him, business is a way for people to free themselves and become happier; a revolutionary idea that could see the UM becoming 'a world leading centre' both for plumbers and for the next Steve Jobs!

LAB TO LIFE

What is it that separates innovation in the lab from successful multi-million euro ventures that make money and have a positive impact on the world? The Knowledge Transfer Office's ***Andras Havasi*** *writes.*

When the firm grounds of research have been laid and a new invention is proven in the laboratory, the possibility of a new journey opens up: from the lab to life. This entails transforming inventions into products and services that create profit for companies and benefit society. This is the infamous valley of death that separates multi-million euro ventures from inventions that never stand a chance of returning the invested time and funds. But what separates two projects at either end of the spectrum? What are the key ingredients that make that very important difference?

Only a mere fraction of new inventions and technologies reach the market. These stories of victory are all unique. There is no secret recipe for guaranteed success. However, most of them have one thing in common: a lead researcher who plays a major role throughout the whole process. They drive the research beyond the walls of the lab into the outside world where it can be put to use.

Developing a product and selling it on the market is very different from conducting research. It is business we are talking about here, and it is severely competitive. The qualities and skills you need to maneuver through the business world are new to most researchers. The first is being able to see a business opportunity. This must be followed up with the ability to react to the opportunity and create value for customers. Then there is the scariest part of it all: having an aptitude for taking calculated risks. Most of the time, scientists stop dead in their tracks. A few rise to the occasion; they become both researcher and business person combined—an academic entrepreneur.

Andras Havasi
Photo by Jean Claude Vancell

As with most of life's choices, becoming an academic entrepreneur is personal. It requires careful self-examination, an assessment of your abilities and a consideration of your position in life and in your career. There's more to consider beyond one's own individual skills and dedication when starting a business venture that has a high chance of failure. In fact, the challenges that come with this move are so formidable that it is crucial to have a supportive academic environment that embraces entrepreneurship. Key steps include setting up technology transfer offices, business incubators, and entrepreneurship courses on campus. Also needed is the facilitation of industry-academia collaboration while having accessible business knowledge and support for researchers. But more could also be done. We need to encourage academic entrepreneurship by acknowledging researchers' willingness to take the risk of the lab-to-life journey. Patents, spin-outs, and commercialisation efforts should count towards promotion.

Several international role models have proven that academic and entrepreneurial activities are compatible if you can learn the necessary skills. Researchers from Ohio University, Stanford, and MIT played a huge role in the development of GPS technology, Google, and the Internet respectively. It can be a real win-win situation for those who desire both academic freedom and the excitement of inventing new things and seeing one's inventions in the hands of users. As for research institutions, if they want to strengthen their integrity in the triple helix model of innovation—the academia-industry-government relationship—then this is definitely the way forward.

There is a risk in leaving the comfort zone of research behind, but even in the worst case scenario there are gains to be had. The adventure might leave a researcher somewhat battered and bruised for a little while, but they will emerge armed with invaluable experience that will ultimately make them a better researcher. As for the best case scenario? The only limits to that are one's own imagination and nerve.

MSc student Helene Nuland conserving a Baroque wall painting cycle in the Chapel at Palazzo de la Salle in Valletta, the focus of a previous conservation project carried out by the Department of Conservation and Built Heritage.
Photo by the Department of Conservation and Built Heritage

Conserving brushstrokes

A new conservation project will soon start work on one of Malta's most significant historical artworks. ***Laura Bonnici*** *meets* ***Prof. JoAnn Cassar***, ***Jennifer Porter***, ***Dr Chiara Pasian***, *and* ***Roberta De Angelis*** *to find out why conserving the d'Aleccio Great Siege Wall Painting Cycle is of national importance.*

In 1575, just a decade after Malta's Great Siege, the Order of St John commissioned Matteo Perez d'Aleccio, a disciple of the school of the world-famous Michelangelo, to capture key historical moments of the infamous siege for the principal hall of the then newly-built Grandmaster's Palace in Valletta.

The work lasted six years and almost certainly took into account eyewitness statements from war veterans. According to Emmanuel Magro Conti, Senior Curator of Maritime and Military History at Heritage Malta and historical consultant on this conservation project, d'Aleccio's efforts resulted in what is arguably the best and most accurate representation of Malta's famed siege.

DEFINING WORK

'The paintings depict 12 key moments from the four-month-long Siege,' explains the project leader Jennifer Porter from the Department of Conservation and Built Heritage at the Faculty for the Built Environment, University of Malta (UM). These include the arrival of the Ottoman armada, pivotal battle scenes, and the arrival of a relief force from Sicily, which effectively convinced the Ottomans to lift the siege. The paintings are extremely detailed and they accurately depict styles of dress, armour, weaponry and the ships of the period. The narrative is developed visually through key events which play out over a series of frames.

At their core, the paintings 'constitute an extraordinarily important historical document,' Porter says. They are also defining for the history of art in Malta. However, the passage of time has not been kind to these works of art.

Over the centuries, these monumental paintings have deteriorated. A project launched in 2001 by the Dresden Academy of Fine Arts in Germany conserved around two-thirds of the cycle, before the project stalled due to funding problems and the illness of the project's director Prof. Heinz Leitner. Now, a group of conservators in Malta is gearing up to tackle the remaining third part of the cycle, to finally complete the whole project.

'The paintings and the Dresden project are very well-known in our field and, as a department, we have always revered the d'Aleccio painting cycle,' explains Porter. 'We have been dreaming of the possibility of undertaking this project for some years and are thrilled that we have managed to make it happen, with the support of the UM, the Research, Innovation and Development Trust (RIDT), Heritage Malta, and the Office of the

Detail of a battle scene from the Perez d'Aleccio Great Siege wall painting cycle in the Grandmaster's Palace, Valletta.

Bottom, left: MSc student Lara Walker uncovers the lower border of the painted frieze in the Chapel at Palazzo de la Salle

Bottom, right: MSc student Helene Nuland conserving the coat of arms of Grandmaster de Vilhena in the wall painting cycle of the Chapel at Palazzo de la Salle

Photos by the Department of Conservation and Built Heritage

The d'Aleccio paintings serve as enduring symbols for the identity of the nation today.

President, as well as logistical support from the Restoration Directorate.'

The project made the headlines earlier this year when it sought €300,000 in funding. At the project's official launch in July, HE The President Marie-Louise Coleiro Preca applauded efforts to conserve the d'Aleccio Great Siege Wall Painting Cycle and encouraged more companies and entities to come forward and contribute to the conservation of the piece and of Malta's heritage.

When a generous sponsorship was secured from The Gasan Foundation, a lead sponsor found with the help of the RIDT, preliminaries for the start of the project commenced. The team had two main objectives: conservation of the cycle, and providing one-of-a-kind training to future conservators.

A LEARNING OPPORTUNITY

The d'Aleccio paintings are exceptional and as such have created a scenario of their own, bringing together institutions that have not worked side-by-side in this way before.

The UM and Heritage Malta are joining forces to create a unique learning experience for students on the Master of Science (MSc) degree in the Conservation of Decorative Architectural Surfaces.

'MSc students spend 50% of their time in practical training, which is essential to form skilled conservators. During our conservation projects, they always work under the close supervision of the department's team of professionally-trained wall-painting conservators,' Porter explains. Porter herself is the coordinator of this course. Key figures from Heritage Malta involved in the project include Principal Conservator of Paintings Anthony Spagnol and Senior Curator Emmanuel Magro Conti. Professional wall paintings conservators will also be engaged to keep up the project's momentum while the students follow the theoretical part of the course.

This combination of collaboration and sponsorship marks a new frontier for conservation projects at the UM. 'It would be impossible for us to carry out such a project without the support we have been offered,' remarks Porter. 'These projects require specialised equipment and materials. Lighting, electrics, scaffolding, or photographic equipment. It is often impossible for universities to undertake projects of such a scale due to the need to work at a slower pace than professional teams since we are teaching and training students at the same time.' Teaching and research institutions like the University of Malta have the resources and time to properly study the paintings and their treatment, and to glean as much from the experience as possible.

'Spending so much time in such close proximity to a work of art is a truly privileged situation for both the professional conservators and the students. In the case of the d'Aleccio Great Siege Wall Painting Cycle, we are in the presence of history. To be able to conserve this piece of Malta's heritage, and use it to train the next generation of conservators, is hugely exciting and we hope it will inspire the conservation projects of the future.'

The Maltese Time Machine: Magna Żmien

Andrew Pace for the Valletta 2018 Foundation

As I write this article, a box full of 8mm film has just been delivered to our studio. On these tapes is local home footage featuring carnival celebrations from the 1960s, a visit by the UK's Queen Elizabeth II, and an assorted series of family events recorded around the Maltese Islands. These films are valuable historical records opening a window onto the unfiltered and uncensored perspective of Maltese citizens.

Magna Żmien is a Valletta 2018 project coordinated by artistic director Andrew Alamango and a collective of like-minded individuals. The purpose of the project is to collect and preserve historic Maltese content recorded on home sound, image, and video equipment over the past century. Left neglected, these personal documents containing evidence of Malta's changing landscapes—physical, social, and political—might have been lost and forgotten. Instead, the team is reusing them, reinterpreting them through art.

The move to digitise and make available fading analogue memories is physically manifested through 'The Magnificent Memory Machine'—the Kapsula Merill, designed and built by Matthew Pandolfino, Andre Vujicic and Late Interactive. In the driver's seat is Armchair Voyager Wistin (Jacob Piccinino). Behind the scenes is the professional studio that makes it all happen, digitising open reel tapes, audio cassettes, vinyl, Super 8 and 8mm film, photographs, negatives, and slides at high resolution. Since February 2018, we have digitised over 2,000 items from 51 different donors, in addition to receiving a further 600 digital files from private collections.

The collected material has many stories to tell. Our performance events throughout 2018, including at Science and the City and Malta Café Scientifique, only scratch the surface when it comes to the sheer volume of material we have been allowed to copy by donors.

One thing we often encounter is the personal voice message—greetings between diasporic Maltese. Dating back to the 1950s, these appear most frequently on open reel and audio cassette tape, but also on special vinyl discs. One particular recording is by a man named Charlie who recorded his message in a Calibre booth on a platform at London Waterloo station. In the message, Charlie sends wishes to his family and regales them with tales of all the football matches he is attending, one of which he is particularly excited about: England vs East Germany. Some minor detective work has revealed that this recording was made on 24 November 1970 when England beat East Germany three goals to one.

Messages such as these may seem inconsequential, but of all the voice recordings we have heard, they are perhaps among the most honest. Recorded in a busy, alien environment under strict time constraints, the speakers didn't have the luxury of retakes before their voices were forever fixed on vinyl.

Magna Żmien will continue to collect sounds, images, and videos like these, and present its research in innovative contexts beyond 2018. We want to continue engaging citizens in the technical and cultural components at the heart of our project. Agreements are also underway to establish a formal association between Magna Żmien and the National Archives, ensuring the longevity of this material as public documents are accessible to all. What we collect, after all, belongs to the Maltese people at home and abroad. The recordings contain an essence of our national identity that cannot and should not be lost. T

For more, visit: www.magnazmien.com

Both images: Magna Żmien
Photos by Elisa von Brockdorff

POLICING THE SEAS

Living on an island in the middle of the Mediterranean, chances are that fish are an integral part of your diet. But do you think about how the fishing industry actually works? ***Kirsty Callan*** *talks to* ***Dawn Borg Costanzi*** *about the need for safer, more ethical practices.*

When you sit down to eat your next tuna steak, will you be thinking about where the fish came from, and how it was caught? Will you be thinking about the fishermen's working conditions? The likely answer is no. But these are 'real problems in the global fishing industry,' says Dawn Borg Costanzi. Working from the London hub of the international NGO 'The Pew Charitable Trusts,' Borg Costanzi and her colleagues are on a mission to end illegal fishing.

A SERIES OF COINCIDENCES

Borg Costanzi found herself working in fisheries policy after completing a BSc in IT (specialised in computer science and artificial intelligence). After graduation, she got a job with a Maltese software development company, and she started working on a project tracking fishing vessels for the government's Department of Fisheries and Aquaculture. By the end of the project, she and her team had re-developed the electronic register of fishing boats for the Maltese Islands.

The project attracted the attention of the United Nations. The Food and Agriculture Organization (FAO) wanted to develop a similar register for the whole of the Mediterranean, and needed someone from the Maltese team to consult with them for a year and share their local experiences. Borg Costanzi rose to the occasion. The relationship continued to flourish when FAO set its sights on a global register of fishing vessels.

Borg Costanzi moved to Rome for six years to work with FAO on the software development side of things. She helped build the Global Record of fishing vessels and a questionnaire for countries to report their progress in fostering responsible fishing practices. The goal was to crack down on illegal, unreported, and unregulated fishing. Together with her team, she presented the prototype of the Global Record at the Committee on Fisheries in 2014, a biennial meeting attended by representatives from all fishing countries to take decisions on fisheries management. 'It was met with very positive feedback—it was a great moment,' she says.

But as time rolled on, Borg Costanzi slowly became more involved in policy-making. Today, this is her primary work with 'The Pew Charitable Trusts.' 'We want to ensure the sustainability of three things: the fish, boats, and people,' she explains. They do this by trying to get policy agreements through the UN and other international fisheries management bodies.

SHINING LIGHT

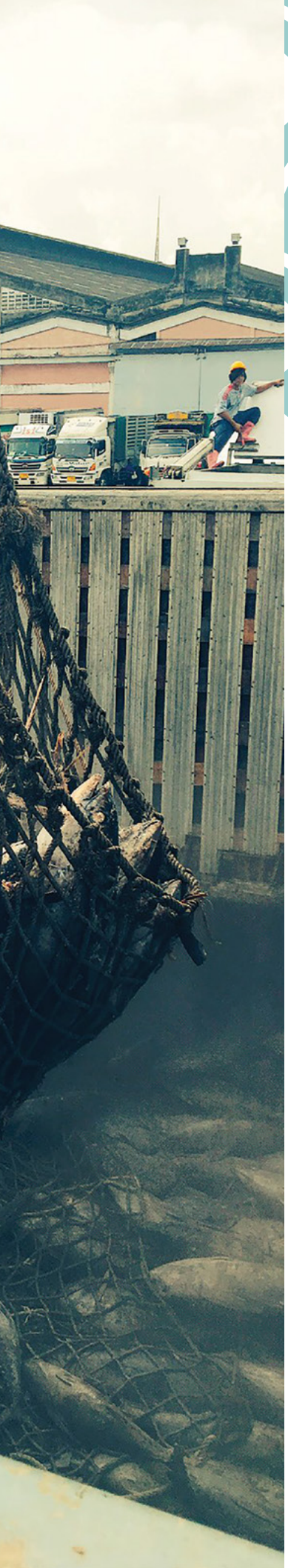
'When you say illegal fishing, people think about some boats catching too many fish. That is a big problem but it's not the only thing,' Borg Costanzi adds. Ships are fishing where and when they shouldn't, the catch is not always reported accurately, and some areas simply have no fishing rules or regulations. Some fishing methods can damage the seabed, and safety is a major problem. There are human rights issues that should also be considered. Fishing is the second most dangerous occupation in the world with 24,000 deaths annually and people often go missing at sea,' she says. But it gets worse. In some parts of the world, 'fishermen are offered contracts

Dawn Borg Costanzi

but payments aren't honoured. Sometimes they can be stuck on board for years at a time, practically locked up in cages, with not enough food and working 20 hours a day.' Sometimes fishing becomes slavery.

'Consumers can do their bit in fighting against this by showing interest,' Borg Costanzi insists. Ask your fishmonger: is this a local fish? Is it farmed? How was it caught? Was it transported? Was it frozen? 'These questions show the supply chain that the consumers care, and that makes them [the industry] clean up their act,' she says. Look out for certification and eco-labels on pre-packaged food, as an indication of sustainable fishing. On a personal level, she encourages people to eat a variety of local fish that are in season. This is something people are becoming more aware of. However, habits are still hard to break and this is why some fish, like tuna, is now close to becoming endangered.

Ultimately though, Borg Costanzi concedes that consumers have little way of knowing whether their seafood has been caught illegally. It is the authorities



Skipjack and yellowfin tuna being offloaded from a fish carrier in a port in Bangkok, to be taken to a processor for canning
Photo by Dawn Borg Costanzi

FISH4TOMORROW

Created out of concern over the state of Maltese and European fisheries, fish4tomorrow is an NGO that conducts research, lobbies and campaigns with one aim in mind: to foster a culture of sustainable seafood consumption.

One of their most useful endeavours was the Quickfish guide, currently available on their website. Compiled with the help of scientists, fisheries, and other experts in the field, it is a rich, practical resource for consumers to use when consuming fish. It uses a rating system that tracks environmental sustainability and includes information on the health of fish stocks, fishing methods and their consequences, social consequences, and any other environmental impact of fishing, farming, and importation.

For more, visit: ***www.fish4tomorrow.com/quickfish-guide***

that must set up appropriate checks at the ports and when authorising ships for fishing. Seafood suppliers should ensure the traceability of their supply chains—everything also needs enforcement.

REFLECTING...

Despite her success in fisheries, the kind of work Borg Costanzi does was not something she always aspired to. 'When I started doing IT, I didn't know the world of fisheries management even existed,' she says. 'But it's only when you actually enter an industry that you get to know the full extent of the opportunities available. You just have to be open to new experiences.' On this note, 'it's important [for others] to know that you don't have to be restricted to what you study. It's OK to feel like you'd prefer to do something else and decide to change paths. As long as you can show [that] you are adaptive and can learn easily, and are interested in other things, it doesn't matter,' she says—some healthy career advice.

Speaking candidly about her own path, Borg Costanzi recalls a brief period when she stepped outside the fishing world to work for an online university. She soon realised, however, that her heart wasn't in it. 'I thought I'd go back to doing IT full-time. I thought the fisheries projects had just been a short stint, but I soon realised I wasn't making good use of my experience and I went back.'

Borg Costanzi now feels very committed to the work she's doing combating the illegal fishing industry. 'These are serious problems that we are tackling and there is a huge team behind it all,' she says, noting that it will take a long time to resolve these 'if it is even possible.' But she remains hopeful: 'small efforts make a big difference when you combine them,' she continues.

'It's the idea that you're doing something for the greater good, which is a bit cliché but also true,' she continues. 'I can see a clear path of how my work can take us from working on illegal fishing to really improving food security and making sure people have enough food to eat—for me, that's very, very important.' T

TO-DO LIST

MUSIC

You'd be forgiven for thinking that British rock band ***The Darkness*** is not usual fare for this office. But it's the ultimate millennium throwback that we cannot say no to. I do believe in a thing called love. Yes, I do!

BOOK

Protagonist Eleanor, from ***Eleanor Oliphant is Completely Fine*** by Gail Honeyman, is the most distinctive character we've met all year. There may be something very dark beneath it all, but Eleanor emerges as a bright light.

YOUTUBE CHANNEL

If you're a fan of pop culture and video essays, ***Pop Culture Detective***'s critical lens should hit the spot. Politics, entertainment and masculinity feature often. You have been warned.

POP CULTURE DETECTIVE AGENCY

PODCAST

Global Pillage is about the diversity of human experience. It's a panel show with weird (but true) facts about the human race. AND they have comedians.

MOVIE

In post-truth times like these, a film about defending the press and its freedom to expose corruption is a must-watch. Steven Spielberg's ***The Post***. Put it on your list!

TV

Beaches, museums, places of cultural significance: this is what regular tourists flock towards. Then there are those who are more attracted to places historically associated with death and tragedy. These are the people featured in ***Dark Tourist...***

INSTAGRAM

All the pretty things made by the people in the ***@Adobe*** community are featured on their feed. And it's a good 'un!

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